(Projects funded under the Call 2014 onwards must use this format)

LIFE Project Number

LIFE17 NAT/ES/000568

Final Report

Covering the project activities from 01/10/2018[1] to 30/09/2023

Reporting Date[2]

<30/12/2023[3]>

LIFE BIORGEST

Innovative Forest Management Strategies to Enhance Biodiversity in Mediterranean Forests: Incentives & Managements Tools

Data Project

Project location:	Catalonia (Spain) and Languedoc-Roussillon (France)
Project start date:	01/10/2018
Project end date:	30/09/2023
Total budget:	€1,576,374
EU contribution:	€945,822
(%) of eligible costs:	60%

Data Beneficiary

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[1] Project start date
[2] Include the reporting date as foreseen in part C2 of Annex II of the Grant Agreement
[3] The actual Reporting Date is 29/02/2024. On 08/12/2023 a postponement for the delivery of Final report was requested and approved by the Project Officer

Package completeness and correctness check	
Obligatory elements	**✓ or N/A**
Technical report	
The correct latest template for the type of project (e.g. traditional) has been followed and all sections have been filled in, in English *In electronic version only*	✓
Index of deliverables with short description annexed, in English *In electronic version only*	✓
Mid-term report: Deliverables due in the reporting period (from project start) annexed Final report: Deliverables not already submitted with the MTR annexed including the Layman's report and after-LIFE plan Deliverables in language(s) other than English include a summary in English *In electronic version only*	✓
Financial report	
The reporting period in the financial report (consolidated financial statement **and** financial statement of each Individual Beneficiary) is the same as in the technical report with the exception of any terminated beneficiary for which the end period should be the date of the termination.	✓
Consolidated Financial Statement with all 5 forms duly filled in and signed and dated *On paper (signed and dated originals*) and in electronic version (pdfs of signed sheets + full Excel file)*	✓
Financial Statement(s) of the Coordinating Beneficiary, of each Associated Beneficiary and of each affiliate (if involved), with all forms duly filled in (signed and dated). The Financial Statement(s) of Beneficiaries with affiliate(s) include the total cost of each affiliate in 1 line per cost category. *In electronic version (pdfs of signed sheets + full Excel files) + in the case of the Final report the overall summary forms of each beneficiary on paper (signed and dated originals*)*	✓
Amounts, names and other data (e.g. bank account) are correct and consistent with the Grant Agreement / across the different forms (e.g. figures from the individual statements are the same as those reported in the consolidated statement)	✓
Mid-term report (for all projects except IPs): the threshold for the second pre-financing payment has been reached	**N/A**
Beneficiary's certificate for Durable Goods included (if required, i.e. beneficiaries claiming 100% cost for durable goods) *On paper (signed and dated originals*) and in electronic version (pdfs of signed sheets)*	✓
Certificate on financial statements (if required, i.e. for beneficiaries with EU contribution ≥750,000 € in the budget) *On paper (signed original) and in electronic version (pdf)*	**N/A**
Other checks	
Additional information / clarifications and supporting documents requested in previous EASME letters (unless already submitted or not yet due) *In electronic version only*	✓
This table, page 2 of the Mid-term / Final report, is completed - each tick box is filled in *In electronic version only*	✓

**original signature by a legal or statutory representative of the beneficiary / affiliate concerned*

1. Table of contents

2. List of key-words and abbreviations

BA: Basimetric area

CAP: Common Agricultural Policy

CEIB: Committee of Experts on the Integration of Biodiversity Conservation into Forest Management

CFC: Consorci Forestal de Catalunya, coordinating beneficiary

CIE: International Committee of Experts on PBI Validation

CINEA: The European Climate, Infrastructure and Environment Executive Agency

CNPF: Centre National de la Propriéte Forestière, associated beneficiary

CPF: Centre de la Propietat Forestal, associated beneficiary

CREAF: Centre de Recerca Ecològica i Aplicacions Forestals, associated beneficiary

CSR: Corporate Social Responsibility

CTFC: Centre de Ciència i Tecnologia Forestal de Catalunya, associated beneficiary

CTNFM: Close-to-Nature Forest Management

DARP: Ministry of Agriculture, Livestock, Fisheries and Food

DGFEEM: Directorate-General for Forest Ecosystems and Environmental Management

DGEPNE: Directorate-General for Environmental Policies and Natural Environment

DTES: Ministry of Territory and Sustainability

EAFRD: European Agricultural Fund for Rural Development (FEADER in Spanish)

EASME: Executive Agency for Small and Medium-sized Enterprises

EC: European Commission

ERDF: European Regional Development Fund (FEDER in Spanish)

FCC: Forest Canopy Cover

FPI: Forest Planning Instrument

GA: Grant Agreement (LIFE17 NAT/ES/000568 - LIFE BIORGEST)

ha: Hectare

KPI: Key Project Indicators

ORGEST: Guidelines for Sustainable Forest Management in Catalonia

PBI: Potential Biodiversity Index

PES: Payment for Environmental Services

TCs: Transfer Classrooms – marteloscopes. In Spanish: Aula de Transferencia (AT)

XCN: Xarxa per a la Conservació de la Natura, associated beneficiary. Previously, the name of this entity was Xarxa de Custòdia del Territori (XCT).

3. Executive Summary

The main objective of the LIFE BIORGEST Project, "Innovative forest management strategies to enhance biodiversity in Mediterranean forests: Incentives & Management Tools", is to improve the biodiversity of Mediterranean forests by integrating specific measures and innovative practices into forest planning and management instruments and through new financing and compensation mechanisms. It is therefore intended to reconcile the improvement of biodiversity with the economic sustainability of forest management, ensuring forest persistence and their adaptation to climate change. The project has been developed in Catalonia (NE Spain) and Occitania (SE France) and was completed in 2023.

The project is divided into six main action groups which are summarised below. Overall, all actions have been completed in the time and manner foreseen in the GA.

The **project management** actions (actions F) has been carried out without any significant problems. At the start of the project, the constitution of the Coordination Committee, the main management and decision-making body, made up of one or more individuals from each partner entity, was approved, as was the position of project director. Throughout the project, this Committee had met on 10 occasions. The CFC has been the institution responsible for management and overall coordination.

The **preparatory actions** (actions A) were completed in summer 2020. The first phase involved defining the demonstrative stands (each covering approximately 8 ha) in which the management models for enhancing biodiversity were to be implemented and signing the agreements with the owners. Altogether, 28 stands for actions C1-C4 and C5.2, including naturally evolving stands, were created.

The main results of this group of actions are as follows: (i) Seminar with experts to define indicators and thresholds for assessing the conservation status of Mediterranean forest habitats and the drafting of the corresponding report; (ii) New version of the Potential Biodiversity Index (v2.1) and the data collection protocol; (iii) Based on the initial diagnosis of each stand and the implementation of PBIC v2.1, a silvicultural report was drawn up and a cartographic database was created with GIS for inclusion on the project website; (iv) Programme for integrating conservation measures into forest management with forestry itineraries for each stand, and processing of administrative permits; (v) and study of innovative funding mechanisms, incentives and contractual mechanisms.

The main problems encountered during the preparatory actions were the change in the location of several stands with respect to the original proposal and the slow process of signing several agreements. In any case, except in the case of two stands, this delay did not have a negative impact on the subsequent actions or make it necessary to reschedule the forestry work.

The **conservation actions** (actions C) consisted mainly of: implementing the management models for the improvement of biodiversity in all the stands corresponding to actions C1-C4 (pure and mixed stands of *Quercus ilex*, *Quercus humilis* and other oak species, and *Pinus halepensis* located in Catalonia); diagnosing and marking the biodiversity elements to be conserved in 15 stands where the owner planned to act and assumed the costs of the action (C5. 1); implement conservation measures in 4 stands in Occitania (C5.2), and generate the validated version of the IBP (IBPC v3.0) (C5.3).

The forestry actions in stands C1-C3 and C5.2 were carried out in accordance with the forestry itineraries and consisted basically of: selective cutting or thinning, regulating competition for trees for the future and clearing work, in addition to biodiversity enhancement measures such as: retaining large trees, retaining trees with dendro-microhabitats, creating deadwood, etc. In the C4 stands, action was taken to prepare the forest for natural dynamics. As foreseen in the

GA, the forestry activities in all of these stands were due to be finished by late May 2020. However, Storm Gloria (which affected many regions in Catalonia and Occitania) and the restrictions imposed due to COVID-19 resulted in delays in several stands. It should be noted that these delays only affected, on an ad hoc basis, some sampling for monitoring biodiversity indicators and ecosystem functions. Once the forestry work had been carried out, the corresponding 'Technical description document on the implemented innovative management models' reports were drawn up.

As part of the conservation actions, intensive work has also been done to integrate the proposed measures into the policy and regulations affecting the management of Mediterranean forests. This has resulted in:

- Creation of a working group in the forestry administration to reach a consensus on the best measures for integrating biodiversity in the process of approving the different FPI.
- Specification of a set of improvements to be incorporated into the ORGEST.
- Inclusion of biodiversity integration criteria in the proposed modification of the Order regulating FPI.
- In addition, the regulatory bases have been published for the financing of measures for the integration of biodiversity in forest management and for the creation of forest reserves based on the technical information worked on in the project.

The **monitoring actions** (actions D) involve monitoring and assessing the stands subject to forestry activities from a silvicultural, biodiversity and ecosystem function perspective. To this effect, in mid-2019, an initial monitoring protocol was drafted, which describes the methodology for implementing control plots and performing the inventories and samplings. In general terms, inventories/sampling were carried out before and after the forestry actions, and at the end of the project. In addition, the project was also assessed from a socioeconomic perspective, based on surveys given to relevant stakeholders and data provided by the partners.

Furthermore, with a view to providing advice on specific aspects of certain actions, the CEIB was created, and the CIE, which has met on three and five occasions, respectively.

All the results have been compiled in 3 final reports describing the effect of the treatments on the main silvo-dasometric parameters, on the biodiversity carrying capacity, and on biodiversity indicators and ecosystem services according to habitat and management model.

During the last year of the project, the action **'Compensation to landowners'** (action B1) has been addressed. In the framework of this action, XCN has bought the forest harvesting rights not to exercise them and thus create a forest reserve in a 6 ha stand, by means of a stewardship contract for a duration of 25 years.

The **awareness and dissemination of results actions** (actions E) have been carried out, for the most part, throughout the project. The project has a website, www.lifebiorgest.eu, and a Twitter account, @lifebiorgest. Various dissemination materials have been designed, including informational brochures, roll-ups, information panels and merchandise, and an informative video has been edited. A newsletter has been published every 6 months (9 in total). A significant number of networking actions have been carried out, 21 articles on the project have been published in Catalan and French journals, and the project has been presented at 16 different events/seminars. Four transfer workshops, as well as other additional, 3 specialisation courses, 4 workshops in the Transfer Classrooms and one final seminar have also been held. Due to Covid19, some of these events had to be held online. Contact with the media has yielded the following results: appearances in 39 written or digital press outlets (local, regional and national) and on 7 radio and 5 local and regional television stations. Finally, 5 guides have been published, summarising the work and knowledge acquired throughout the project, different information sheets related to the PPI and Layman's report.

4. Introduction

Background:

The LIFE BIORGEST project has been developed in Catalonia (NE Spain) and Occitanie (SE France) and has covered the most widespread and representative forest habitats of community interest (HCI) in the Mediterranean region of Western Europe: holm oak forests ((HIC9340)), sub-humid oak HIC9240 and Aleppo pine (HIC9540) and cork oak forests (HIC9330) (pure and mixed).

In Catalonia, these formations make up 50% of the forested surface area, while in Occitania they are also highly significant, representing 88% of the forested area in this region.

The project has taken place almost entirely in natural areas of the Natura 2000 Network. Specifically, in the following areas: Massís del Montseny (ES5110001), Alta Garrotxa (ES5120001), Zona volcànica de la Garrotxa (ES5120004), Serra de Collserola (ES5110024), Serres del litoral septentrional (ES5110011), El Montgrí-Les Medes-El Baix Ter (ES5120016), Sant Llorenç del Munt i l'Obac (ES5110010), Sistema Transversal Català (ES5110005), Basses-Corbieres (FR9110111), Massif des Albères (FR9101483) and EIN Turons de Maçanet.

With regard to these types of formations on which the project has focused, there is a general consensus that, in the context of the abandonment of forest uses and the abundance of young, coetaneous and thicket stands, **forest management is key to improving their favourable conservation status**. That is to say, favouring forests with heterogeneous densities and structures and adequate proportions of stands in different stages of development favouring connectivity. Such management is also essential to protect against major forest fires and other disruption and to ensure the sustainable provision of ecosystem services.

Within the scope of the project, there are widely known and used models of sustainable and multifunctional management of forest areas, such as the ORGEST models in Catalonia, close-to-nature forestry models and french management guidelines, among others. However, the emphasis in these management models and orientations is usually on the production of wood or other non-wood forest products, physical soil protection, improved vitality and fire prevention. Although these management models also consist of some biodiversity conservation criterion, there was no clear definition of what are the indicators of maturity and structural complexity related to biodiversity (and their respective thresholds), and, above all, specialist forest fauna, that would help us to develop new management models for real implementation at operational scale.

In this sense, the challenge of LIFE BIORGEST was to generate much more comprehensive and unifying technical prescriptions for the incorporation of biodiversity conservation into multifunctional management, in a way that had not been addressed to date in the region. The aim has been to cover all phases of the forest management and planning process and propose specific measures, such as, for example, retaining large trees or trees with cavities, creating deadwood and performing selective thinning and clearing to enhance habitat heterogeneity, eliminate competition for endangered plant species and improve the habitats for wildlife. Additionally, the project has included the implementation of new financing and compensation mechanisms.

Project objectives:

The main objective of the project is to improve the biodiversity of Mediterranean forests by integrating specific measures and innovative practices into forest planning and management instruments and through new financing and compensation mechanisms. It is therefore intended

to reconcile the improvement of biodiversity with the economic sustainability of forest management, ensuring forest persistence and their adaptation to climate change.

The specific objectives were:

1) Improve the biodiversity of the most representative Mediterranean forests by incorporating innovative practices into forest management, balancing these forests' environmental, social and economic assets and guaranteeing their adaptation to climate change.
2) Demonstrate the applicability of the measures proposed with on-field implementation.
3) Create a revised, accepted version of the Index of Potential Biodiversity for Catalonia (IBP_Cat) to be used as a diagnostic and forest management and planning support tool.
4) Develop new funding mechanisms to provide private forest owners with incentives to apply biodiversity improvement measures.
5) Incorporate the measures developed into the regional policies and standards which govern Mediterranean forest management.
6) Transfer the results to all parties involved in forest management (property, managers, forest administration and companies).
7) Raise societal awareness of the importance of improving biodiversity through sustainable and multifunctional forest management that avoids rural abandonment and promotes healthy forests capable of generating ecosystem services and hosting a resilient and diverse ecosystem.

Expected longer term results:

- The implemented management models will improve biodiversity indicators and reduce competition and water stress, increasing growth rates and vitality of forests, as well as their resilience, favouring their adaptation to climate change.
- Thanks to the conservation actions implemented as part of the project, the populations corresponding to the various groups of organisms associated with the structural indicators will increase: vascular plants, bryophytes, lichens, saproxylic beetles, birds and bats, among others.
- Development of silvo-environmental compensation measures, including a methodology for calculating the economic impact and the development of compensation and financing mechanisms.
- New tools and models transferred to the forest sector to implement new management approaches favouring the conservation of these habitats. In the long-term, these models should be naturally adapted by forest owners and managers.
- Increased public awareness of the importance of developing a form of forest management that serves to enhance biodiversity and prevents forest neglect.
- The conservation actions carried out in the project include implicit solutions for enhancing biodiversity that are compatible with other functions and the production of goods. And these solutions on the ground, with slight variations, may be easily replicated in other Mediterranean forest habitats.

5. Administrative part

Project management has consisted of the following actions:

F1: Project management and coordination, by the CFC.
F2: Operational project meetings.
F3: Administrative and financial monitoring.
F4: Drafting of the “After-Life Plan”.

Between 21 November and 12 December 2018, all agreements between the CFC and the associated beneficiaries, which outline their technical and financial involvement in the project, were signed. Thanks to these agreements (which were delivered with the Midterm report), a multi-disciplinary team of forest owners, foresters from public authorities, scientists and experts in the field of conservation and sustainable forest management has been assembled, lending the project a cross-cutting nature and making it a point of reference around the Mediterranean Basin.

At the start of the project, the project's management structure was defined and the constitution of the Coordination Committee, the main management and decision-making body, made up of one or more individuals from each partner entity, was approved, as was the position of project director. During the first Coordination Committee meeting, the names of the financial officers from each entity were also provided.

The Coordination Committee has met 10 times (28/11/2018, 18/06/2019, 05/05/2020, 26/01/2021, 22/06/2021, 22/03/2022, 03/05/2022, 30/11/2022, 09/06/2023 and 14/09/2023), with a view to defining the specific objectives for each period, reviewing project progress until the time of the meeting and developing a general plan for the following period. For each of the meetings, the project director has written and sent the meeting minutes to the partners for their supervision and subsequent approval. The calls and minutes (Deliverables) of all these coordination meetings can be found in BUTLER application. According to the GA, it was planned that, of these 10 meetings, 6 will be held in person and the other 4 online. But, finally, only 4 meetings have been held in person (and the others online) mainly due to the Covid19 pandemic.

Aside from the coordination meetings, a number of work meetings between the various partners have been organised to discuss daily tasks. E-mail and other digital communication systems such as a joint WhatsApp group have been also used regularly. The project director was copied into all correspondence between the partners concerning project supervision and management. Meetings have also been arranged with the project co-financiers, to keep them informed of project developments.

The project has been managed without any major problems, and all partners have been actively involved in the project.

The CFC, with timely support from the CTFC, has undertaken all financial and administrative control and monitoring tasks, and has been responsible for requesting that the partners submit financial statements every 6 months (at the most) to keep the accounts up-to-date.

Since the start, the project has benefited from the advice provided by the external team from the EC (Ms Sara Mora first, and Ms Sara Barceló later), which has been extremely helpful in terms of project management. Communication with the external team has been smooth and has been done mainly by e-mail or, depending on the complexity of the matter, telephone. During the last months of the project, queries have been processed through the LIFE IT HELPDESK platform.

The visits carried out by the external EC team have been the following:

- 18/06/2019, at the CTFC offices in Solsona.
- 02/06/2020, online meeting, due to COVID-19.
- 24-25/03/2021, telematic meeting for technical review and visit to the demonstrative stands of Collserola
- 16-17/06/2022, in-person meeting at the CFC headquarters and visit to the demonstration stands in the Garrotxa Volcanic Zone.
- 25-26/10/2023, visit to the demonstration stands of the Montnegre-Corredor and visit to the Transfer Classroom (AT) of Castellfollit, in the PNIN of Poblet.
- 24/10/2023, telematic meeting with the external monitor of ELMEN and the Project adviser, Ms Manuela Osmi.

The only amendment requested and approved by CINEA was the change in the name of the associated beneficiary 'Xarxa de Custodia del Territorio' (XCT), since in April 2019 it was renamed 'Xarxa per a la Conservació de la Natura' (XCN). This amendment was approved by CINEA on 19/05/2021.

Regarding the preparation of the 'After-Life Plan', it is explained in detail in section 6.1.

6. Technical part

6.1. Technical progress, per action

Action A1. Meetings with owners, drafting and signing of agreements

Foreseen start date: 10/2018 Foreseen end date: 12/2018
Actual start date: 10/2018 Actual end date: 05/2020

Activities undertaken and outputs achieved:

This action began when the project proposal was drafted, as this was the moment in which we contacted forest owners in Catalonia (both private and public) who might be interested in taking part in the project and who had, on their properties, stands featuring the forest formations covered in the project and a diverse range of environmental conditions. This made it possible to select areas in which to perform the forestry activities from actions C1-C4, as well as the reference stands (naturally-evolving stands). Afterwards, the owners signed the corresponding letters of commitment.

Meetings with owners and final selection of stands:

Once the project had started, we contacted the owners from the region of Catalonia (Spain), and members of the technical teams from the CFC, CPF, CREAF and CTFC carefully examined each of the stands. During these visits, it became clear that several stands were either not large enough to be used as demonstrative stands or lacked the desired characteristics (lack of homogeneity, under capitalisation, etc.). As a result, in these cases, new locations that improved upon the initial proposal had to be found. Altogether, 7 new stands were selected. These changes were accepted by the EASME in a letter dated 18/07/2019.

With the newly proposed stands, 2 Special Areas of Conservation (SACs) in Catalonia were incorporated into the project: ES5120001-Alta Garrotxa and ES5110010-Sant Llorenç del Munt i l'Obac.

Photographs 1-2: Visit to the various stands by the project partners and their respective owners in order to select and define the project's final demonstrative stands.

With regards to the region of Occitania (France), the CNPF began searching for the 4 stands from action C5.2 at the start of the project. Under the Grant Agreement, the project had to be carried out within the framework of the SAC FR9101483-Massif des Albères and SAC FR9101490-Fenouillèdes. The stands ultimately selected in these two areas were: a cork oak stand (*Quercus suber*) in SAC FR9101483-Massif des Albères, 2 stands (a holm oak (*Quercus ilex*) stand and an Aleppo pine (*Pinus halepensis*) stand) in SAC FR9110111-Basses Corbieres and an oak stand outside the Natura 2000 Network. In relation to the oak stand, the following change was made: a *Quercus petraea* stand was selected instead of a *Quercus humilis* stand (as

foreseen in the GA). This was due to the fact that we were unable to find a *Quercus humilis* stand (neither within nor outside the Natura 2000 Network) that was large enough and in which the activities could be performed in winter 2019-2020. This change was reported to the external monitor during her second visit and in the Progress Report.

With regards to the stands from action C5.1, the selection process began in late 2019 (as foreseen in the GA). However, as a result of the COVID pandemic, the final selection was not made until October 2020 (this is explained in further detail in the information on action C5.1).

The Midterm report included a table with the final stands for actions C1-C4 and the reference stands, as well as a table with the final stands for actions C5.1 and C5.2. In addition, a map of Catalonia and Occitania showing the location of the selected stands, a map of each Natura 2000 Network area and an individual map of each stand were attached.

Drafting and signing of the agreements:

Work on the agreement/contract for stands C1-C4, C5.2 and the reference stands began at the start of the project, with help from the XCN. In the case of publicly-owned stands, the model was adapted to the requirements of each local administration. In any case, and broadly speaking, the agreements included an authorisation from the owner to carry out forestry work in accordance with the innovative management models foreseen in the project and to hold knowledge transfer events, as well as the commitment not to perform actions that could alter the structure of the stand and diminish the demonstrative value of the activities. The agreements for the stands from action C4 indicate that, following completion of the actions, all manner of human intervention will be suspended, allowing the stand to return to its natural evolution.

By 12/12/2019, all of the agreements concerning these stands had been signed, except one, which was signed on 29/05/2020 (the one for the CasaNova de Maspons stand).

Overall, finalising the signatures of the agreements with the private property owners was a fairly quick process (by 09/04/2019, they had all been signed). However, in the case of public properties, despite the high interest in the project, the process was much slower due to the necessary legal and administrative formalities.

Some of the agreements for privately-owned stands (stands C1-C3) will remain in force for 20 years, while others will be valid for 10. In any case, since each of these stands have a Technical Plan for Forest Management and Improvement - PTGMF (a forest planning instrument) approved by the Forestry Administration, each Technical Plan has been amended to include the instruction to follow the ORGEST or close-to-nature forest management models, as appropriate for the stand. Therefore, even though 10 years may have passed since the agreement was signed, any owner wishing to carry out forestry work must do so in accordance with these management models. It should be noted that these management models, depending on the tree species and stand characteristics, provide for rotation lengths (the time between two consecutive thinning or selection cutting cycles) of between 10 and 20 years.

In the case of publicly-owned stands, a number of legal forms have been used to translate this commitment not to undertake activities that contravene the project's objectives for a period of at least 20 years into concrete actions: cooperation agreements, authorisations and the temporary leasing of stands.

For all stands owned by the Provincial Government of Barcelona, a 4-year, extendible cooperation agreement has been drafted, in which the Council undertakes not to carry out activities that contravene the project's objectives for a period of at least 20 years (expressly indicating that no such actions are foreseen in the Technical Plan, and that any amendments to the Technical Plan must comply with these objectives).

For the stands corresponding to action C5.1, the CPF prepared a model authorisation that was signed by the owners as the forestry work were carried out. In it, the owners undertaked not to carry out any activities in the stand that contravene the objectives defined in the Life Biorgest project, until the next scheduled cutting, at which time the technical team from the CPF and the owner will, by mutual agreement, decide whether or not to continue with the applied conservation measures.

The following table summarises the information from the previous paragraphs.

Table 1. Type and duration of the agreements signed with the demonstrative stand owners.

Stands corresponding to actions C1, C2, C3 and C4	Duration	No. stands
Contract (used in the case of private owners) / Authorisation (Serra de Collserola Natural Park Consortium) / Temporary lease (Torroella de Montgrí City Council)	20 years	11
Extendible contract (used in the case of private owners)	10 years	5
Cooperation agreement (Provincial Council of Barcelona)	4 years	2
Stands corresponding to action C5.1		
Authorisation (private owners)	Until 30/09/2023	23
Stands corresponding to action C5.2		
Agreement	20 years	4
Reference stands (naturally evolving stands)		
Authorisation (Serra de Collserola Natural Park Consortium) / Temporary lease (Torroella de Montgrí City Council)	20 years	2
Cooperation agreement (Provincial Council of Barcelona)	4 years	4

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Agreements with owners for actions C1, C2, C3, C4 and C5.2	31/12/2018	05/2020, although all agreements for stands C1-C4 and C5.2 were signed by December 2019, except one.

It should be noted that the agreements for stands C5.1 were not expected to be signed prior to the deadline established in action A1, as the GA indicates that the stands corresponding to this action would be selected in 2019 (extendible to 2020, if necessary).

All agreements (deliverables) were delivered together with the Midterm report.

Actual results compared to expected results and calendar / Changes / Main problems encountered:

Despite the delay in completing this action, the results of the action are as anticipated, since by signing the agreements, all owners have pledged their involvement and commitment. In no case did changing the stands or the slow process of finalising the signatures of several agreements have a negative impact on subsequent actions (except in the case of the CasaNova de Maspons stand) or make it necessary to reschedule the forestry work. In the case of the CasaNova de Maspons stand (owned by the Sant Iscle de Vallalta Town Council), setbacks were experienced in the forestry work to the delay in signing the agreements.

Prospects for continuing the action following completion of the project:

Once the project is finished, the commitment made by the forest owners not to carry out activities that may alter the structure of the stand and diminish the demonstrative value of the activities will remain in force.

Action A2. Definition of the baseline biodiversity indicators

Foreseen start date: 10/2018 Foreseen end date: 06/2019
Actual start date: 01/2019 Actual end date: 07/2019

Activities undertaken and outputs achieved:

This action involved a literature review of the current state of indicators and criteria related to biodiversity, forest naturalness, spatial integrity and the human footprint (forest maturity) in forests, particularly within the context of Mediterranean forests. This review was undertaken by the CREAF, which proposed a series of indicators grouped by criteria for diagnosing biodiversity and forest maturity. In the original proposal, each indicator was qualified by a series of threshold values based on the forest habitat. Due to the fact that references to threshold values for Mediterranean forest habits are virtually non-existent, the decision was made to leave the threshold proposal until the end of the project.

The partners (CREAF, CTFC, CPF and CNPF) held two meetings to reach an agreement as to the initial list of indicators that would serve as a basis for defining the biodiversity assessment protocols (action D3) for the demonstrative stands (actions C1, C2, C3 and C4), and also to adapt the Mediterranean Potential Biodiversity Index to Catalonia (action A3).

The first meeting took place on 05/03/2019 at the CREAF offices. On 14/05/2019, the CPF hosted a seminar with experts to define the indicators and thresholds for assessing the state of conservation of Mediterranean forest habitats. As decided at the start of the project, this seminar was co-organised by the partner responsible for action A3, so that it might be useful for both actions. The meeting therefore served to discuss the various indices (the Naturalness Index, developed as part of the REDBOSQUES Project, and the Potential Biodiversity Index; PBI), indicators and the corresponding thresholds that have been included in the new version of the PBI_Cat, integrating it with the French PBI-Med. The meeting also included a field visit to an Aleppo pine stand mixed with holm oaks (Can Planas) to discuss, on-site, its applicability at stand level.

Photographs 3-4: Seminar with experts, held on 14/05/2019

On 31/07/2019, the deliverable entitled “Adaptation of forest naturalness and biodiversity indicators, criteria and thresholds to the Mediterranean context” was completed.

In any case, given that the proposed thresholds have been worked on throughout the project and finally these thresholds have been included in the “Complete Guide for the evaluation of maturity and biodiversity in Mediterranean forest stands”, in September 2023 the Deliverable of this A2 action has been updated adding a brief explanation of the aforementioned guide.

The proposed thresholds have been based on those proposed in the original protocols of Redbosques (a project in which CREAF participated as a beneficiary partner), on the one hand, and the PBI (updated within the framework of the Life Biorgest), on the other hand. Throughout the project we have interacted (networking) with the RedCapacita2015 project (Redbosques). Specifically, on 27/11/2019 a meeting was held in Zaragoza with the expert committee of said project.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Report entitled "Adaptation of forest naturalness and biodiversity indicators, criteria and thresholds to the Mediterranean context"	30/06/2019	31/07/2019
(D) Minutes of the seminar with experts held to define the indicators and thresholds and assess the state of conservation of the Mediterranean forest habitats	30/04/2019	14/05/2019

The two Deliverables have already been delivered along with the Midterm report. But now the final version of the Report is being delivered again (through BUTLER), in which only a brief paragraph has been added (see section 6 of the report) explaining that the threshold values are included in the "Complete Guide for the evaluation of maturity and biodiversity in Mediterranean forest stands".

This new version of the report has also been posted in the 'Documentation and products' section of the project website.

Actual deliverables compared to expected deliverables and calendar / Changes:

In the Midterm report it was explained that the product that was delivered was an almost complete report (deliverable) with the commitment to update it towards the end of the project with a proposal for thresholds for the biodiversity and maturity indicators for the main Mediterranean forest habitats. And this is what has been done.

Prospects for continuing the action following completion of the project:

This action is not expected to continue following completion of the project.

Action A3. Development of a Potential Biodiversity Index: the PBI_Cat

Foreseen start date: 10/2018 Foreseen end date: 09/2019
Actual start date: 11/2018 Actual end date: 12/2019

Activities undertaken and outputs achieved:

This action was divided into 2 sub-actions involving the first 3 stages of the process for aligning regional indices with the international PBI proposed by Gonin *et al* (2017). The work was carried out jointly by the CNPF and CPF and is outlined in **technical report A3**, which was already delivered along with the Midterm report, at the request of the external monitor. The results were compiled in the action's **deliverable** (which was already delivered along with the Midterm report).

Sub-action A3.1. Revision of the biogeographical domain and identification of PBI_Cat factors - stages 1 and 2

- Collection and analysis of bioclimatic data for Catalonia and comparison with other sources of information at European level. Data was collected by the CPF (bioclimatic mapping and datasheet on the forest formations present in Catalonia, comparing the 3 most commonly used classifications), while the CNPF was responsible for analysing the data and proposing means of alignment at European level. It was concluded that, in the case of Catalonia, only one index, with thresholds corresponding to the Mediterranean domain, was needed.

- Creation of a working group to define the PBI for Catalonia, whose members included representatives from all major stakeholders in biodiversity conservation in Catalonia, including the heads of the ministries of Agriculture and Territory, research centres and parks and a group of forest-owner representatives. This action, although not originally included in action A3, was considered essential for PBI development, and the feeling was that it was perhaps a better idea to integrate the objectives of the seminar foreseen in action A2 into this group. The group has met on 2 occasions (05/03/19, in the CREAF offices, and 14/05/2019, in the CPF offices), and both times the 10 PBI factors, as well as those aspects that should be taken into consideration during application, were presented and discussed. The 2nd meeting (14/05/2019) took place in the "seminar" format anticipated in action A2 and served to compare the indicators used in the PBI with those from the Naturalness Index from action A2.

- Agreement on the 1st aligned version of the PBI_Cat v2.0. Feedback on how the group members' proposals were integrated into the final version of the PBI_Cat v2.0 was given by e-mail, and the members were invited to take part in the training session scheduled for September 2019.

Sub-action A3.2. Implementation of the PBI_Cat v2.0 in stands C1, C2 and C3 and new version of the PBI_Cat v2.1 - stage 3

- Application and assessment of the field application of pre-existing indices (PBI Med Fr and PBI_Cat v1.0) and the 1st aligned version of the PBI_Cat v2.0 in a representative selection from stands C1, C2 and C3 by experts from the CPF and CNPF, to test the factors, thresholds and values included in version 2.0 and analyse the sensitivity of the index in different forest formations, with a total of 18 tests.

- Collection of all information generated in this action and development of a new PBI_Cat v2.1 and a protocol for its field application in the diagnosis of stands C1, C2 and C3 (foreseen as part of action A4, on the part of the other project partners).

- Validation of the PBI_Cat v2.0 during the 1st International PBI Committee meeting in Toulouse (31/10/2019).

- Creation of a PBI section on the CPF website linked to the BIORGEST Project website.

http://cpf.gencat.cat/ca/cpf_03_linies_actuacio/cpf_transferencia_coneixement/Index-Biodiversitat-Potencial/

It should be noted that, in accordance with the suggestion made by Ms Sara Mora, the common name for the various forest species and a link to http://www.floracatalana.net, with a view to aiding recognition of the species, were included in the PBI application protocol.

- 2 training actions by the CPF and CNPF, intended for: i) project partners, in the Can Buscastells stand from action C3 (05/09/2019), and the CPF's technical staff responsible for applying the PBI in the stands from action C5.1 (02/12/2019). The latter training session was also due to take place in the Can Buscastells stand (La Selva) from action C3, but was moved to the Ribera Salada Transfer Classroom (Solsonès), as rain was forecast.

Photographs 5-6. Left, photo of the PBI training session for project partners, in a stand from action C3. Right, photo of the 1st PBI working group meeting at the CREAF offices.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) PBI_Cat v2.1 + associated data collection protocol	30/09/2019	06/09/2019, revised to 12/2019

Actual deliverables compared to expected deliverables and calendar / Changes:

No changes have been made. Please note that the final update of the protocol with the two sampling methods (transect and plot sampling) can be found in the documentation of action E7.5.

Prospects for continuing the action following completion of the project:

This action is not expected to continue following completion of the project**.**

Action A4. Initial diagnosis of the stands subject to forestry activities and naturally evolving stands: Characteristics and cartography

Foreseen start date: 01/2019 Foreseen end date: 09/2019
Actual start date: 03/2019 Actual end date: 12/2019

Activities undertaken and outputs achieved:

To carry out this action, the following partners were involved: CTFC (action leader), CFC, CPF, CREAF and CNPF. The results of the action are as anticipated, as, while delineating the stands and performing the initial diagnosis, we managed to collect the information necessary to move on to the next actions.

The first step in this action was to plot the stands (approximately 8 hectares) onto a base map at a scale of 1:5000. On this base map we also defined an area of 1 hectare that would serve as a control plot, in which no forestry activities would be carried out. These plots were not mentioned in the Proposal. However, in the early stages of the project, it was considered important to establish a plot, adjacent to the stand, for control purposes (making it possible to compare the area subject to forestry activities with the untreated area), both to monitor the forestry activities (actions D2-D4) and for demonstrative purposes in the knowledge transfer events organised as part of the project. As explained in action D2, the same inventory tasks performed in the demonstrative stands were also conducted in the control plots.

We also designed a protocol for the parameters that needed to be measured and the methodology for collecting information on the stand that could prove useful in planning the conservation actions. This protocol is included at the end of the of the deliverable of action A4.

Once the protocol had been designed, between May and July 2019, the partners responsible for the various stands performed the required field measurements (what we call the "expert estimation"). These measurements include: specific composition, stem density, diameter distribution, basal area, height, canopy cover, species, ground cover and structural vulnerability to forest fires. Data were collected using the following instruments: tape measure, girthing tape, Vertex dendrometer for measuring height and gradient and a chain relascope for estimating the basal area.

This information was used to draw up a report (deliverable) on the initial diagnosis of each stand, which was delivered along with the Midterm report.

Photograph 7: Experts carrying out inventory work to assess forest conditions

It should be noted that, in the case of the naturally evolving stands, an initial diagnosis was not considered necessary, as no forestry activities was performed in these stands. The inventories and samplings from actions D2-D4 were carried out with a view to comparing the areas in which different management models are implemented with near-mature areas and areas where no forestry activities are performed.

During the June 2020 visit, Ms Sara Mora indicated that the deliverable was lacking information on the stands in Occitania and the results of the PBI. Admittedly, the indirect biodiversity assessment is a measurement that is taken into account in action A4, because it enables us to identify which biodiversity elements should be integrated into the design of the management models from action A5. Therefore, although the application of the PBI in all the demonstration stands was carried out within the framework of action D2.2, the results of this first evaluation (carried out mainly between the months of July and October 2019), as well as the protocol for application of IBPC v2.1 by plots, were included in the Deliverable of this action A4.

With regards to mapping, in addition to plotting the stands onto topographical maps and orthophotomaps in pdf format (as shown in the above-mentioned deliverable), the information was also entered into the Instamaps viewer, accessible via the project website (in the section "Action Areas": https://lifebiorgest.eu/en/action-areas/). As suggested by the EC, more complete information on the stands was also incorporated into the viewer, specifically the sheets prepared within the framework of action D2 that include photographs of the results of the management measures applied.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Cartographic database with GIS	30/09/2019	30/12/2019
(D) Silvicultural and Biodiversity Report for each stand	30/09/2019	30/12/2019

Actual deliverables compared to expected deliverables and calendar / Changes:

The Silvicultural and Biodiversity Report includes all information that was necessary for designing the management models for actions C1-C4 and C5.2.

The letter from the EC received on 22/07/2020 requested that information on the legal restrictions and the preliminary results of the biodiversity characterisation of each stand, performed by direct assessment, using the indicators from action A2, be included. As regards these matters, it must be noted that, at the start of the project, in a meeting held between all partners, we decided to define the forestry activities based on the expert appraisals and the application of the PBI, which is the manner in which forest managers and owners normally proceed. Forestry activities are generally not defined based on the direct biodiversity analysis, as this is a painstaking task that the owners would have trouble completing. The direct biodiversity analysis (both before and after the activities) formed part of action D3.

We used the PBI to diagnose the state of the elements that are key to stand biodiversity, assessing 10 structural factors which impact their capacity to host species (animals, plants and fungi). In this regard, the PBI enabled us to quickly identify the main habitats that should be favoured and which could be improved, incorporating specific measures into the forestry activities.

What was not carried out in action A4 was a comparison between the stand characterisation based on the direct biodiversity indicators and the PBI results obtained in action A3, as this task was not necessary for designing the forestry activities.

As for legal restrictions, information is provided when the permits required to carry out the activities are processed, as this is when the body tasked with managing the area draws up a report and sets the conditions. Therefore, this information, which was originally part of action A4, has been included among the permits and/or terms and conditions from action A5.

Prospects for continuing the action following completion of the project:

This action will not be continued following completion of the project.

Action A5. Design of the forest conservation measures and forestry operations, drafting of the terms and conditions and processing of administrative permits

Foreseen start date: 04/2019 Foreseen end date: 9/2019
Actual start date: 04/2019 Actual end date: 10/2019

Activities undertaken and outputs achieved:

The following partners were involved in this action: CPF (action leader), CFC, CTFC, CREAF and CNPF.

This action was linked to the conclusion of actions A2, A3 and A4 and the application of the PBI, undertaken in action D2.2. With the information obtained from these actions, it was possible to develop forestry itineraries adapted to the 3 relevant management models (ORGEST, naturalistic management and management to prepare for natural dynamics) and the 3 forest formations included in the project, both mixed and pure stands.

To do so, the project partners organised two meetings in which they shared information and discussed which conservation measures should be implemented in the forestry itineraries for each stand. These meetings (held on 23/09/2019 in Matadepera and 11/10/19 at the CPF offices in Santa Perpètua de Mogoda) proved decisive.

The result was the development of 18 forestry itineraries, which include measures for conserving biodiversity, presented in the deliverable "Programme for integrating conservation measures into forest planning and management" (delivered along with Midterm report). More specifically, the itineraries corresponding to the ORGEST and close-to-nature forest management models are explained in Table 10, while those addressing preparation for natural dynamics can be seen in Table 19, in section 6, entitled "Integration of models to prepare for natural dynamics in selected stands in Catalonia: Activity design".

A detailed description of the activities required and the final silvicultural control parameters (canopy cover, number of stems/ha and basal area to be removed) were established for each stand. The specific conservation and biodiversity enhancement measures included in the forestry itineraries differ from one stand to the next. However, generally speaking, they may be grouped as follows:

- Measures that promote structural (vertical and horizontal), species and genetic diversification.
- Retention and promotion of key elements when cutting and clearing.
- Creation of standing and fallen deadwood (medium-sized and/or large).

The next step was to process the administrative permits required to carry out the forestry work. In privately-owned stands with Forest Planning Instruments (IOFs), these IOFs were amended to include the relevant forestry itinerary (with consideration for the prior reports from the entities tasked with managing the protected areas), following which the start of the work was communicated. In this case, the CPF, as the authority responsible for private forests in Catalonia, played an active role.

In private stands with no IOF and publicly-owned stands (Government of Catalonia, city and town councils, provincial councils), authorisation was granted by the Ministry of Agriculture, Livestock, Fisheries and Food (DARP) and reports were drafted by the entities tasked with managing the protected areas.

Table 2 shows the stands in which a request to amend the IOF was lodged and those in which authorisation to commence work was necessary. In certain publicly-owned stands, all that was needed was an agreement signed with the body that owned the stand.

With regards to the stands in Occitania, there was no need to request authorisation, as the 4 stands have a management plan approved by the Centre Régional de la Propriété Forestière (CRPF). With the 3 stands located in Natura 2000 sites, L.122-7/8 approval, which guarantees sustainable management, was requested.

Afterwards, the terms and conditions for each stand were drawn up prior to signing the contracts with the forestry companies. These specifications and the authorizations corresponding to each stand or group of stands (if these belong to the same forest) were delivered with the Midterm report.

Table 2. List of the stands in Catalonia, with the following information: stand ownership (private or public), existence or otherwise of a Forest Planning Instrument (IOF), date on which the IOF was amended and whether authorisation was required to perform the work. The abbreviation "n/a" means "not applicable".

Action	Code	Forest	Type	Partner responsible	IOF amended	Notification / Authorisation
C1	GOQip	El Bruix	Private with IOF	CFC	12/11/2019	Yes
C1	GpNQip	El Bruix	Private with IOF	CFC	12/11/2019	Yes
C1	GOQim	Mas Quintana i Argalès	Public	CPF	PAF 2019	n/a
C1	GpNQim	La Torroella	Private with IOF	CTFC	10/12/2019	Yes
C2	GOPhm	Can Planes	Private with IOF	CPF	10/12/2019	Yes
C2	GpNPhm	Can Planes	Private with IOF	CPF	10/12/2019	Yes
C2	GOPhp	La Muntanya Gran	Public	CTFC	n/a	n/a
C2	GpNPhp	La Muntanya Gran	Public	CTFC	n/a	n/a
C3	GOQhp	Can Casas	Private with IOF	CFC	18/02/2020	Yes
C3	GpNQhm	CasaNova de Maspons	Public	CFC	n/a	No
C3	GpNQhp	Buscastell	Private with IOF	CPF	10/12/2019	Yes
C3	GOQhm	Can Barnench	Private	CTFC	n/a	Yes
C4	GNPhp	La Muntanya Gran	Public	CREAF	n/a	Yes
C4	GNPhm	Can Calopa de Dalt	Public	CREAF	n/a	Yes
C4	GNQip	Can Bosc	Public	CREAF	n/a	Yes
C4	GNQim	Can Calopa de Dalt	Public	CREAF	n/a	Yes
C4	GNQhp	Font Groga	Public	CREAF	n/a	Yes
C4	GNQhm	La Mata (Carena del Pagès)	Public	CREAF	n/a	Yes

With regards to publicly-owned forests, no changes have been made to the IOFs, as there is no specific procedure in these cases. All that is needed in these cases are the signed project participation agreements and the description of the specific activities. Furthermore, authorisations are not required if the forest harvest operations have been included in the Annual Harvesting Plan.

Of the stands: 7 are private with an IOF; 1 is private without an IOF; 9 are public; and 1 is public with an Annual Harvesting Plan.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Programme for integrating conservation measures into forest management	30/09/2019	31/10/2019
(M) Terms and conditions drawn up and administrative permits processed	30/09/2019	04/09/2020*

* Although most had been obtained as of February 2020 at the latest, the permit for the CasaNova de Maspons stand was not obtained until 04/09/2020 due to a delay in signing the agreement with the owner.

Actual deliverables compared to expected deliverables and calendar / Changes:

The results of this action are as expected, since, with the creation of forestry itineraries that integrate biodiversity enhancement measures and the inclusion of these measures in the terms and conditions, as well as the processing of the permits, work could be started on the conservation actions.

Main problems/setbacks encountered:

The main problem in this action was the delay in signing the agreement with the Sant Iscle de Vallalta Town Council (the owner of the CasaNova de Maspons stand), which postponed delivery of the terms and conditions and the processing of the administrative permit.

Prospects for continuing the action following completion of the project:

The effective implementation of this action, now concluded, provided further insight into which measures to apply to achieve the project objectives. The knowledge generated as a result will provide the basis for developing new approaches to forest management in Catalonia, which will have a practical application among forest owners and managers and help to enhance biodiversity following completion of the project.

Photographs 8-9. The meetings between project partners held on 23/09/19 and 16/01/20 to discuss the forestry itineraries and applicable measures for retaining and enhancing biodiversity and assess the action's progress.

Action A6. Analysis of the innovative funding mechanisms (direct and indirect) and contract models with owners for integrating biodiversity enhancement into sustainable forest management

This action has been divided into the following two sub-actions:

Sub-action A6.1. Design of contractual mechanisms with forest owners

Foreseen start date: 10/2018 Foreseen end date: 03/2019
Actual start date: 01/2019 Actual end date: 03/2020

Activities undertaken and outputs achieved:

This sub-action began with a meeting between the three partners involved: the XCN, CFC and CPF, in January 2019, in which they discussed the general content of the analysis and work plan. After this, the XCN commenced work on the model contracts, at the same time as action A1 (Meetings with owners, drafting and signing agreements) was under way, revising the model contract for privately-owned demonstrative stands, in partnership with the CFC, and offering assistance to the CREAF, CFC and CTFC in creating model contracts for public stands.

Although an external consultant was originally due to provide advice regarding the design and analysis of the contractual mechanisms, this task was ultimately undertaken by the XCN, as this partner had recently incorporated a lawyer (Mireia Salazar) into its team. She was the main architect of this particular task.

In March 2019, the XCN held an online meeting with Julie Babin, from the *Fédération des Conservatoires d'espaces naturels*, to learn about the contractual instruments used to conserve biodiversity in France, particularly the *obligations réelles environnementales* (ORE). Following this meeting, an initial draft of the deliverable was prepared and validated by all partners involved.

From this point forward, and until December 2019, the XCN performed the initial analysis of the contractual mechanisms and proposed five relevant models, which were revised by the CPF and CFC in early 2020. In March 2020, another meeting took place between the XCN and CFC to iron out the final details of the models. After this meeting, the deliverable was completed in late March. This deliverable was delivered along with the Midterm report.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Document analysing the various land stewardship models and recommendations for the development of other contractual mechanisms	31/03/2019	31/03/2020

Actual deliverables compared to expected deliverables and calendar / Main problems or setbacks encountered:

This sub-action involved an analysis of both existing contractual mechanisms and mechanisms that could be designed to incorporate biodiversity enhancement activities into forest management on both public and private properties, as well as the creation of models for these contractual mechanisms. The deliverable covers all these aspects and is divided into traditional private contracts, administrative law instruments and international legal instruments (namely OREs, a French instrument linked to conservation measures). It also includes 5 model mechanisms: a land stewardship contract, a cutting rights waiver contract, a contract for the partial enjoyment of rights in rem, an administrative agreement and *obligation réelle environnementale* (ORE).

This sub-action was initially delayed until the project kick-off meeting and a specific meeting could be held. Following this, priority was given to revising the contracts for the demonstrative stands. As it was done in-house, it was also necessary to dedicate additional hours that were not originally accounted for and which increased the delay. Despite the delay, however, none of the subsequent actions were affected.

Prospects for continuing the action following completion of the project:

The XCN plans to continue to improve the model contracts for biodiversity enhancement, as part of its activity. The idea is to get several different stakeholders (public authorities, owners and environmental institutions) involved in this improvement process.

Sub-action A6.2. Analysis of the innovative funding mechanisms (direct and indirect) for integrating biodiversity conservation into sustainable forest management

Foreseen start date: 10/2018	Foreseen end date: 03/2019
Actual start date: 12/2018	Actual end date: 03/2020

Activities undertaken and outputs achieved:

In December 2018, the partners involved in this action (CFC, CPF and XCN) began searching for and compiling information on funding mechanisms and people/institutions with experience in the matter. In January, a meeting was held between these same partsners, during which they pooled their experiences and information concerning existing funding mechanisms. They also agreed to divide the sub-action into two parts: an analysis of tax mechanisms (which would start shortly after) and an analysis of other mechanisms (which would be addressed later on, in order to include experiences from the LIFE CLIMARK and H2020 SINCERE projects, in which the CPF was involved).

On 29 January 2019, Life Biorgest was invited to present the challenge of analysing innovative funding mechanisms as a case study for discussion during the online meeting of the 'Network of Regional Governments for Sustainable Development', in which representatives from various regions contributed ideas and which resulted in a summary report.

In April 2019, the XCN tasked the company 'ENT Environment & Management', with ample experience in environmental taxation, with conducting the analysis of the various tax mechanisms, and facilitated all the information collected up to that point. A draft version of the analysis was received in September 2019, and, after being revised by the project partners, the final version was received in November 2019.

In December 2019, with part of the unused budget for "External assistance" from sub-action A6.1, the CFC tasked Elena Górriz (a researcher with expert knowledge of financial instruments for rural development and the bio-economy) with analysing the other mechanisms, and also provided her all the information gathered up to that point, including information relating to the SINCERE and CLIMARK projects. After some meetings, and several reviews by the partners, in mid-March 2020 Elena Gorriz delivered the final version of the document. Once received, the XCN prepared the deliverable, merging both documents (fiscal mechanisms and other mechanisms), to deliver it together with the Midterm report.

Later, during the supervisory meeting held in June 2020, Sara Mora (NEEMO-IDOM) recommended that another mechanism, insurance, be included in the document and provided the contact information for LIFE Adapta Blues, in which it was due to be implemented. She also suggested (as indicated in the letter from the EASME) that the document be revised following approval of the new Common Agriculture Policy (CAP).

In accordance with these suggestions, we contacted LIFE Adapta Blues, and, based on the information and references they provided, included insurance in the updated document. Once the new CAP was approved, Elena Gorriz was also commissioned to analyze the forestry measures of the new CAP 2023-2027 in relation to forest biodiversity, and in February 2023 the final version of the deliverable was closed. On the credits page it is already specified which section has been updated.

This new version of the deliverable is posted on the BUTLER platform and also on the project website.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Compilation document of different innovative financing and incentive mechanisms for biodiversity conservation in the GFS, application recommendations	31/03/2019	03/2020*

* As explained, a new version of the document was published in March 2023 following the suggestion of EASME.

Actual deliverables compared to expected deliverables and calendar / Main problems or setbacks encountered:

This sub-action has been developed as foreseen in the AG. The deliverable addresses the following aspects: it provides a list of the different types of public and private funding options for biodiversity conservation (tax incentives, tax routes, EAFRD, ERDF, LIFE, green funds, equity funds, certifications, CSR, carbon market, biodiversity banking, PES...), includes examples of real experiences and provides recommendations and guidelines for implementation.

As it was explained in the Midterm report, this deliverable experienced a significant delay as the decision was made to wait for the results of other European projects (SINCERE and CLIMARK) that investigate or implement funding mechanisms. As for the Life CLIMARK Project, it was agreed that a representative from the XCN would serve on this project's Expert Committee. However, it was not until November 2019 that the XCN was finally able to take part in a meeting.

It should be noted that this delay in no way affected any other actions, as the action most directly related to action A6 is D7, which was not due to begin until 2021.

According to the letter we received from EASME, the additional expenses for incorporating the analysis of the forestry measures of the new CAP 2023-2027 in the deliverable are considered eligible.

Prospects for continuing the action following completion of the project:

Both the XCN and CFC have prior experience in proposals for improving tax incentives for sustainable forest management, and plan to continue to work to implement some of the mechanisms addressed in this deliverable.

Action B.1. Compensation to forest owners

Foreseen start date: 10/2021 Foreseen end date: 03/2023
Actual start date: 01/2022 Actual end date: 09/2023

Activities undertaken and outputs achieved:

The objective of this action has been to buy the forestry exploitation rights so as not to exercise them and thus create a forest reserve through a custody contract for a duration of 25 years and using the calculation method provided for in action D7.

Following an internal consultation to the XCN member entities, a property (called "Requesens"), located in the north of Catalunya, that includes a 6.14 ha stand (called "la teuleria") of potentially mature *Quercus ilex* and *Quercus rotundifolia*, was identified.

Then, the XCN contacted the property and found that it had an interest in its forest exploitation, a fact that justified an expert analysis to assess its maturity.

The protection figures that affect the stand are: the PNIN Massís de la Albera, the Red Natura and PEIN spaces with the same name, and the Habitat of Community Interest 9340. And, on the other hand, the property has a Forestry Management Plan (IOF) approved by the CPF.

To validate its maturity, CREAF carried out an expert analysis of the stand based on the Naturalness Index developed in the LIFE RedBosques project (and used in several Life Biorgest actions) that considers the composition, complexity, senescence, microhabitats and dynamic. Under these criteria, it was detected that the stand is the 5th best rated stand in Spain (out of 51), with a maturity score of 6.8, and that it has exceptional natural and ecological interest. The CFC, the Sèlvans Association (which presents other types of custody contracts with the same property) and the XCN were also present in the analysis of the stand.

After verifying the maturity of the stand, a 25-year waiver contract was signed between three parties: the Property, the Sèlvans Association and the XCN. The specific objectives that are intended to be achieved with the formalization of the contract are the following: Guarantee the ecological, landscape and scientific integrity of the "La Teuleria" stand; Respect the natural evolution of this space during the agreed period; Preserve large trees, as elements of maturity and uniqueness; Make livestock activity compatible with the preservation of the values of the stand. Under this agreement, the Property assigns the forestry exploitation rights of the La Teuleria stand to XCN and Sèlvans with the compromise of not to exercise them for a period of 25 years, in exchange of a stipulated price of €10.000 (€1.628,00/ha). This price corresponds to the value of the wood in the forest park, according to the region's 2022 price applied to the tons produced by the surface that will not be exploited during this 25-year period.

Of this amount, XCN, representing the Life Biorgest project in the contract, is responsible for compensating 4.73 hectares through the payment of €7,700; and Sèlvans is responsible for compensating the remaining 1.41 hectares, through the payment of €2,300 from its own funds. In addition, Sèlvans is committed to monitoring the stand and the relationship with the property.

The calculation of the income has been carried out based on the methodology applied by the Girona Provincial Council, which was also included in action D.7. The two main novelties of this contract have been that, on the one hand, it represents one of the few known cases where a custody contract is signed between three parties, and, on the other hand, that evidence of the maturity of the stand has been verified. scientifically by a research center.

Said contract (which is posted in the BUTLER application) was signed in mid-September 2023 and payment was made on 28/09/2023.

Deliverables (D) and Milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Custody agreements signed with all owners of the selected properties	03/2023	09/2023
(D) Custody agreements signed with all owners of the selected properties	03/2023	09/2023

Comparison with planned products and schedule / Main problems or drawbacks encountered:

This action has suffered a slight delay in its start due to delays in the D7 action. In addition, the possibility of modifying the compensation object and changing it from a mature stand to one that integrates measures to improve biodiversity in sustainable forest management with productive or fire prevention objectives was discussed.

After consulting with the monitor and CINEA, and requiring additional justifications at the beginning of 2023, due to the project calendar, it was decided to follow what was provided in the Grant Agreement. Finally, the only deviation from what was planned was that compensation was not carried out in the stands of action C4, since all these stands are publicly owned, and the compensation mechanism has been planned for private property. Consequently, XCN member entities were explored to see which properties might have mature Mediterranean forest stands and would be willing to give up exploitation rights.

Prospects for continuation of the action after the completion of the project:

As stated in the contract (deliverable), the agreement not to exercise exploitation rights is extended until at least 25 years, to guarantee the natural evolution of the stand.

Action C1. Implementation of management models to enhance biodiversity in managed Mediterranean forests dominated by *Quercus ilex*

Foreseen start date: 07/2019 Foreseen end date: 12/2020
Actual start date: 10/2019 Actual end date: 06/2021

Activities undertaken and outputs achieved:

This action has been divided into the following two sub-actions:

Sub-action C1.1. Implementation of the demonstrative stands

Following completion of the initial diagnosis of all the stands (action A4), and having designed the conservation measures and forestry operations, drafted the terms and conditions and obtained the administrative permits (action A5), work began on the conservation actions.

The first step was to accompany representatives from several companies to the various stands and provide them with the terms and conditions, on the basis of which they could estimate the cost of implementing the management models indicated in the project. After selecting the company, the relevant contracts between the partner responsible for executing the work (CTFC, CFC and CPF) and the company were formalised.

The management models covered in this action, and the stands in which they have been implemented (both models included measures for increasing structural complexity and biodiversity), are as follows:

- ORGEST management model (baseline forestry models at stand level): In the mono-species *Quercus ilex* stand on the El Bruix property (8.02 ha) and the Mas Quintana i Argalès stand located in a *Quercus ilex* forest mixed with *Pinus sylvestris* (7.11 ha).
- Close-to-nature forest management model (CTNFM/GpN): In the mono-species *Quercus ilex* stand on the El Bruix property (7.94 ha) and the La Torroella stand located in a *Quercus ilex* forest mixed with *Quercus humilis* (7.85 ha).

Prior to carrying out the work, and to ensure proper execution, the trees selected for cutting from a representative area in each stand were marked (with spray paint). In stands in which close-to-nature forest management was to be implemented, virtually all trees in the area were marked, as, in addition to marking the trees selected for cutting, so-called future trees were also marked. In some cases, the trees were marked while the forestry work was being performed. The trees were marked by the technical staff from the partner institution tasked with managing the stand. In view of the novelty and complexity of applying the close-to-nature forest management model, the services of an expert in this type of management (a member of Pro Silva) were contracted to mark the trees in the El Bruix stand (for one day only, for demonstration purposes). All markings were made in accordance with the management itineraries defined for each demonstrative stand in the document "Programme for integrating conservation measures into forest planning and management" (action A5). Pages 40-48 of this document provide a detailed description of the activities to carry out in each stand, as well as the silvicultural parameters that should be taken into account.

The forestry activities performed in these stands correspond to those set out in the document from action A5. Despite varying somewhat for each stand, generally speaking, the work included:

- Improvement cutting or low thinning in the canopy holm oak forest (in stands in which the ORGEST model was applied)
- Selection of future trees and regulation of competition (in stands in which CTNFM was applied)

- Selective clearing (only in the El Bruix stand, where the ORGEST model was applied)
- Retention of key elements
- Creation of deadwood (fallen and/or standing)

In addition to marking trees, once the forestry activities were under way, the partner institutions tasked with managing each stand directly monitored the work and provided the workers guidelines as to which key elements to retain (large trees, living trees with dendro-microhabitats, dead standing trees, fallen deadwood...) and the creation of deadwood. All dead standing trees and fallen deadwood were left.

In terms of creating standing deadwood (by ring-barking the trees), it should be noted that, in the case of broadleaf forests, the decision was made (when preparing the document for action A5) that it would only be performed experimentally in stands prepared for natural dynamics or those which researchers from the CREAF or CTFC could monitor. As a result, as part of action C1, trees in the Mas Quintana i Argalès stand were ring-barked.

The following table shows the start and end dates for the work carried out in each stand:

Table 3. Start and end dates for the forestry activities performed in the 4 stands from action C1

Code	Stand name	Partner responsible	Start date	End date
GOQip	El Bruix	CFC	12/11/2019	26/10/2020
GOQim	Mas Quintana i Argalès	CPF	10/02/2020	04/05/2020
GpNQip	El Bruix	CFC	12/11/2019	30/10/2020
GpNQim	La Torroella	CTFC	24/02/2020	25/11/2020



Photographs 10-12. The El Bruix stand. Left: State of the stand prior to the activities. Centre: Chainsaw operator cutting a marked tree. Right: View after the activities, with the wood ready to be loaded onto the truck.

As explained in the Midterm report, in the GpNQip stand (El Bruix) a small area was left untouched with the intention of reserving it for the production of the informative video and thus being able to record images of the action. Thus, the felling of this small area was carried out during the month of April 2021, while the video corresponding to the E8 action was being recorded.

<u>Sub-action C1.2.</u> Technical description of the implemented innovative management models

Once the actions in the stands of this C1 action were completed, work began on the technical description report of the management models implemented. First, an outline to serve as a basis for both the report of this subaction C1.2, and for the reports of actions C2, C3 and C4 was

prepared. Each of these reports describes the technical details of the management models implemented, and includes: the description and quantification of the actions carried out, the justification of the type of marking and the planned silvicultural actions, an estimate of the effect of the treatments on the capacity to host biodiversity, and a compilation of lessons learned during implementation. Furthermore, except for the C4 action report, each action report includes a sheet containing the following information for each of the stands: description of the starting structure and specific objective, management itinerary, description of the marking carried out and the actions implemented, and results. The results section shows the main dasometric data taken, before and after the forestry action, within the framework of action D2.

These documents (Deliverables) are found in the 'Documentation and products' section of the project website and in the 'BUTLER' web application. Furthermore, as explained in action A4, the sheets for each of the stands have also been posted in the 'Instamaps' viewer on the same website (https://lifebiorgest.eu/zonas-de-actuacion).

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Implementation of all demonstrative stands in forests dominated by *Quercus ilex*	31/05/2020	25/11/2020
(D) Technical description document on the implemented innovative management models	31/05/2021*	31/05/2021

*Although according to the GA the planned delivery date was 31/12/2020, CINEA accepted a postponement until May 2021.

Actual deliverables compared to expected deliverables and calendar / Changes:

The management models implementation was initially expected to be completed before 15 April 2020. However, this was not possible due to Storm Gloria (which lasted from 20-23 January 2020) and the state of alert imposed due to COVID-19 (which began on 16 March 2020).

This delay in the completion of the forestry works brought with it the foresight of a delay in the delivery of the technical description document of the management models applied. For this reason, during Ms Sara Mora's 3rd visit, a postponement was requested in the delivery of this Deliverable (and those of actions C2, C3 and C4) which was accepted by CINEA.

Main problems/setbacks encountered:

The conservation actions commenced somewhat later than expected, as numerous meetings and discussions involving all partners were required to design the conservation measures and forestry operations (action A5), and the relevant administrative permits could not be applied for until the activities were defined.

In any case, the main problems encountered in this action were, by far and away, Storm Gloria (which took place from 20-23 January 2020) and the state of alert caused by COVID-19.

The operations in the El Bruix stands were heavily affected by Storm Gloria, which affected many areas in Catalonia, yet hit Montseny particularly hard, and forced the company contracted to perform the work to stop what they were doing and remove fallen trees from the river banks, forest areas, paths, roads to inhabited areas, etc. Yet despite this, once this situation was over, the work was expected to be finished by mid-April. The measures associated with COVID-19 once again brought the work to a halt. Bearing in mind that cutting work should not be

performed in broadleaf forests during the period of active sap flow, the work could not be resumed until the autumn.

Prior to the start of the COVID-19 pandemic, the forestry activities in the La Torroella stand had almost concluded. Only a small section had to wait until autumn 2020 (when the plant life was once again dormant).

Prospects for continuing the action following completion of the project:

This action is not expected to continue following completion of the project, although it should be noted that the owners of these stands have assumed a commitment not to perform forestry activities that could diminish the demonstrative value of the project for the next 10 or 20 years.

Action C2. Implementation of management models to enhance biodiversity in managed Mediterranean forests dominated by *Pinus halepensis*

Foreseen start date: 07/2019 Foreseen end date: 12/2020
Actual start date: 10/2019 Actual end date: 06/2021

Activities undertaken and outputs achieved:

This action has been divided into the following two sub-actions:

Sub-action C2.1. Implementation of the demonstrative stands

The demonstrative stands for action C2 were implemented by taking the same steps as in action C1. First, representatives from several companies were accompanied to the various stands and given the terms and conditions, on the basis of which they could estimate the cost of carrying out the forestry activities indicated in the project. After selecting the company, the relevant contracts between the partner responsible for executing the work (CPF and CTFC) and the company were formalised.

The management models implemented in this action, and the stands in which they have been implemented (both models included measures for increasing structural complexity and biodiversity), are as follows:

- ORGEST management model (baseline forestry models at stand level): In the mono-species *Pinus halepensis* stand La Muntanya Gran (7.63 ha) and the Can Planes stand located in a *Pinus halepensis* forest mixed with *Quercus ilex* (7.41 ha).
- Close-to-nature forest management model (CTNFM/GpN): In the mono-species *Pinus halepensis* stand La Muntanya Gran (7.66 ha) and the Can Planes stand located in a *Pinus halepensis* forest mixed with *Quercus ilex* (7.42 ha).

As occurred in action C1, the trees selected for cutting were marked (with spray paint) prior to carrying out the work. The methodology used was the same as described in action C1, i.e. in line with the management itineraries defined in the document "Programme for integrating conservation measures into forest planning and management" (action A5).

The forestry activities performed in these stands correspond to those set out in the document from action A5 (see pages 40-48). Generally speaking, this work included:

- Low thinning in the canopy pine forest and coppice with standards in the canopy holm oak forest (in stands in which the ORGEST model was applied).
- Training to identify the best stems and regulate regeneration. Selective thinning (in stands in which CTNFM was applied)
- Selective clearing (only in stands in which the ORGEST model was applied)
- Retention of key elements
- Creation of deadwood (fallen and/or standing)
- Complementary diversification measures

As in action C1, once the forestry activities were under way, the partner institutions tasked with managing each stand directly monitored the work and provided the workers guidelines as to which key elements to retain (large trees, living trees with dendro-microhabitats, dead standing trees, fallen deadwood...) and the creation of deadwood. All dead standing trees and fallen deadwood were left.

Ring-barking was performed in the two stands at Can Planes.

Table 4. Start and end dates for the forestry activities performed in the 4 stands included in action C2

Code	Stand name	Partner responsible	Start date	End date
GOPhp	La Muntanya Gran	CTFC	02/03/2020	29/05/2020*
GOPhm	Can Planes	CPF	16/01/2020	11/02/2020
GpNPhp	La Muntanya Gran	CTFC	02/03/2020	29/05/2020*
GpNPhm	Can Planes	CPF	03/02/2020	11/02/2020

*Although the felling work was finished on 29/05/2020, the trees were not fully removed until a few weeks later.

Photographs 13-15: Stand at Can Planes. Left: State of the stand prior to the activities. Centre: Pulling cut trees with a skidder. Right: Results of the activity.

Sub-action C2.2. Technical description of the implemented management models

The procedure for preparing the Deliverable 'Technical description of applied innovative management models for this subaction C2.2 was the same as the one used for preparing the Deliverable for subaction C1.2. And, in fact, the structure of these reports is the same. For this reason, although the implementation of action C2 did end on schedule, work on the report began at the beginning of 2021, to be able to work simultaneously with the report of action C1 (and C3).

This report can be found in the 'Documentation and products' section of the project website, and has also been posted in the 'BUTLER' application. In addition to all the technical details of the management models applied, the Deliverable includes a descriptive sheet for each of the stands of this action. These sheets are posted in the 'Instamaps' viewer found on the project website.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Implementation of all demonstrative stands in forests dominated by *Quercus ilex*	31/05/2020	29/05/2020
(D) Technical description document on the implemented innovative management models	31/05/2021*	31/05/2021

*Although according to the GA the planned delivery date was 31/12/2020, CINEA accepted a postponement until May 2021.

Actual deliverables compared to expected deliverables and calendar / Changes:
With the exception of the document containing the technical description of the implemented innovative management models, all other activities were carried out according to schedule.

Main problems/setbacks encountered:

The state of alert caused by COVID-19 brought the work that was being performed in the La Muntanya Gran stand to a halt. In any case, since the cutting work may be performed during the period of active sap flow, once the forestry companies were allowed to resume work, the activities continued in these two stands and the cutting work was finished by late May 2020, pending removal of the wood. The wood was removed from the stand at a later date.

Prospects for continuing the action following completion of the project:
The same as explained in action C1.

Action C3. Implementation of management models to enhance biodiversity in managed Mediterranean forests dominated by *Quercus humilis, Quercus faginea* and *Quercus canariensis*

Foreseen start date: 07/2019 Foreseen end date: 12/2020
Actual start date: 10/2019 Actual end date: 06/2021

Activities undertaken and outputs achieved:

This action has been divided into the following two sub-actions:

Sub-action C3.1. Implementation of the demonstrative stands

The demonstrative stands for action C3 were implemented by taking the same steps as in action C1. First, representatives from several companies were accompanied to the various stands and given the terms and conditions, on the basis of which they could estimate the cost of carrying out the forestry activities indicated in the project. After selecting the company, the relevant contracts between the partner responsible for executing the work (CTFC, CFC and CPF) and the company were formalised.

The management models implemented in this action, and the stands in which they have been implemented (both models included measures for increasing structural complexity and biodiversity), are as follows:

- ORGEST management model (baseline forestry models at stand level): In the mono-species oak stand Can Cases (8.29 ha) and the Can Barnench stand located in a mixed *Quercus humilis* and *Quercus ilex* forest (8.53 ha).
- Close-to-nature forest management model (CTNFM/GpN): In the mono-species oak stand Can Buscastell (8.05 ha) and the CasaNova de Maspons stand located in an oak forest mixed with *Quercus ilex* (7.93 ha).

As in action C1, the trees that were selected for cutting were marked prior to carrying out the work. The methodology used was the same as described in action C1, i.e. in line with the management itineraries defined in the document "Programme for integrating conservation measures into forest planning and management" (action A5).

The forestry activities performed in these stands correspond to those set out in the document from action A5 (see pages 40-48). Generally speaking, this work included:

- Improvement cutting or low thinning in the canopy oak and holm oak forest (in stands in which the ORGEST management model was applied).
- Selection of future trees and initial regeneration activities. Selective thinning (in stands in which CTNFM was applied)
- Selective clearing
- Retention of key elements
- Creation of deadwood (fallen and/or standing)
- Complementary diversification measures

As in action C1, once the forestry activities were under way, the partner institutions tasked with managing each stand directly monitored the work and provided the workers guidelines as to which key elements to retain and the creation of deadwood.

As regards the creation of standing deadwood (through ring-barking), it was performed in all stands except Can Barnench.

Table 5. Start and end dates for the forestry activities performed in the 4 stands from action C3

Code	Stand name	Partner responsible	Start date	End date
GOQhp	Can Casas	CFC	February 2020	12/03/2020, although the work was repeated in a small area in September 2020 at the request of the partner responsible (CFC)
GOQhm	Can Barnench	CTFC	23/11/2020	23/12/2020
GpNQhp	Buscastell	CPF	27/02/2020	24/03/2020
GpNQhm	CasaNova Maspons	CFC	27/10/2020	22/12/2020

Photographs 16-18: Stand at Can Buscastell. Left: Picture of the stand prior to the activities. Centre: Worker from the CPF marking trees based on close-to-nature forest management criteria. The trees considered valuable and which were therefore selected for conservation were marked in white, while those in competition with them and which hampered their development were marked in red. Right: Same image as the one to the left, following the activities.

Sub-action C3.2. Technical description of the implemented innovative management models

As explained in the two previous actions, the technical description reports of the innovative management models applied were prepared in the same period (between January and May 2021) and all follow the same structure. The report (deliverable) is also posted in the 'BUTLER' application and in the 'Documentation and products' section. The stand sheets are also found in the 'Instamaps' viewer on the project website.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Implementation of all demonstrative stands in forests dominated by *Quercus ilex*	31/05/2020	23/12/2020
(D) Technical description document on the implemented innovative management models	31/05/2021*	31/05/2021

*Although according to the GA the planned delivery date was 31/12/2020, CINEA accepted a postponement until May 2021.

Actual deliverables compared to expected deliverables and calendar / Changes:

According to the proposal, the forestry activities were scheduled to be completed during the 2019-2020 dormant period. However, this was only possible in the Can Buscastell and Can Casas stands. It was not possible in the other stands due to the circumstances explained below.

Main problems/setbacks encountered:

The main problem encountered in this action was not being able to carry out the forestry activities during the 2019-2020 dormant period in the Can Barnench and CasaNova de Maspons stands. The reasons were as follows:

- Can Barnench: The cooperation agreement was entered into with the owner of this stand without any problems on 18 February 2019 (see action A1). However, when the forestry activities were ready to begin (having completed the initial diagnosis and all samplings from actions D2-D4), the owner expressed doubts about commencing the work and wanted to postpone the start until a later date. Fortunately, in October 2020, following a meeting with the owner in the stand, we agreed to commence work. Since then, the owner has expressed his satisfaction with the activities undertaken in his stand.

  It should be noted that, since each stand contains a control plot in which no activities were performed, the comparison between the action and non-action areas (made possible by the monitoring actions) has been equally as valid, as it has been the activity's demonstrative effect.

- CasaNova de Maspons (owned by the Sant Iscle de Vallalta Town Council): Ever since the CasaNova de Maspons stand was proposed as one of the demonstratives stands for the Life Biorgest Project, the Town Council showed a great deal of interest and made a verbal agreement. The problem was that the administrative formalities required to formalise the agreement took a long time to complete, and the agreement was not signed until 07/05/2020. Due to the fact that the sap was active at that point and the trees could not be cut, the work was unable to commence until the following autumn.

Prospects for continuing the action following completion of the project:

The same as explained in action C1.

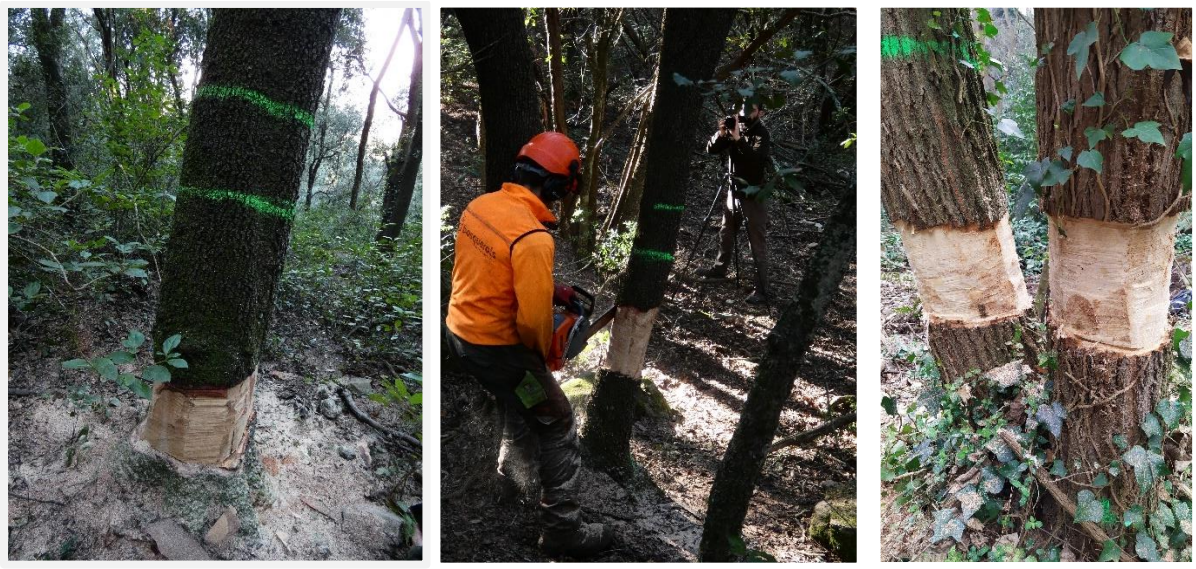
Action C4. Implementation of management models to prepare for natural dynamics

Foreseen start date: 10/2019 Foreseen end date: 12/2020
Actual start date: 11/2019 Actual end date: 05/2021

Activities undertaken and outputs achieved:

Prior to this action, the CREAF performed an expert diagnosis in spring 2019 using a common protocol (action A4) for all demonstrative stands from action C4. This expert diagnosis provided information on the structure and composition of the stand, while also allowing us to identify and, using GPS, locate the key elements for stand biodiversity and maturity that we wanted to retain and/or improve (large standing or fallen deadwood, exceptional trees, complementary tree species) or remove (stems of exotic species, etc.). Based on this information, an exhaustive survey of the 6 stands from action C4 (~50 hectares altogether) was performed and, with the help of a tablet which recorded the route, we identified and marked with paint all of the stems selected for cutting or ring-barking in accordance with the silvicultural criteria for enhancing naturalness and preparing the stand for natural dynamics. Ultimately, between 100 and 150 stems per stand, approximately 12 to 20 stems/ha, were marked. The marking operations took several days (within the period from November 2019 to January 2020) and were carried out by the CREAF, with help from the XCN in the La Font Groga stand. During the first day of the marking operations in each stand, the managers and technical team from the body tasked with managing the natural area were convened to discuss the activities that were due to be performed, providing on-site examples of how the trees should be marked and explaining the marking criteria. In January 2020, the CREAF and XCN processed the administrative authorisations required to carry out the forestry operations with the competent body. They also contacted three forestry companies that were known to have experience in conservation-oriented forestry operations. The contracted company carried out the works during the month of February 2020, just before the COVID-19 lockdown.

Photographs 19-21. Photographs illustrating the marking of stems selected for ring-barking (double strip) and felling (circle) and the placement of plastic strips indicating that the tree should be retained (uncommon species) and should not be harmed during the forestry activities.



Photographs 22-24. Photographs illustrating the ring-barking of trees to create standing deadwood and provide more space for valuable elements, such as large trees or tree species uncommon to the stand, such as, for example, a cherry tree (*Prunus avium*) or a rowan (*Sorbus torminalis*), or to eliminate exotic species such as *Robinia pseudoacacia* (photo to the right).

Later, based on the experience and results of the actions, a report regarding the justification and characterization of the actions carried out in each stand was prepared. This report includes the same sections as those of actions C1-C3. The only difference is that the report for this C4 action does not include a file for each stand but rather shows different tables with the following data: forest structure of the stands, number of trees felled or girdled by size and functional type, wood volume (m^3) of the felled or girdled stems, expected effects of felling or girdling the marked stems on the profit obtained and concerning the objectives of the action, and number of released trees and percentage concerning the marked trees in the different stands.

The report (deliverable) is found in the 'Documentation and products' section of the project website, and in the 'BUTLER' application.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Implementation of all demonstrative stands prepared for natural dynamics	31/05/2020	25/02/2020
(D) Report justifying and characterising the activities carried out in each stand	31/05/2021*	31/05/2021

*Although according to the GA the planned delivery date was 31/12/2020, CINEA accepted a postponement until May 2021.

Actual deliverables compared to expected deliverables and calendar / Changes:

The forestry operations in the demonstrative stands from this action were scheduled to be completed in May 2020, yet were completed 3 months earlier than expected. Regarding the report, as explained in the previous actions, a postponement was requested until May 2021, which was accepted by CINEA. Thus, the report was delivered coinciding with the delivery of the reports for actions C1-C3.

The “external assistance” cost for this action was ultimately much lower than originally budgeted in the GA. This is due to the fact that the initial quote was calculated based on the standard cost of forestry tasks (€1,200/ha). However, the type of activity that was ultimately performed in these stands was very low intensity and involved felling 583 trees and girdling 260 trees in 50 ha, resulting in much lower costs than expected.

The CREAF, for example, spent only €5,880 (without VAT) on subcontracting the forestry activities for the 5 stands it was assigned, despite the fact that €48,000 had been budgeted under this heading. In view of this situation, and considering the interest that further monitoring the saproxylic insects could have for the project (action D3), on 23/04/2020, a request to transfer part of the budget from action C4 to D3 was lodged with the EASME. To do so, a detailed report was drafted to explain the context, justify the budgetary changes and provide details regarding the new actions required, and was submitted along with the new budget. On 04/05/2020, the EASME accepted the request and sent the corresponding notification via e-mail. Thus, this budget line was dedicated to: doing a much more exhaustive saproxylic beetles sampling than was planned, monitoring scolytids in 4 stands of Aleppo pine, and monitoring damage by scolytids in 15 live pines per plot in the 8 Aleppo pine stands (4 stands from action C2, 2 stands from action C4 and 2 control stands) (see the monitoring results in actions D3 and D4).

The XCN's expense for contracting forestry work was also much lower than that foreseen in the GA (€2,791.58 spent compared to the €11,616 initially budgeted). The remaining money has been used to cover the extra cost of outsourcing actions A6, D5 and D7 and the extra personnel cost of these same actions and actions B1 and E7.

Prospects for continuing the action following completion of the project:

This action is not expected to continue following completion of the project.

Action C5. Implementation of conservation actions in Natura 2000 Network stands with production-oriented management, identified with the PBI_Cat.

Foreseen start date: 04/2019 Foreseen end date: 09/2021
Actual start date: 04/2019 Actual end date: 12/2021

Activities undertaken and outputs achieved:

Sub-action C5.1. Diagnosis and conservation of biodiversity elements (Catalonia)

The objective of this subaction was to replicate the integrative management proposal developed in the BIORGEST project in 15 stands where felling was already planned, preferably on private properties in Natura 2000 Network. Participation by forest owners was voluntary and support from the CPF technical team was offered. The activities comprised in this action included the selection of properties, the completion of a PBI inventory, the proposal of conservation measures, and the marking of the elements that the owners agreed to retain in the felling, through the signing of an agreement. The agreement did not include the execution of the felling or compensation measures.

At the beginning of the action, a selection of 15 target stands that mostly covered the 3 formations studied in the project was made. Finally, 23 stands were selected (with a total area of 235 hectares) adding other forest formations from the Mediterranean domain (*Quercus suber*, *Pinus sylvestris* and *Fagus sylvatica*). The PBI diagnosis and the management recommendations were carried out in these stands between 2019 and 2021. In all of them, felling has been carried out following the biodiversity conservation criteria proposed in LIFE BIORGEST. The PBI diagnosis and the marking criteria to take biodiversity into account have been disseminated to 27 landowners and 13 forestry work companies. Most of the stands are privately owned, except for one stand owned by a City Council and another stand owned by the Generalitat (PNIN Poblet). Of the 23 stands, 18 were in areas of the Natura2000 Network. Five CPF technicians external to the project have participated in the search for stands and the implementation of the PBI diagnosis and conservation measures.

Table 6. Comparison between stand forecasts and executed stands, by formation and area

Formation (dominant species)	Approximate planned area (ha)	No. stands anticipated	Surface area implemented (ha)	No. stands in which work has been performed
Pinus halepensis	35	4	87	8
Quercus sp. (oaks)	15	2	3	1
Quercus ilex	25	3	54	7
Quercus suber	20	2	19	2
Pinus sylvestris	20	2	37	3
Fagus sylvatica	35	2	35	2
TOTAL	**150**	**15**	**235**	**23**

All the information related to this action has been detailed in the deliverable 'Diagnosis and conservation measures for biodiversity in C5.1 stands'. It includes the authorizations signed by the owners, as well as the results of the PBI diagnoses and the proposed conservation measures. This document has not been posted on the web because it contains owners' private information. It has been delivered through the BUTLER app.

Sub-action C5.2. Diagnosis and implementation of conservation measures (France)

Stand selection:

In accordance with the project proposal, actions were due to be carried out in stands comprised of 4 different species (*Pinus halepensis, Quercus ilex, Quercus suber* and *Quercus humilis*).

These stands had to be located within the Natura 2000 Network and possess a series of specific characteristics of interest in the project. However, despite the efforts to find suitable stands for all 4 species, no *Quercus humilis* stand with the desired characteristics could be found. The decision was therefore made to include in the project stands dominated by *Quercus petraea*, which, despite being located outside the Natura 2000 Network, had characteristics that made them of interest in terms of the project's requirements.

Forestry activities in the stands:

As a result of the COVID-19 situation, forestry companies were unable to visit the stands and prepare quotes, thereby delaying the start of the work. In the Pyrénées-Orientales Department, there are only a small number of forestry operations, and recruiting workers can prove difficult. Forestry companies are therefore in high demand and usually have a full schedule. The spread of the pandemic only made this situation worse.

In the end, the forestry activities were carried out without problems (supervised by CNPF) in the *Pinus halepensis, Quercus petraea* and *Quercus suber* stands. In the *Quercus ilex* stand, however, we found additional difficulties due to the fact that the company which was initially contracted, despite numerous reminders, failed to fulfil the agreements and commitments, and the work was unable to commence. As a result, the contract was finally terminated. In view of this situation, the technical officer from the *Office National des Forêts* visited the site on 18/01/2021. A quote for the work was later received, and was accepted on 25/01/2021. The work was completed on 02/03/2021.

As foreseen in the GA, two different management approaches were implemented in each of the stands (with a surface area of approximately 4 ha). In one half of the stand, a BAU (Business as Usual) approach was taken, while in the other half, biodiversity conservation measures were incorporated into the forest management. Table 7 provides a summary of the dates of the forest activities carried out in the various stands in Occitania. Each part of the stand (approximately 2 ha) has been marked with a T or B depending on whether a Traditional (BAU) management approach or one based on Biodiversity conservation measures was implemented.

Photographs 25-26. Forestry work in the *Quercus suber* stand. Photograph 26 shows the stand after the forestry operations.

Table 7. Dates of the various activities performed in the stands in Occitania

Plot code	Species	Date of stand diagnosis	PBI report	Forestry activities		
				Projection	Start of work	End of work
IBPPhB	*Pinus halepensis*	18/09/2019	66PH_B_20 performed on 09/01/20	Autumn 2019 - Winter 2020	April 2020	19/05/2020
IBPPhT	*Pinus halepensis*	18/09/2020	66PH_T_20 performed on 09/01/20	Autumn 2019 - Winter 2020	April 2020	19/05/2020
IBPQiB	*Quercus ilex*	03/09/2019	66QI_B_20 performed on 26/11/19	Autumn 2019 - Winter 2020	February 2021	02/03/2021
IBPQiT	*Quercus ilex*	26/11/2019	66QI_T_20 performed on 26/11/19	Autumn 2019 - Winter 2020	February 2021	02/03/2021
IBPQpB	*Quercus petrea*	28/11/2019	66QP_B_20 performed on 11/12/19	Autumn 2019 - Winter 2020	April 2020	05/05/2020
IBPQpT	*Quercus petrea*	28/11/2019	66QP_T_20 performed on 11/12/19	Autumn 2019 - Winter 2020	April 2020	05/05/2020
IBPQsB	*Quercus suber*	08/08/2019	66QS_B_20 performed on 25/11/19	Autumn 2019 - Winter 2020	April 2020	08/06/2020
IBPQsT	*Quercus suber*	20/09/2019	66QS_T_20 performed on 25/11/19	Autumn 2019 - Winter 2020	April 2020	08/06/2020

Sub-action C5.3. Final validation of the PBI_Cat: the PB_Cat v3.0

This sub-action has been carried out by the CPF and CNPF as planned. The following tasks have been performed:

- Compilation of the results of applying the PBI_Cat in the various project actions, as well as the application of v1 of the PBI_Cat in the LIFE CLIMARK and MixForChange projects, in 2017-2019, entered into the database created as part of action C6.
- Revision of the index and protocol in accordance with the proposals made by the International PBI Committee (D1), in different bilateral meetings with the CNPF and other stakeholders.
- Survey given to 10 PBI users to assess the index (unforeseen task). With a view to determining the opinion of PBI_Cat users as to the facilities/obstacles encountered when applying the index in the field, a survey (Google forms format) was sent to those technical staff members who have used the PBI at some point during the LIFE BIORGEST, LIFE CLIMARK and LIFE MIXforCHANGE projects. The results were presented by the International Committee of Experts (24/11/2020).
- Completion of 2 complementary studies: "Monitoring of deadwood generation and application of the PBI_Cat for calibration in the *Pinus nigra* stands from the LIFE PINASSA Project" and "Trial landscape-scale PBI_Cat application in holm oak forests within the La Garrotxa Volcanic Zone Natural Park". Both studies, which are described below, can be downloaded in the following links to the project website ('Other technical documentation of interest' section):

  Monitoring of dead wood generation and application of the PBI_Cat for the calibration of *Pinus nigra* stands from the LIFE PINASSA project

Trial landscape scale PBI_Cat application in holm oak forest within La Garrotxa Volcanic Zone Natural Park

Study and authorship	Description	Main results
Monitoring of deadwood generation and application *of the PBI_Cat for calibration in the Pinus nigra stands from the LIFE PINASSA Project (part 1 - completed)* Authorship: Xavier Florensa	In the framework of the "LIFE PINASSA" and "Processionary Control" projects, several conservation and biodiversity improvement measures were applied in plots located in laricio pine (*Pinus nigra*) forests. In the framework of the LIFE BIORGEST project, it was decided to take advantage of the information available in these plots with 2 main objectives: - To monitor the effectiveness of generating dead, standing and ground wood. - Establish a connection between the presence and abundance of the different taxonomic groups studied and the various structural factors evaluated by the PBI_Cat, in partnership with the CNPF, in order to supplement the calibration study initiated in France. This calibration study will be completed during the After-LIFE.	In 2020, the PBI was applied in 23 black pine stands around Catalonia, the deadwood in the stands was quantified and characterised and the presence of bats was evaluated.
Trial landscape-scale PBI_Cat application in holm oak forests within the La Garrotxa Volcanic Zone Natural Park (PNZVG) Authorship: Adrià Bassols (Final Degree Project) Supervisor: Lluís Coll	The PBI was applied to the various structures conforming the holm oak forest in the PNZVG with a view to assessing its capacity to host diversity and propose management recommendations. The interest for the BIORGEST Project lied in the opportunity to test the PBI application methodology and characterise a forest formation at landscape level, in accordance with the methodology proposed by the CNPF.	The capacity to host biodiversity of the various holm oak structures present in the PNZVG has been characterised. It has been linked to different mass and context parameters (density, basal area, orientation...). A trial has been run on the use of the PBI in characterising a forest formation at landscape level, which has made it possible to adapt the methodology proposed by the CNPF to the context of Catalonia.

- Final preparation of the PBI_v3 field sheet and the protocol for data collection. This product (deliverable) is found in the 'Documentation and products' section of the website and in the 'BUTLER' application.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Completion of the forestry work in all stands in Occitania	31/05/2020	By 31/05/2020, the forestry work had been completed in all stands, except for the *Q. ilex* stand, in which it concluded on 02/03/2021
(M) First marked stand in Catalonia	31/12/2019	19/12/2019
(D) Report 'Diagnosis and conservation measures in C5.1 stands'	31/12/2021*	31/12/2021
(D) PBIC v3.0 and data collection protocol	30/09/2021	31/12/2021

*Although according to the GA the planned delivery date was 31/05/2021, CINEA accepted a postponement until December 2021.

Actual deliverables compared to expected deliverables and calendar / Changes / Main problems or setbacks encountered:

As for the work in Occitania, the planned schedule has been met, except in the case of the *Quercus ilex* stand.

Regarding the 2 deliverables, the only one that suffered a small delay was “PBIC v3.0 and data collection protocol” due to the restrictions of the COVID19 pandemic on field work.

The main problem encountered in this action were the restrictions imposed due to the COVID-19 pandemic, which affected the fieldwork and the plans for representatives of the CNPF to travel to Catalonia.

Sub-action C5.1 also experienced a slight setback due to the fact that the PBI diagnosis and marking activities in these properties require at least 3 days of work in cooperation with members of the CPF technical team, and these tasks had been afforded less time when planned.

As regards the stands in Occitania, in addition to the restrictions resulting from COVID-19, the main problem occurred in the *Quercus ilex* stand, where (as explained earlier) the company contracted to perform the work did not fulfil the agreement and the CNPF was ultimately forced to contract a different company.

Under no circumstances did these problems impact the other actions from the project.

Prospects for continuing the action following completion of the project:

With regards to the stands in Occitania (sub-action C5.2), a PBI diagnosis will be performed every 5 years to assess the evolution of the PBI scores. These stands will be used for information and training activities related to the PBI and itineraries that favour biodiversity.

Action C6. Integration of biodiversity enhancement measures into Mediterranean forest management policies and regulations

Foreseen start date: 04/2021	Foreseen end date: 09/2022
Actual start date: 06/2020	Actual end date: 09/2023

Activities undertaken and outputs achieved:

This action, coordinated by the CPF, is divided into three subactions described below:

Subaction C6.1. Memorandum of regulatory aspects to be modified to promote the improvement of biodiversity in the Mediterranean forest

Among the tasks identified in action C6, a Memorandum has been drafted whose specific objective is the compilation of the aspects to be modified of the current regulations that govern the management of Mediterranean forests and their use to promote the integration of the measures to improve biodiversity at the level of Catalonia.

This document has been written in three phases. In the first, based on the compilation and analysis of existing forestry and biodiversity legislation and planning instruments, European strategies and regulations, state and regional regulations and territorial planning, and finally, forest planning and management at a forest level. The second phase includes the selection of promotional measures for the integration of biodiversity in forest management at the stand level, as a result of the standards and work in the BIORGEST project. And, finally, a set of change proposals for regulations is established for the integration of biodiversity at the stand level: the interpretative improvement of the legislation on the conservation of biodiversity and habitats in Red Natura 2000 in the approval process of forest planning instruments; the identification of the changes to be introduced in the regulation of the development of forest planning instruments; and the improvement of the Sustainable Forest Management Guidelines (ORGEST), which is a reference tool for forest management in Catalonia, with the proposal of new management models and the inclusion of biodiversity integration criteria in existing models, which establish preferential fire production and/or prevention objectives.

The work was completed in December 2022. A Deliverable was written and agreed by all project partners through several in-person and online meetings.

Subaction C6.2. Integration of conservation measures in forest planning instruments

This subaction aims to establish a series of techniques and support elements to integrate the improvement of biodiversity in the Forest Planning Instruments (FPI), the basic tool for managers and owners to plan and promote sustainable forest management in Catalonia. Based on this general objective, the integration of measures to improve biodiversity in the FPI has been approached from three points of view:

1) Adaptation of regulations and FPI approval process: two processes have been initiated specifically aimed at the conservation and improvement of biodiversity within the framework of forest planning. The first of them is a proposal to modify Order ARP/122/2017, of June 13, which regulates forest management instruments, which among other aspects, proposes to include diagnosis at a stand level to determine its capacity to host biodiversity, including the calculation of the PBI, and its degree of maturity. The second one is the signature, in 2022, of a collaboration protocol between different administrations to better integrate forestry and biodiversity conservation policies in forestry planning.
2) Economic promotion of biodiversity conservation and improvement in forests with FPI in force: with the approval of regulatory bases for grants to forest property, different

criteria are defined and established to implement the integration of biodiversity in forest management and to delimit biodiversity conservation zones associated with more mature forests.

3) Adaptation of the Sustainable Forest Management Guidelines of Catalonia (ORGEST): the forest management models and criteria selected at stand level based on the main planned objective. First, a report has been written to analyse the implementation of existing models, ORGEST 2014-2020 study, based on the analysis of 144 management models, for 29 forest formations; Afterwards, 2 general meetings were held to establish the bases for improvement of the ORGEST; and, finally, 1 specific meeting has been held to modify the management of holm oak and Scots pine forests. In general, for these formations and those that can be worked on within the framework of other projects, the final ORGEST proposal will include a gradient between the preferred objectives (production, fire prevention and biodiversity conservation and improvement) and will consider the technical tools provided within the framework of LIFE BIORGEST.

All this has been compiled in the deliverable 'Technical proposal for regulations, instructions and applications to integrate biodiversity in forest management'. This deliverable contains the following annexes:

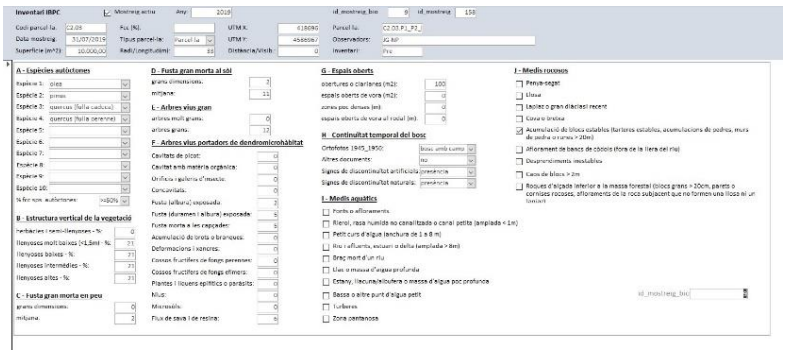
Annex 1: Resolution published in the Official Journal of the Generalitat de Catalunya on the approval of the regulatory bases for incentives to improve biodiversity (CENTRE DE LA PROPIETAT FORESTAL RESOLUTION ACC/1786/2023, of 23 May, publicising the Agreement of the Governing Council of the Centre de la Propietat Forestal on the approval of the regulatory bases for de minimum aid to incentivise the ecosystem services of sustainable forest management in privately owned forests).

Annex 2: Report on ORGEST (analysis of the 2014-2020 period).

Annex 3: Minutes of the meetings on the revision of ORGEST and discussion on the working proposal for its modification.

<u>Subaction C6.3.</u> Development and dissemination of an environmental information system for monitoring biodiversity

This task includes: 1) the creation of a database of PBI values, based on the information protocol of the existing database in France; 2) the collection of data from the plots of the BIORGEST stands and other European projects in which the CPF has participated; 3) analysis of the information and writing of a final report on the PBI value of the forests of Catalonia; 4) the continued improvement of the database to accommodate the information from PBI_v3, the final result of the project, and 5) translation into Catalan and Spanish, adaptation and improvement of the international database for PBI inventories created by the CNPF.



The database of biodiversity and environmental information on forest management has been created and hosted on the CPF server, based on the previous database of the CPF Demonstration Plot Network and connected to the CPF's private property's Forest Management Instruments database. It has been structured to be compatible with the international PBI database, created

by the CNPF. The contributions of the CPF to this French base have made it possible to improve the initially developed tool. In addition to being a common database at an international level, this database is the one used to generate the PBI graphs.

The database has been fed with PBI values of 185 stands inventoried from July 2017 to December 2022, and a final report has been written based on this sample which includes different forest formations, mainly holm oak forests and Scots pine forests. The report, titled 'Analysis of the PBI of the forests of Catalonia, period 2017-2022', is not part of any deliverable foreseen in the GA but has been posted in the BUTLER application together with the deliverable 'Technical proposal for regulations, instructions and applications to integrate biodiversity in forest management'.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Creation of a database for biodiversity indicators	09/2022	12/2020
(M) Drafting of the proposal to regulate the integration of biodiversity conservation into forest management	06/2022	09/2022
(D) Regulatory memorandum for integrating biodiversity conservation into forest management	06/2022	12/2022
(D) Technical proposal concerning regulations, instructions and applications for integrating biodiversity into forest management	09/2022	07/2023

Both Deliverables are posted on the project website, and have also been added to the BUTLER application.

Actual deliverables compared to expected deliverables and calendar / Changes:

Due to the needs of the project, the database was created earlier than planned, but the interest in including the greatest number of PBI stands possible in said database, for the writing of a 2017-2022 diagnostic report, led to the action completion in 2023. On the other hand, the technical proposals for regulations and instructions have been completed later than expected given the need to obtain the technical results of other implementation and monitoring actions and agree them between the project partners and experts.

Prospects for continuing the action following completion of the project:

As indicated in the After-Life, over the next few years the PBI database will continue to be fed with information and the necessary updates will be made to facilitate its use and data processing; a proposal will be drawn up to amend ORDER ARP/122/2017, of 13 June, regulating forest planning instruments; and the drafting of new ORGEST models will continue. In addition, it is expected that the Generalitat de Catalunya (through the CPF) will continue to call for grants to incentivise the Ecosystem Services of sustainable forest management, which subsidise the promotion of silvicultural practices to produce forest biodiversity associated with target trees, and the establishment of forest reserves. On 26/05/2023 this aid was called for the first time, and on 09/02/2024 a new call has been published to give continuity to this incentive.

Action D1. Establishment and functioning of the Expert Advisory Committee

Foreseen start date: 10/2018	Foreseen end date: 07/2023
Actual start date: 10/2018	Actual end date: 07/2023

This action has been divided into the following two sub-actions:

<u>Sub-action D1.1.</u> Expert Committee on the Integration of Biodiversity Conservation into Forest Management (CEIB)

<u>Activities undertaken and outputs achieved:</u>

As foreseen in the GA, during the first coordination meeting (28/11/2018), each partner proposed 2 or 3 candidates to serve as part of the CEIB, the purpose of which is to ensure that all project actions are completed properly and provide advice concerning specific aspects of these actions. Afterwards, the CFC (the institution responsible for this action) contacted each of the proposed candidates and assembled the definitive list of experts. The individuals on this Committee come from different backgrounds and institutions related to the management of Mediterranean forests, biodiversity conservation and close-to-nature forestry. They were foresters, academic doctors, forestry engineers and members of the forestry and conservation administration. The Committee also featured one representative from each of the institutions that were co-financing the project.

Following, the three meetings that took place during the project are summarized:

The first Experts Committee meeting took place on **29/05/2019**. The meeting was attended by 14 Committee members and the project's technical team. As one of the issues on the table was the close-to-nature forest management model, Jesús Garitacelaya, chairman of the association Pro Silva (an organisation which aims to promote, disseminate and research close-to-nature forest management) was also invited, despite not being a Committee member.

The meeting took place in two different settings. First, in one of the rooms at the Sant Celoni City Hall, where the beneficiary partners presented the project, the PBI and the foreseen management models, and presented the proposal for monitoring the actions. Then, the meeting moved to the CasaNova de Maspons demonstration stand (in the Montnegre i el Corredor Natural Park) where the chairman of the association Pro Silva, Jesús Garitacelaya, discussed the activities required to achieve the project's objectives, in accordance with close-to-nature forestry. To bring the practical workshop to a close, the attendees were divided into different groups in order to unify criteria for implementing this management model.

Photographs 27-28. First Expert Committee (CEIB) meeting

On **26/10/2021**, the **second meeting** of the CEIB was held in a training room on the Can Calopa property (in Collserola). 12 members of the Committee attended. On this occasion, the objective was to make a shared diagnosis of the state and evolution of biodiversity in our forests, and the role that forest management has as a tool for its improvement. Thus, the meeting is structured in 4 blocks in which the following questions were addressed: How is biodiversity evolving at the forest level in Catalonia, and how do we measure it?; What is the impact of management on biodiversity conservation? Do we have tools and indicators to assess this impact? What instruments and tools do we currently have that provide us with guidelines for the integration of biodiversity in forest management? Finally, the last block was dedicated to explaining the methodology for assessing the economic costs and benefits of actions to improve biodiversity and proposals for incentives and compensation for forest ownership to favor their implementation.

In each of the blocks an interesting debate was generated, and several reflections were made, which were captured in the minutes of the meeting.

Photograph 29. Second Expert Committee (CEIB) meeting

On **24/02/2023** the **third meeting** of the CEIB was held at the CFC headquarters (Santa Coloma de Farners). The meeting, in which 11 members of the Committee participated, focused on incentives for the conservation and improvement of forest biodiversity. Firstly, the different instruments and mechanisms to encourage the improvement of biodiversity in sustainable forest management were made known, and secondly, a debate was opened on the challenges of these instruments to achieve the objectives of the project and on the specific technical criteria for each incentive. The presentations of the incentives, as well as the contributions made, are included in the deliverable of this subaction.

Photographs 30-32. Presentation and group debate on biodiversity conservation and improvement incentives during the third CEIB meeting.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Holding of the first meeting of experts on conservation integration	30/04/2019	29/05/2019
(D) Minutes of the experts in biodiversity conservation integration into forest management committee meetings, including attendance list.	31/07/2023	28/02/2023

The Deliverable, delivered through the BUTLER application, includes the list of members of this Committee of Experts, the call for each of the meetings, the list of attendees and the corresponding minutes.

Actual deliverables compared to expected deliverables and calendar / Main problems or setbacks encountered:

The first Committee meeting was held at the scheduled time and as planned and was of great interest to the entire project team. The second meeting, on the other hand, was due to take place in the third quarter of 2020, but due to Covid19 and the preference to hold these meetings in person, they ended up being held in October 2021. This also caused the last meeting to be postponed a little. The three meetings were of great interest to the entire project team.

Sub-action D.1.2. Creation of the 'International Committee of Experts on PBI Validation' (CIE)

Activities undertaken and outputs achieved:

During the first coordination meeting (28/11/2018), the partners were asked to propose candidates to serve on the CIE. Subsequently, the CNPF (institution responsible for this sub-action) was in charge of contacting each of the experts, getting them agree, and thus closing the final list. The CIE is formed by 23 experts from 8 countries.

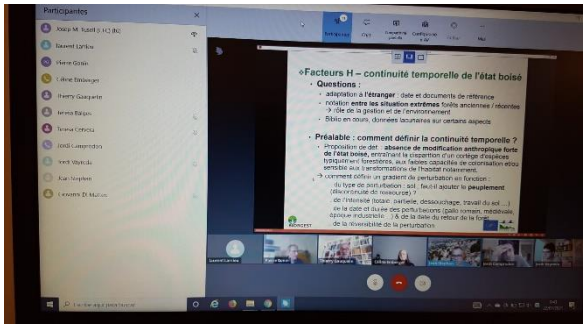
The **first CIE meeting** took place on **31/10/2019** in Toulouse (France). In addition to representatives from the CFC, CREAF, CTFC, CPF and CNPF, also in attendance were experts in Mediterranean arch biodiversity and forest management from countries such as Spain, France, Italy, Morocco, Tunisia, Turkey and Lebanon, as well as members of Mediterranean delegations to international organisations such as the IUCN, FAO and AIFM. This initial meeting served to present and discuss the structure and content of version 2.1 of the PBI, developed in Catalonia as part of the Life Biorgest Project. It proved highly effective as a means of initial contact and illustrated the interest on the part of the various experts in this diagnosis tool.


Photographs 33-35. First meeting of the International Committee of Experts (CIE)

Photograph 36. Second CIE meeting

The **second meeting** of the CIE was held on **24/11/2020** via videoconference, as was initially planned. The meeting began with information on the latest developments relating to the Mediterranean PBI from Pierre Gonin, Laurent Larrieu (from the CNPF) and Teresa Baiges (from the CPF). They presented the tests and discussions currently taking place within the framework of the project, as well as the results of the surveys conducted among PBI users in Catalonia. Afterwards, experts from other Mediterranean regions presented examples of how the PBI has been applied in their countries.

On **22/07/21** the **3rd meeting** of the CIE was held by videoconference. The meeting allowed of pending issues related to the definition of the PBI. In particular, the adaptation of factors H "Temporal continuity of the forested state" and F "Live trees with dendromicrohabitats". The results of the research on these 2 factors were presented. As not all pending issues were discussed due to the lack of time, another meeting was scheduled for 17/09/21.



Photograph 37. Fourth CIE meeting

This meeting (the **4th CIE meeting**) made it possible to complete the discussion on the pending issues regarding the definition of the PBI, in particular to conclude on the factors H and F discussed on 22/07/21, and then discuss the adaptation of the others factors: B "Vertical structure of vegetation", C and D "Large dead wood", I "Aquatic environments". The issue of scoring in special cases was addressed and reported in the PBI survey methods document. In conclusion, the issue of the last face-to-face meeting of the CIE was discussed.

On **21 and 22/03/23**, the **5th CIE meeting** was held in Italy, on the occasion of the final conference of the Life GoProFor project, what facilitated the organization of the meeting and allowed for further exchanges with partners. Those who were unable to travel to Italy participated in the meeting by videoconference.

On 21/03/23 a visit was made to a beech forest, in the Pratomagno forest, which allowed us to present the definition of the PBI and discuss the 2 inventory methods: with/without limit.

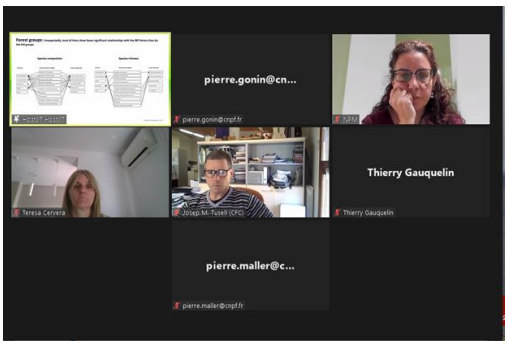
Photographs 38-39. Visit to the Pratomagno beech forest during the 5th CIE meeting.

On 22/03/23 the meeting continued in a room and the following presentations were made, which concluded with a debate on the future operation of the CIE:

- PBI calibration: studies on the relationships between taxa and PBI scores or factors.

- Methods for taking PBI data in the field and archiving/processing it.

- Version of the PBI for European and Mediterranean temperate forests (EUR.MED v3.0): version intended for countries for which there is no specific version, in order to be able to carry out tests.



Photographs 40-41. Picture of the 5th CIE meeting in Florencia (and by videoconference for those who could not come to Italy)

The CNPF was in charge of organizing the meeting material, preparing the interventions, writing the minutes and organizing travel/accommodation/catering in the case of in-person meetings.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Holding of the first meeting of the Committee of Experts on PBI Validation	30/04/2019	31/10/2019
(D) Minutes of the meetings of the International PBI Validation Expert Committee, with attendance list	31/10/2022	31/03/2023

The Deliverable, delivered through the BUTLER application, includes the list of members of this Committee of Experts, the call for each of the meetings, the list of attendees and the corresponding minutes.

Actual results compared to the expected results and calendar / Main problems encountered:

The first two meetings were held as planned in 2019 and 2020. The date, however, was postponed until the end of the year (October and November) to allow for broader exchanges that included the initial results regarding development of the new version of the PBI. The impact of Covid was not a limitation for the 2020 meeting since it was scheduled to be held by videoconference.

Due to the persistence of Covid in 2021, with traffic restrictions, videoconference and face-to-face meetings were reversed and the last face-to-face meeting was held in 2023, together with the final conference of the Life GoProFor project.

As reported to Ms Sara Mora, part of the "External assistance" budget from this action was transferred to "Other costs" to cover the experts' travel expenses.

Prospects for continuing the action following completion of the project:

The CIE meetings will continue within the framework of the Life GoProFor Med project, launched in 2022. On this occasion, the CIE will soon include Belgian colleagues who are currently working on the adaptation of the PBI in Belgium (so that it can be used throughout the country, this version will be available in Dutch, French and German).

Action D2. Silvicultural assessment of the activities

Foreseen start date: 04/2019 Foreseen end date: 06/2023
Actual start date: 04/2019 Actual end date: 08/2023

Activities undertaken and outputs achieved:

To carry out action D2, the following partners were involved: CTFC (action leader), CPF, CFC, CREAF and CNPF.

This action has been divided into the following two sub-actions:

Sub-action D2.1. Silvo-dasometric assessment

This sub-action involves a) the development of the monitoring procedure, which describes the methodology for implementing control plots and performing the inventories; b) implementation of the plots; c) data collection; d) data analysis (at the end of the project).

a) Development of the monitoring procedure

The protocol was developed primarily by the CTFC and CREAF, with help from all partner institutions. To discuss and reach an agreement as to the number and size of the plots and which variables to record, several meetings were held between representatives from the CREAF, CTFC, CPF and CFC. The result is the deliverable "Monitoring procedure for actions C1, C2, C3 and C4", which was delivered along with the Midterm report. This procedure also includes the sampling protocol for biodiversity and ecosystem function indicators and a model data sheet to collect dasometric data

b) Implementation of the permanent sample plots

- In the 24 demonstrative stands from actions C1, C2, C3 and C4, including reference stands, a total of 84 plots were installed:
  - C1: 4 stands (OM and CTNFM), with 3 plots per stand.
  - C2: 4 stands (OM and CTNFM), with 3 plots per stand.
  - C3: 4 stands (OM and CTNFM), with 3 plots per stand.
  - C4: 6 stands (ND), with 5 plots per stand.
  - 6 reference stands (natural evolution), with 3 plots per stand.
- In control areas (in which no activities will be carried out), a total of 16 permanent plots were implemented:
  - C1-C3: 10 plots (1 plot per stand, except for 2 plots that will serve as control plots for two stands at the same time).
  - C4: 6 plots (ND).

As indicated in the protocol, each of the plots (which are circular) was marked with a PVC tube, whose UTM coordinates were recorded. In addition to signalling the centre, this tube is also used for placing the Vertex dendrometer and calculating the plot's radius. To visualise the plots, a wooden stake was placed alongside the tube, and, to keep from losing track of the plot's centre in the event it was moved or disappeared during the forestry work or for any other reasons, a reference tree was also marked, and the distance and course with respect to the central point were recorded.

Figure 1. Outline of a stand and its permanent sample plots.

c) Data collection (dasometric inventories)

As planned, 3 sampling campaigns have been carried out throughout the project: the first in autumn-winter 2019-20 (before the forestry actions), the second just after the actions, and the last in autumn-winter 2022-23 (at the end of the project). Each partner undertook the inventories for the stands in which they had executed the forestry activities. As the variables measured are described in detail in the Protocol, the following is a brief summary:

- **Description of the stand**, for an overview of the stand. This included information on: the presence of woody species, phases of the silvogenetic cycle and the human footprint.
- **Description of the plot**: Since the radius of the plot was defined based on the number of stems measured, the minimum radius of 10 m was extended until at least 30 large living stems were measured. The main variables measured were:
  - For each tree stem with a Dn > 7.5 cm located inside the plot radius: species, vital condition (alive, dead), type of stem, sociological class (emerging, dominant, codominant, etc.), appearance of stem, stem shape (fusiform, tortuous, cleared, etc.), normal diameter, identification of dendro-microhabitats (DMHs) and average height of trees per species and diameter.

    Each stem counted was marked with a green line at a height of 1.3 m, on the side facing the centre of the plot.
  - No. of tree stems with a Dn > 2.5 and < 7.5 cm.
  - Deadwood with a diameter greater than 12.5 cm and length of 1 m, indicating the species, state of decay and whether the origin of the deadwood was artificial or natural.
  - Vertical layering of the vegetation.
  - Appraisal of the plot's vulnerability to forest fires, in accordance with the ORGEST Manual.
  - Photographs in all four directions (N, S, E, W) and from above.


Photographs 42-43. Left: image of the stake indicating the centre of the plot, from where the plot's radius was measured. Right: plot with horizontal green markings, indicating the trees selected for inventory work within the sampling radius. The T tree can be seen to the right of this photograph.

d) Obtained data analysis

From the measurements taken in the field, a series of silvodasometric parameters have been calculated for each plot, which have made it possible to characterize the silvicultural treatment and the evolution of the stand. All the information generated has been compiled in a report for monitoring and evaluating the conservation actions according to the habitat and management method (deliverable mentioned later).

Sub-action D2.2. Application of the PBI_Cat v2.1 and PBI_Cat v3.0

As it was planned in the GA, PBI has been applied in two different periods, in the same dasometric inventory plots (subaction D1.2):

- Application of PBIC v2.1 (resulting from action A3), in parallel to the initial silvo-dasometric inventory, and before the silvicultural actions (autumn-winter 2019-2020).
- Application of PBIC v3.0 (resulting from action C5.3), in parallel to the final silvo-dasometric inventory (autumn-winter 2022-2023).

In the prospection of the plot, carried out by the partner responsible for each stand, contextual factors and factors related to the stand have been considered. All these factors are described in high detail in the PBI Application Protocol.

The results and conclusions of this subaction are also compiled in the conservation actions monitoring and evaluation report (deliverable).


Photographs 44-45. Left: Meeting for sharing ways to apply the dasometric inventory and PBI protocols, held on 5 September 2019 in the Can Buscastell stand. Right: a canker which, due to having a diameter of more than 20 cm, would count as a dendro-microhabitat.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Monitoring protocols for actions C1, C2, C3 and C4	09/2019	31/12/2019, revised in summer 2020 to include the sampling protocol for monitoring health, included in action D4
(D) Monitoring and evaluation of the actions report	06/2023	08/2023

The monitoring and evaluation report of conservation actions is found on the project website and has been added to the BUTLER application.

This report includes the following information: description of the treatments performed; results of the effect of the treatments on the trees, the undergrowth, the vulnerability to crown fire and on the capacity to host biodiversity in the holm oak (C1), Aleppo pine (C2), oak (C4) and prepared for natural dynamics (C4) stands; and a conclusions section. The analysis is carried out by comparing the results of the pre-intervention inventories ('Pre') with the inventories carried out after the intervention ('Post') and those carried out 2 years later ('Final').

The conclusions section is presented in two languages (Spanish and English).

Actual deliverables compared to expected deliverables and calendar / Changes:

The action has been developed as planned in the proposal. Additionally, information collected during the evaluation of PBIC v2.1 has helped prepare the internationally validated version (PBIC v3.0) in Action C5.3; and the information collected by PBIC v3.0 has been stored in the database created in Action C6.3.

With regards to the concerns raised by the EASME about whether the delay in the forestry work for the conservation actions would affect the post-activity inventories, it should be noted that the effect has been minimal, as the final inventories were completed during the 2020-2021 dormant period, as was originally planned. The purpose of the post-activity inventories is to

verify the result of the work and compare the state of the stand before and after the activity. The delay in completing the forestry work had absolutely no effect on this objective.

In accordance with the suggestion made by the EC (in the letter dated 18/07/2019), a model sheet integrating version 2.1 and version 3.0 was elaborated for the PBI inventories 3 years after the activities in order to compare the end state of the stands with the two versions of the PBI.

Prospects for continuing the action following completion of the project:

Given that the forest inventory plots installed during the project are of a permanent nature, it is possible to monitor the evolution of the demonstration stands in the long term. At least three of the demonstration stands (which will be part of the CPF Demonstration Plots Network) will be monitored for ecological and dasometric variables and their capacity to host biodiversity (see After-Life Plan).

The protocols for performing the dasometric inventories and applying the PBI from this action provide transfer value, as they will be available for future studies and projects and may continue to be accessed via the webpage following completion of the project.

Action D3. Assessment of the biodiversity indicators

Foreseen start date: 10/2019 Foreseen end date: 06/2023
Actual start date: 05/2019 Actual end date: 09/2023

Activities undertaken and outputs achieved:

This action has been mainly undertaken by the CTFC and CREAF. The other Catalan partners have taken part in sampling certain variables.

Biodiversity has been assessed based on the indirect indicators (structural variables) and direct indicators (bioindicators) defined in action A2, as explained below.

It should be noted that the methodology used to evaluate these biodiversity indicators is described in the "Common sampling protocol for assessing forestry activities, biodiversity indicators and ecosystem functions", explained in action D2. Although not originally foreseen as a deliverable in action D3 or action D4, at the start of the project, the decision was made to develop a common protocol to make it easier to monitor the forestry activities from actions C1-C4, both at a silvicultural level (action D2) and in terms of biodiversity indicators (action D3) and ecosystem functions (action D4).

1. **Sampling of structural variables**

This sampling has been carried out in all stands from actions C1-C4 and in stands prepared for natural dynamics. The variables measured were:

- Amount of deadwood (standing and fallen): quality and quantity, state of decay
- Woody vegetation: vertical and horizontal structure, canopy cover/strata
- Exceptionally large living stems
- Cavities for refuge or nesting: types and abundance
- Microhabitats: types and abundance
- Regeneration of tree species
- Human footprint

As explained in the protocol, these variables were evaluated in the moment the silvicultural assessment was performed and in the same sample plots as established in action D2. In other words, in 3 plots within the area subject to forestry activities and one plot inside the control area (except in the case of the stands from action C4, in which 5 permanent sample plots have been established). As regards the reference stands (naturally evolving stands), the sampling was also performed in the 3 permanent plots. Each partner collected samples for these indicators before and just after the activities carried out in the stands for which they were responsible. Finally, one last sampling was performed during the dormant period in the last year of the project (late autumn 2022 – early winter 2023).

2. **Biodiversity characterisation sampling:**

For the characterisation of biodiversity through direct indicators, in general, two censuses were carried out, one before the actions and one at the end of the project: (i) vascular flora: May 2019 and May-June 2022; (ii) bryophytes: autumn 2019 and November-December 2022; (iii) fungi: November-February 2019-2020 and May 2023; (iv) birds: May 2019 and May-June 2022; chiroptera: June 2019 and July 2022. Post-treatment sampling of birds and chiroptera was conducted only in stands with the greatest reduction in basal area, where a likely change in the composition of these faunal bioindicators was expected.

A separate case was the monitoring of saproxylic beetles, for which a single monitoring was carried out in all the stands of actions C1-C4 using passive flight interception traps, during the months of May to July (3 months) of 2021.

All the sampling was carried out by specialised CTFC and CREAF staff or by external specialists. The activities carried out for the sampling of the different direct biodiversity indicators and some of their results are described below. It should be noted that all the complete results are included in the final report 'Effects on biodiversity indicators according to habitat and management model' (deliverable). This report assesses the effect of the application of forest management models on maturity and biodiversity proxies, the response of bio-indicators before/after silvicultural treatments, a brief description of the organism communities and their distribution by habitat, and the relationship of bio-indicators with structural variables, especially those most influenced by stand level management. The assessment of girdled trees is also included. These results not only allow us to evaluate the response of direct biodiversity indicators to the treatments carried out, but also to increase our knowledge on the relationship between direct bioindicators and management in Mediterranean/sub-Mediterranean forests.

Bryophytes and fungi:

Sampling was carried out in 2-3 plots per stand (plus control plots) coinciding with the dasometric plots of action D2.

In the case of mosses and liverworts, the total cover and cover per species on 5 selected trees per plot were measured. With regards to fungi, a mycological inventory was done, in which preference was given to examples from the Aphyllophorales order, associated with deadwood, one of the main microhabitats that must be preserved and promoted.

In addition, and to complement the assessment, soil samples were also taken to acquire further information about the entire fungal composition (saprophytic and mycorrhizal fungi), by extracting mycelia and performing a metagenomic analysis. This sampling, performed in addition to that on aphyllophorales is interesting, because it allows us to track changes in the mycelium network of saprophytic and mycorrhizal fungi resulting from tree cutting, changes in the living/dead networks of trees, incoming light, decreases in air humidity and soil moisture, etc. However, as it was a complementary sampling proposed during the definition of the monitoring protocol, genomic analysis was not foreseen in any of the project's budget lines. This is why this analysis has been added to the After-Life, in the hope of obtaining funding from other projects.

In brief, 62 species of bryophytes have been identified, of which 53 are mosses and 9 liverworts, and 182 species of fungi, with 54 saproxylic species. No unique, threatened, or red-listed species have been found in either group.

Photograph 46. Image of a bryophyte inventory station in a Life Biorgest stand.

To summarise, the main results are:

1) No significant differences have been detected before and after treatments.

2) Regarding the bryophytes:

- There is a relationship with the degree of humidity, orientation and phorophyte.
- There is a higher abundance in holm oak forests and wet oak forests.
- There is a positive relationship with the BA and a negative relationship with shrub cover and conifer BA.

3) Regarding saproxylic fungi:

- There is a positive relationship with shrub cover and dead wood and negative with coniferous BA.

Vascular plants:

Sampling was carried out in the same dasometric plots than action D2. During the first quarter of 2019, the preliminary analysis of all endangered flora within a radius of 1 km around the stands included in the study was carried out. In May 2019 and May 2022, the inventory of all endangered or rare, characteristic and/or bioindicator species was performed, in accordance with the common protocol from actions D2, D3 and D4.A total of 79 species were inventoried, none of them threatened or rare. The main results are:

1) No significant differences were detected before/after treatments.
2) Presence of 9 nemoral species with more than 10% frequency of occurrence.
3) Positive relationship with FCC, shrub cover and BA of large trees and negative with total BA.

Saproxylic beetles and bark beetle damage:

The unused part of the budget from action C4 was allocated to this action D3 for the following tasks:

1) deploying passive flight interception traps to monitor the beetles from May-June 2021 (3 months, with samples collected every 15 days) in all stands from actions C1, C2, C3 and C4 (18 stands x 3 traps/stand = 54 traps). 324 samples in total.

2) using the same passive traps to monitor bark beetles in 4 Aleppo pine stands (12 passive traps, 3 traps per stand) from May-November during 2020, 2021 and 2022. 504 samples in total.

3) monitoring the damage caused by bark beetles, which will also include a twice-yearly sampling (December-January and late July, 2020-2022) of all observable damage caused by bark beetle attacks in 15 pines/plot in all Aleppo pine stands (6 stands) + 2 control stands (no activities). 360 pines in total. Sampling started in January 2021 and finished in winter 2023.

4) monitoring of the status of the 260 girdled trees and 583 felled trees in action C4, during the month of June 2023. Information was collected on the status (alive or dead of the girdled trees), degree of wood decomposition, degree of defoliation and decay and abundance and diversity of microhabitats.

The company Naturalea was subcontracted for the installation of the traps, collection, preservation and storage of the samples. In a second phase, the company Aquanea was subcontracted for the processing of these samples, that is, determination of the beetles and Scolytidae collected in the samples of activities 1 and 2 described above.


Photographs 47-48. Photographs illustrating the fieldwork conducted to monitor saproxylic beetles in all stands and bark beetles in the Aleppo pine stands. Left, passive trap set between early May and late November; right, example of the damage caused by bark beetles (January 2021).

The main results are summarized below:

1) In the 18 stands in which actions have been carried out, 20,007 specimens of beetles of 390 species (from 61 different families of O. Coleoptera) were captured, of which 288 are saproxylic. The richness of exclusive species for each habitat ranges from 21% in pine forests, to 15% in holm oak forests and 17% in oak stands. These data are similar to the number of species that share the three habitats, 60 species (21%). Holm oak and oak forests share more species between them (17%) than any of these habitats do with pine forests (5% in both cases).

2) In relation to the monitoring of Scolytidae, during 7 months for 3 years, a total of 245 saproxylic species were captured, most of them with unknown pathogenic potential. Of these, only 7 had a medium to high pathogenic potential.

3) In relation to the monitoring of the damage by Scolytidae, none of the 360 pine trees showed damages that would lead to death.

4) In relation to the monitoring of the state of the girdled and felled trees, it was observed that a high percentage of the cut trees died during the 2 following years and that the rate of wood decomposition and appearance of microhabitats was very rapid.

Explanatory note: The results of sections 2 and 3 have been included in action D4 report (Report on the evaluation of the effects on ecosystem services according to type of management and habitat) since it made more sense when dealing with aspects related to the health status of the stands.

Birds:

The censuses were performed using listening stations (1 or 2 stations were set up per stand, coinciding with the dasometric plots). A higher number of stations per stand were not deployed

in order to ensure independent samples. As explained in detail in the Midterm report, due to the size of the stands (8 ha), three stations could not be set far enough apart without there being interference.

Photograph 49. Bird census carried out by CTFC expert staff.

In brief, the main results are as follows:

1) Sampling has focused on common birds (47 species inventoried, of which 37 were forest birds).
2) No significant differences were detected before/after treatments.
3) Positive relationship with large trees, with dead wood (climbers) and negative with BA.
4) Climbing bird group has the best indicator value: under-represented in BIORGEST stands.

Bats:

This taxonomic group monitoring was carried out using automated echolocation detection stations. One ultrasound detector per stand was deployed for 7 consecutive nights.Aware that bat species travel large distances across the length and breadth of the stand, this prolonged week-long exposure made it possible to characterise the activity of acoustic groups and species in the stand. It should be noted that, although the species were determined automatically using the Kaleidoscope program, the data had to be revised to avoid misinterpretations.

In addition, in March 2021, groups of special bat boxes were placed in selected stands in each habitat. A total of 139 units of 5 different models were installed. All of them will be kept in the stand in order to be able to continue long-term monitoring. The objective behind installing these roosts is two-fold: to further monitor and improve the roosts for arboreal species (*Plecotus auritus*, *Myotis cripticus*, *M. bechsteinii* and *B. barbastellus*). 1 or 2 sets of 5 boxes were installed in each stand. Each set will be placed several hundred metres apart. Each set includes one of each of the different box models, each placed approximately 10-20 metres apart. The reason for this is to encourage occupancy by members of the various bat species, offer the opportunity to alternate roosts (bats change roosts every few days) and determine whether there are differences between the various box models from an occupancy standpoint.

Photographs 50-51. Left: Ultrasound detector; Middle: one of the 5 different models of roost boxes used to monitor bats in the Life Biorgest stands; Right: Leisler's bat specimen inside a project roost box.

In total, flight activity of 20 species/phonic groups was detected, with at least 5 arboreal species.

Outstanding results:

1) Proven or probable presence of threatened species (few contacts). E.g. *Barbastella barbastellus*.
2) No significant differences detected before/after the treatments.
3) There is a positive relationship with large trees and dead wood and a negative relationship with BA of medium and small trees.
4) The occupancy of the refuge boxes one year later was 35%.
5) The most common species are three pipistrelles, all of them generalist species, and one forest species (the lesser noctule).
6) Different occupancy according to locality and structure: higher in forests with lower BA.
7) Occupation is expected to increase over the years.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Stage-one field samples	31/12/2019	31/12/2019, except the sampling of fungi in 6 stands, which was performed in February 2020
(M) Stage-three field samples	12/2022	12/2022
(D) Report on field sampling + database of the biodiversity indicators results covering all 3 sampling stages	03/2023	09/2023
(D) Final report: "'Effects on biodiversity indicators according to habitat and management model'	06/2023	09/2023

The two deliverables have been uploaded in the BUTLER application. The final report includes a section of conclusions in two languages (Spanish and English).

Actual deliverables compared to expected deliverables and calendar / Changes / Main problems/setbacks encountered:

For bryophytes, vascular plants and birds, the schedule has been kept as foreseen in the protocol. For fungi, an extraordinary sampling of soil mycelia was incorporated in spring 2021 in case genomic analysis can be performed in Post-Life.

Regarding bats, although it was not foreseen in the proposal, at the end of the project, sampling by echolocation stations has been incorporated in the stands with more pronounced structural changes, as the response of this group of bio-indicators is more evident in the medium term. The refuge boxes were installed later than planned because it was considered necessary to delay their installation until the silvicultural works were completed in all the stands, in order to avoid damage to the refuges.

The delay of the work in 2 Aleppo pine stands (see action C2) also meant that the installation of passive traps for monitoring Scolytidae was only carried out in 4 of the 6 Aleppo pine stands.

On the other hand, thanks to the budget transfer from action C4 to action D3, a much more exhaustive monitoring of saproxylic coleoptera has been possible than initially planned.

Prospects for continuing the action following completion of the project:

As discussed in action D2, the permanent nature of the inventory plots makes it possible to be able to monitor the evolution of the demonstration stands in the long term. Thus, in the period 2023-2028, it is planned to monitor: all the chiropteran nest boxes installed, fungi and mycorrhizae by means of soil samples collected in all the stands, Scolytidae in the 6 Aleppo pine stands, the degree of maturity of the stands that have been prepared to leave them to natural evolution and the mortality rate, the degree of decomposition of the wood and the quantification of new microhabitats in the girdled and felled trees. All direct and indirect bioindicator data will be entered into a database under construction (Access format) by the CTFC Conservation Biology Group. This is explained in more detail in the After-Life Plan (action F4).

Action D4. Ecosystem function assessment

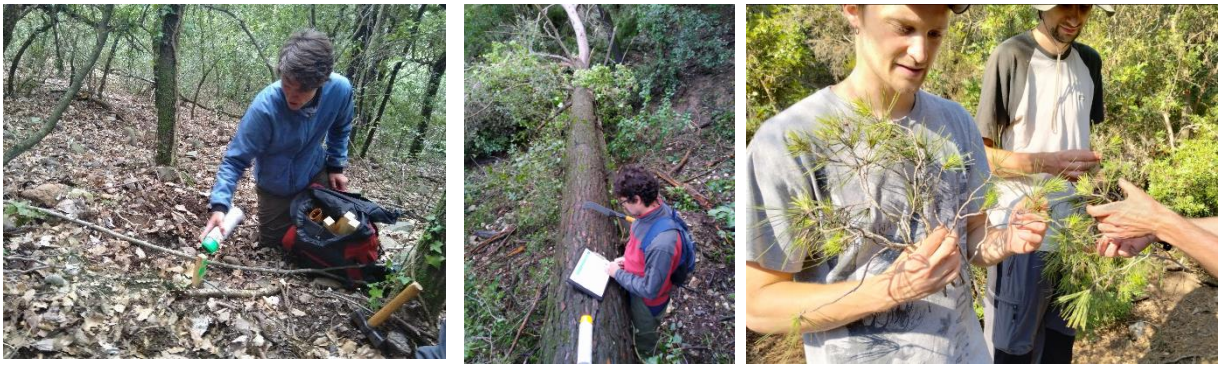
Foreseen start date: 10/2019 Foreseen end date: 06/2023
Actual start date: 10/2019 Actual end date: 09/2023

Activities undertaken and outputs achieved:

As mentioned in regard to previous actions, during the first months of the project, the CTFC, CREAF, CPF and CFC developed a common sampling protocol for monitoring the forestry activities from actions C1, C2, C3 and C4 and assessing the indicators from actions D2, D3 and D4. This first protocol version included the sampling for monitoring 4 of the 5 indicators from this action D4 (provision of timber and fuelwood, carbon sink capacity, protection of soil against erosion, protection against forest fires). Health state monitoring methods were included later in the protocol, in summer 2020.

First 4 indicators were assessed in the same sample plots in which the silvicultural assessment was performed (action D2). In other words, 3 plots in the area subject to forestry activities and one plot inside the control area (except with the stands from action C4, in which 5 permanent sample plots were established). As regards the reference stands (naturally evolving stands), sampling was performed in 3 permanent plots. Each partner carried out the sampling of these indicators in their corresponding stands, before the actions, just after and at the end of the project.

To evaluate the health status (5th indicator), a single sampling was carried out, during the month of September 2022, in the 18 stands of actions C1, C2, C3 and C4. The sampling involved taking a sample of leaves, in every action stand and from the main species, from the middle-top section of the crown of 5 liberated co-dominant stems. Similar samples were taken from 5 stems in the control area. The core was extracted from these trees (5 + 5) using a Pressler borer (this part was not included in the initial proposal).



Photographs 52-54. Photographs illustrating the field work for action D4 performed in the stands.

Based on the data from the different field sampling we obtained, on the one hand, the results of the indicators of the following ecosystem services: i) supply of wood and firewood, ii) carbon sink capacity, iii) soil protection against erosion, and iv) wildfire protection; and, on the other hand, the health status indicators: i) average life of the leaves, ii) moisture content of the leaves, iii) relative growth of the trees and iv) annual affectation of pines by Scolytidae.

The data has been included in a common database together with the sampling data from actions D2 and D3. CREAF has been responsible for processing all this data and coordinating the writing of the final report (Deliverable).

The main results are:

- Provision of wood and firewood: There are great differences between stands, from more than 100 t/ha extracted to values less than 10 t/ha. There are no differences for the same type of habitat between stands with different management.
- Carbon sink capacity (C): With some exceptions, preparation for natural dynamics management shows lower relative values of C stock reduction than the other types of management.
- Soil protection against erosion: In all stands, the change in vegetation cover as a result of the actions does not imply an increase in the risk of erosion.
- Wildfire protection: In general, vulnerability to crown fire remains constant or has been reduced as a result of partial clearings carried out in some stands.
- Average life of the leaves: The average life of the leaves in the action area increases in relation to the trees in the control area, only in the holm oak forests.
- Leaf moisture content: Very few differences have been detected between trees in the action area and the control area.
- Relative growth in basal area: a higher relative increase in the released trees (action zone) than in the non-released trees (control zone) has been detected only in approximately half of the stands.
- It is possible that the especially dry years of 2021 and 2022, which coincide exactly with the years after the action, have cancelled the possible beneficial effect of the forestry actions on the 4 health indicators tested.
- Monitoring of scolitidae by trapping. The abundance and relative diversity of the Scolytidae species with the greatest pathogenic potential is very low in all stands and for all monitoring years.
- Affectation of pines by Scolytidae. Throughout the four sampling campaigns, no pine suffered any attack by Scolytidae that led to its death.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Stage one field sampling	12/2019	18/12/2019, except the samples from one stand, which were taken on 20/01/2020
(M) Stage three field sampling	12/2022	12/2022
(D) Final report: "Effects on ecosystem services according to type of management and habitat"	06/2023	09/2023

The final report (Deliverable) is located on the project website and has been added to the BUTLER application. The report included a conclusions section that is in Spanish and English.

Actual deliverables compared to expected deliverables and calendar / Changes:

Before the forestry actions, specifically at the end of 2019, sampling was carried out in all stands for the following indicators: provision of wood and firewood, carbon sink capacity, soil protection against erosion, and protection against wildfires. Post-action sampling was carried out between the month of May 2020 and the first quarter of 2021, as the forestry actions were being completed (in the stands of El Bruix, Can Barnench, La Torroella and CasaNova de Maspons, works lasted until on 31/12/2020). In any case, all post-action inventories were

completed during the 2020-2021 dormant period, complying with the provisions of the GA and the protocol. The third and last sampling was carried out on the scheduled dates.

The delay in the conservation actions (actions C1-C4) had only a minor effect on these 4 indicators, as the purpose of the post-activity inventories was to compare the situation prior to and following the activity, for each individual stand. The fact that the inventories were performed in different months (they were carried out as the forestry work was completed) in no way affects the overall assessment of the ecosystem functions.

Main problems/setbacks encountered:

The main problem with this action was that the sampling to monitor the health status, was initially scheduled for September 2020, and had to be postponed as a result of the delay in forestry actions in some of the stands. This time lag between stands compromised the comparability of the indicator between stands. That is why it was decided to do a single sampling as late as possible (in September 2022) in order to dilute this temporal effect. This forced us to rethink the indicators to follow and write a new sampling protocol adapted to the new situation.

Prospects for continuing the action following completion of the project:

It is planned to continue monitoring the impact by Scolytidae on the 15 pines in the 3 plots of each of the 8 stands (360 pines) to certify that an attack does not occur in the coming years. The first sampling will be held in January 2024 and will be repeated in winter 2025.

Action D5. Socioeconomic assessment of the project

Foreseen start date: 01/2019 Foreseen end date: 06/2023
Actual start date: 03/2019 Actual end date: 06/2023

Activities undertaken and outputs achieved:

To carry out this action, the following partners were involved: XCN (action leader), CFC and CTFC. The main objective of this action was to gauge the project's short and long-term social and economic impact in Catalunya (as indicated in the GA) to provide arguments in favour of sustainable forest management that enhances the biodiversity of Mediterranean forests and the inclusion of specific measures in the Forest Management Instruments. To perform this analysis, firstly, an external company (ENT Environment & Management) was contracted to draft a report which would help to determine which economic and social indicators, both qualitative and quantitative, should be taken into account (document delivered along with the midterm report). In this report, these indicators were specified, as well as their measurement units and the way to obtain the data (own information from the partner entities, surveys, etc.). The chosen indicators were grouped according to the following areas of analysis:

- Employment
- Perception of the impact on the local economy
- Education, training and skills development
- Technological and scientific impact
- Dissemination
- Knowledge and awareness
- Impact on regulations and planning

Employment, technological and scientific impact and dissemination indicators have been monitored with data provided by the project partners. However, to gauge the perception of the impact on the local economy (forestry, tourism and natural park sector), education and knowledge and awareness (forest owners, forestry companies, course attendees, people who view the informational panels or videos), surveys were conducted among the various stakeholders, (in each case, before or after the forestry activities or at any time during the project). The collectives surveyed have been those which are directly or indirectly affected by the project's actions. The model surveys for each type of stakeholder were delivered along with the Midterm report.

Prior to conducting the surveys, a database was created with information on the rural accommodations, tourism companies and nature guides that work in and around the project stands in Catalonia. If possible, we also verified whether they had European Charter for Sustainable Tourism certification. With regards to forest owners and forestry companies, the surveys were aimed at the owners of the demonstrative stands and the companies that performed the forestry work in these stands. Though not indicated in the report, it was also deemed a good idea to give the survey to individuals who teach subjects related to forest management and planning in Catalonia.

The surveys intended for forest owners and forestry companies were conducted by the partner responsible for the relevant stand, while the others were carried out by either the CTFC and CFC.

Based on the obtained data for each indicator, a final report (Deliverable) has been prepared in which an analysis of this data is carried out and the conclusions are presented (in Spanish and English) on the socioeconomic impact of the Life Biorgest project. This report, which has also

been prepared by 'ENT environment & management', is posted in the 'BUTLER' application and on the project website.

Below is a brief summary of the most notable results:

1. Employment

The project has had a total of 99 paid people, with equal gender representation (42 women and 57 men), of which the majority (96%) are from Catalonia. In addition, there have been 68 subcontracted people for the execution of conservation actions. In a broad sense, the project has generated an average of 6 jobs per year in the Catalan economy from its beginning to its end.

2. Perception of the impact on the local economy

In this area, the impact of different forest management models (traditional, alternative management, and natural dynamics) on the local economy has been analysed based on surveys addressed to representatives of the forestry and tourism sectors and of the natural parks in the intervention areas.

Based on the opinion of actors in the forestry sector on 2 models - traditional and alternative management - it is possible to point out the identification of the first model as the one that can generate more income and the second as the one that can correspond to lower production costs and a greater variety of marketable products. With regard to the perception of the actors in the tourism sector about the 3 management models considered, there is a certain consensus in relation to the model that is associated with an improvement in the quality of the landscape and greater tourist attraction (alternative management) and more restrictions for the development of leisure and recreational activities (natural dynamics). In addition, the opinion of the representatives of the natural parks on the 3 models seems to suggest, on the one hand, a certain uncertainty in relation to which model can correspond to a greater economic promotion of the forestry sector and, on the other hand, although in a not very expressive way, the consideration of traditional management as the option that can contribute to a greater promotion of other activities of the local economy and towards a greater tourist attraction of the territory.

3. Education, training and skills development, Technological and scientific impact, and Dissemination

Results included in the report comprise: 2 final academic projects and 15 training activities with a total of 631 participants; 22 published articles, 21 of which are of a technical nature and 1 of a scientific nature; There have been 23.313 visits to the project website from 139 countries (72,6% of the visits are from Spain); 51 published news related to the project, of which 62.7% are in digital media.

Furthermore, during the last two months of the project, activities were carried out that could not be included in the Report (because it was closed in July 2023), such as: the celebration of the final Seminar in which 75 people attended, and the launch of another press release that led to the project appearing in 4 media outlets. It should also be taken into account that the total number of visits to the website to date is 32,866.

4. Knowledge and awareness

The evaluation of the perception of the project's contribution to improving knowledge and awareness on its subject has been carried out through surveys addressed to various actors.

Among its results, the following stand out: the consideration by forest owners of a high degree of contribution of the project to a better perception of the importance of integrating specific measures to improve biodiversity in forest planning and management instruments; the high

level of general satisfaction of participants with the training courses/days; or the fact that the information on the informative panels was associated with a high degree of interest of the viewers. In any case, the surveys carried out through the information panels have turned out to be ineffective with only 8 responses.

5. Impact on regulations and planning

Within the framework of the project, work meetings have been held on the Sustainable Forest Management Guidelines of Catalonia (ORGEST) and a working group has been created in the competent administration to incorporate the improvement of biodiversity in forest management. The measures proposed by the project have been accepted. In addition, the Forest Property Center (CPF) has approved the regulatory bases (resolution ACC/1786/2023, of May 23) for minimum aid to encourage ecosystem services from sustainable forest management in privately owned forests. This aid incorporates the biodiversity improvement measures and the cost and benefit estimates made in the Life Biorgest project. Finally, the modification of the order that regulates the writing of the Forest Management Instruments has begun, and it is planned to incorporate here the project results. However, its approval will require between 2 and 3 years.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Design of system of indicators and initial assessment	06/2019	12/2019
(M) Application of indicators and comparative results evaluation with the first year	03/2023	04/2023
(D) Report: Evaluation of the socioeconomic impact of the project	06/2023	07/2023

Actual outcomes compared to expected outcomes and calendar / Changes / Main problems or setbacks encountered:

All activities planned in this action have been carried out as planned. Only the 'design of the panel of socioeconomic indicators' suffered a slight delay, as well as the surveys of forest owners and companies, due to the delay in the start of the conservation actions. But in any case, this has not had any consequences on the other actions.

The only drawback found is that since the report had to be delivered in July 2023, it does not contain any information after this date, such as the number of participants in the final Seminar or the latest appearances in the media. These data are included in the description of actions E4 and E5.

Prospects for continuing the action following completion of the project:

No actions have been planned to give continuity to said action beyond the project.

Action D6. Monitoring of project progress and Key LIFE Indicators

Foreseen start date: 10/2018 Foreseen end date: 09/2023
Actual start date: 10/2018 Actual end date: 09/2023

Activities undertaken and outputs achieved:

Action D6 involves monitoring both the progress of the project (sub-action D6.1) and Key LIFE Indicators (sub-action D6.2). To carry out this action, the following partners were involved: CFC (leader of the action and the sub-action involving monitoring project progress) and CTFC (leader of the sub-action involving monitoring Key LIFE Indicators). Furthermore, the other project partners also collaborated by providing the information needed to complete the various indicators.

Sub-action D6.1. Monitoring project progress: This sub-action is based on the table of progress indicators developed while drafting the project proposal. The table also indicates, by action, the frequency with which each indicator is monitored.

These indicators will be monitored for the entire duration of the project, particularly when preparing the activity reports to be submitted to the EC.

Sub-action D6.2. Monitoring Key LIFE Indicators (KPIs): The Key Project Indicators (KPIs) were monitored based on the indicators recorded in the KPI Webtool. This online tool indicates the achieved and expected results in terms of environmental and socioeconomic benefits. Throughout the project, two updates to the 'LIFE KPI webtool' have been carried out: in February 2020 (just after the delivery of the first Progress report), and in February 2024 (coinciding with the delivery of the Final report). In the last update, the results obtained at the end of the project and those expected beyond 5 years have been recorded.

In the first snapshot, the frequent correspondence with the external monitor, Ms Sara Mora, was extremely helpful when it came to answering questions about how to complete the KPIs. And in the last snapshot we have had the support of the KPIs manager of the Iberian LIFE project monitoring team.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Assessment of the KPIs and updating of the LIFE KPI Webtool in the First Progress Report	31/12/2019	07/02/2020
(D) Evaluation of the KPIs and updating of the LIFE KPI Webtool in the Final Progress Report	30/09/2023	29/02/2024

Actual deliverables compared to expected deliverables and calendar / Changes:

This action has been developed following what was planned in the project's report. There was only a small delay in the first recording of the KPIs (1st snapshot) due to technical problems with the Webtool itself. These problems were already explained in the Midterm report. And in any case, the delay in recording the KPIs did not entail any consequences for other actions.

The last update was made in February 2024 because the EC has granted an extension until February 29, 2024 for the delivery of the Final report.

Action D7. Economic valuation of the implementation of measures to improve biodiversity and design of ownership compensation mechanisms.

Foreseen start date: 01/2021 Foreseen end date: 12/2021
Actual start date: 09/2021 Actual end date: 07/2023

Activities undertaken and outputs achieved:

The objective of this action has been the economic valuation of the management actions implemented in the project, considering both direct and indirect costs and benefits. In addition, a debate has been carried out with proposals and reference measures for encouraging ownership, based on the analysis of previous costs and benefits and the results of action A.6.2.

The selected cost estimation methodology incorporates the opportunity cost, that is, the additional expenses for the forester for incurring interventions to improve biodiversity indicators, as well as the loss of income due to not cutting certain trees. These costs have been estimated for a period of 15 years and for different plot sizes. The direct costs analysed correspond to: the inventory, the marking of the trees to leave, the girdling of trees to create standing dead wood, the cutting of the trees to generate dead wood on the ground, training for the company and works management. Indirect costs correspond to the value of large diameter wood and wood with microhabitats that is no longer cut and standing and lying dead wood.

From the analysis of data from the experience in the BIORGEST project, the following distribution of interventions based on costs is obtained: Works management represents the highest cost, and then marking of the trees. This is followed in a similar magnitude by the value of the creation of dead wood on the ground, the PBI inventory, and the training of the company. The lowest costs correspond, in general, to the value of the wood and the work of the chainsaw operator. A review of the strategy for purchasing logging rights for the creation of forest reserves has also been carried out.

Regarding the benefits, a benefit transfer analysis has been carried out based on previous existing literature, however, there are only 3 studies on the matter, which indicates the need for more information on the matter in future studies.

Following the cost-benefit analysis, a debate was held on March 24, 2023 on proposals and reference measures to encourage ownership. This debate was also built on the results of action A.6.2, prioritizing the following 4 instruments:

1. Regulatory bases of the minimum aid to encourage ecosystem services of sustainable forest management in privately owned forests,
2. The register with initiatives for the conservation of natural heritage and biodiversity
3. The aids of the Diputació de Girona to create or extend forest reserves
4. The voluntary market for climate credits (LIFE Climark)

Photographs 55-58. Photographs that illustrate the debate session with the involved actors

The discussion day was attended by 21 participants from public administration, environmental entities, research centres and forest ownership. Among the participants were the public entities responsible for these incentives. The debate resulted in a series of recommendations for the different financing instruments that were subsequently shared with the competent administrations.

As a result of this action D7, a report (Deliverable) was produced containing the following information: Opportunity Costs derived from the implementation of management itineraries for the improvement of biodiversity; Costs associated with the restrictions and conditioning factors of the environmental reports of the Management Plans; Economic estimation of the potential benefits of management that improves forest biodiversity; Analysis of the Costs and Benefits; and Proposals and reference measures for the incentivisation or compensation of the implementation of measures for the improvement of forest biodiversity to the ownership.

This report can be found in the BUTLER application.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Valuation methodology design	09/2021	02/2023
(M) Valuation final results	09/2021	02/2023
(D) Report on economic valuation of the implemented measures for the improvement of biodiversity and ownership compensation mechanisms design.	12/2021	07/2023

Actual deliverables compared to expected deliverables and calendar / Changes:

The action has suffered significant delays, nevertheless, it has been possible to complete the action on schedule and avoiding compromising action B1 execution. The delays were caused by different reasons:

At the beginning it was difficult to find a professional or expert company that knew the reality of the Mediterranean forest systems in Catalonia and was able to carry out a cost-benefit analysis. Once the expert had been identified and the commissioned report was available, a close review was carried out by the CPF, the CFC and the XCN, and a small group of experts was also involved to provide input to the document. In parallel to the finalisation of the cost-benefit analysis, it was decided to dedicate a meeting of the project's Expert Committee to the discussion of incentives for forest biodiversity conservation and enhancement. This whole process led to a delay in the finalisation of the action, but it can be affirmed that all the steps taken have made a very positive and important contribution to fulfilling the planned expectations, as there is now a public subsidy in Catalonia that is 100% in line with the biodiversity improvement measures implemented in the project and which takes into account all the direct and indirect costs analysed in this action. This is the minimum subsidy, already explained on action C6, to incentivise the ecosystem services of sustainable forest management in privately owned forests, approved for the first time by the CPF on 26/05/2023 (resolution ACC/1786/2023).

Prospects for continuing the action following completion of the project:

In March 2024, a conference is planned to be held to inform environmental entities, forest owners and forestry technicians about the Potential Biodiversity Index and the Naturalness Index and to promote the incentive for ecosystem services among these actors. As it has been explained on action C6, as of today, a second call for proposals has been published to continue this incentive.

Action E1. Design of the logo and corporate image and implementation of the Communication Plan

Foreseen start date: 10/2018 Foreseen end date: 06/2019
Actual start date: 10/2018 Actual end date: 10/2019

Activities undertaken and outputs achieved:

To carry out this action, the following partners played an active role: CTFC (action leader) and CPF. In any case, the other partners also collaborated, reaching a joint agreement as to the main elements of the logo and Communication Plan.

The logo's design was approved by the Coordination Committee during the first coordination meeting held on 28 November 2018 at the CFC offices in Santa Coloma de Farners. This corporate image, along with the Corporate Identity Manual, was delivered along with the Midterm report and has been used in all of the project's promotional materials and documents.

With regards to the Communication Plan, an initial draft was sent to Ms Sara Mora on the occasion of her first visit. During the visit, Ms Sara Mora made a series of recommendations with a view to taking full advantage of the project's strong educational and demonstrative potential. These recommendations also appeared in the letter from the EASME. As a result, we subsequently revised the Communication Plan and included the following aspects:

- Indication of target public or sectors.
- Expansion of the communication channels: We increased the list of entities to which we have sent informational brochures and newsletters, in efforts to raise awareness about the project in Spain, France and around the world. A decision was also made as to which Spanish and French media outlets, at local, regional and state level, to send information on the project to (magazines, written press, radio and television).
- An annex featuring a list of key messages for further disseminating the objectives and topics addressed in the project was added.
- A clear reference to the LIFE Programme's communication requirements and recognition of the EU funding were included.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Project logo and corporate image kit	29/03/2019	11/2018
(D and M) Communication Plan	30/06/2019	10/2019

Both deliverables were delivered along with the Midterm report.

Actual deliverables compared to expected deliverables and calendar:

The objectives of this action have been fully achieved, and, as was mentioned in the previous section, all deliverables foreseen as part of this action have been completed. The logo and corporate image were developed faster than anticipated in the Grant Agreement. The work required to prepare the Communication Plan ran longer than expected so as to incorporate the aspects indicated by the EASME.

Action E2. General dissemination of the project: Promotional materials, project website, layman's report, information panels and newsletters

Foreseen start date: 10/2018	Foreseen end date: 09/2023
Actual start date: 10/2018	Actual end date: 09/2023

Activities undertaken and outputs achieved:

Action E2 involves creating the project's promotional materials, developing and updating the website, the Layman's report, designing and installing the information panels and preparing a weekly newsletter.

The partners that have played the most active role in this action are: the CFC (action leader) and CTFC. All other partners have collaborated by providing information for the website, information panels and newsletter, and have also contributed to the project's promotional materials.

E2.1. Small promotional materials

In accordance with the Grant Agreement, the promotional materials include: Informational brochures, roll-ups, pen drives and cloth bags or folders. After discussing the matter with the other partners, and with Ms Sara Mora during her visits, the decision was made to substitute the pen drive for a glass bottle (protected by a cork sleeve), as it was generally believed that most of the people we were likely to contact would already have a pen drive, and the bottles would be more attractive and useful.

As for the cloth bags, a first design was drawn up and different budgets were requested, but when the pandemic situation arrived, which did not allow us to hold meetings or face-to-face workshops, it was decided to leave it on stand-by. Finally, as CINEA was informed, it was decided to replace the cloth bags with the production of small videos (information capsules) of the project. These videos were commissioned to the same person who had produced the general video of the project and were planned for the end of the project, but unfortunately this person passed away and there was no time to change producer (moreover, this professional had been chosen because he had great experience in editing nature videos). In view of this situation, it was decided to use the budget for the information capsules to hire a simultaneous translation service for the Final Seminar (highly recommended, given the participation of Spanish and French people).

With this, the promotional materials that have been created within the project's framework are as follows:

Informational brochure: two versions have been published, one in Spanish and Catalan and another in English and French, of which 3,790 copies (2,850 in Spanish-Catalan and 940 in English-French) have been printed. A number of brochures were distributed among the partners and project co-financiers, to ensure that brochures were available in their offices and that they may distribute them among their contacts; 1,400 copies were inserted inside the magazine *Catalunya Forestal*, published by the CFC; and others were sent, on an individual basis, to the authorities that manage the natural areas in which the various project stands are located, the forest ranger force and teachers at forestry training schools.

An electronic version of the brochure (which was delivered along with the Midterm report) is available on the project website (in the section "Documents and Products"). In addition, as indicated in the Communication Plan, a copy of the brochure was e-mailed to various entities in Spain, France and abroad to present the project and enlist their help promoting it. These e-mails were very well received.

Photographs 59-60. Brochure printed in English and French (left) and brochure in Spanish and Catalan (right)

Roll-ups: 3 roll-ups (2 in Spanish-Catalan and 1 in French-English), which feature the logos of all partners and co-financiers, the website, contact details and the project objectives, have been created. They have been used in all workshops and online meetings held during the project.

Photograph 61. Roll-up in English and French

Photograph 62. Roll-up in Spanish and Catalan

Glass bottles: A 500ml bottle protected by a cork sleeve. The sleeve includes the logos of the project, LIFE and the Natura 2000 Network, as well as the phrase "The Life BIORGEST project is funded by the EU programme Life". A total of 200 units were ordered and have been distributed among the technical team of the project, the co-financiers, the members of the Committee of Experts and the contacts made in the Networking actions.

Photograph 63. Glass bottle featuring the logos of the project, the EC and the Natura 2000 Network.

E2.2. Website and Layman's report

The **project website** was launched in March 2019, with the web domain www.lifebiorgest.eu. It is available in four languages (Catalan, Spanish, French and English) and is updated regularly. At the start of the project, we also created the Twitter account @LifeBiorgest, which may be viewed on the website.

In the section 'Documents and Products' you can consult the technical and dissemination products of the project (which correspond to the deliverables of several actions), including some recommended by EASME. Halfway through the project, this part of the website was restructured in order to be able to view the documents in a more orderly way. So, the following sections were added:

- Dissemination of the project
- Technical products
- Potential Biodiversity Index (PBI)
- Seminars

In line with EASME recommendations, the following new sections were created:

- "Networking": This section displays the projects or entities with which we have formed partnerships or engaged in active information exchanges.
- "Progress": In this section, visitors may see the milestones and deliverables from each of the actions in order. As regards the milestones, where applicable, links to the section "Documents and Products" or "News" have been included for those interested in further information.

Layman's report was published at the end of September 2023, summarising the objectives, actions and results of the project. It has been published in 4 languages (Catalan, Spanish, English and French), both in digital and paper format (100 units in colour in each language). Although the planned length according to the GA was 5-10 pages, in the end it was extended to 22 pages, as it was considered very useful and interesting to have all the results of the actions implemented in terms of forest structure, direct biodiversity indicators, economics and integration into the regulatory framework and forest policy.

Photograph 64. Layman's report printed in Spanish, Catalan, English and French.

E2.3. Panels boards

To enhance knowledge of the project among the local population in sites where the demonstrative activities had been performed, we designed a model panel featuring general information about the project, 8 panels with specific information about the implemented

management models and measures for enhancing biodiversity in specific stands and 2 panels with specific information about two stands due to the proximity between the two (including one naturally evolving stand). The panel measurements are: General panel: 1200x800 mm; specific panel: 1100x1100 mm. These panels were designed in accordance with the communication and visibility standards established by the LIFE Programme, as well as the requirements of the natural parks in which they were installed. In accordance with the letter from the EASME, the panels containing general information (installed in more frequented areas) are in Spanish and Catalan, while the versions in English and French may be accessed via a QR code (located in one corner of the panel). The specific panels are in Catalan, and the versions in Spanish, English and French may be accessed via a QR code. The QR code also links to the project website and the survey referred to in action D5.

At the beginning of 2021 all the panels were already installed: In Catalonia 4 panels with general information and 10 panels with specific information on certain stands were installed, and in Occitania 4 panels with general information were installed. Images of all these panels are available on the Life Biorgest website.

Photograph 65. Panel board installed in the Montnegre i el Corredor Natural Park

E2.4. Twice-yearly Newsletter

In the course of the project, 9 newsletters have been published. Except for the first newsletter, which was published in Spanish only, the rest are available in Spanish, English and French. The distribution of all these newsletters has been done through: automatic mailings to users subscribed to the newsletter, the dissemination channels of each of the beneficiary partners and through the Twitter account. They are also available on the project website. In addition, the CNPF has published different news about Life Biorgest in its Newsletter.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Brochure with information on the project	09/2019	07/2020
(D) Layman's report	09/2023	09/2023
(M) Information panels installed	03/2020	07/2021
(M) Project website operational	03/2019	03/2019
(M) Creation of the project's promotional materials	09/2019	12/2020

Actual results compared to expected results and calendar / Changes:

- Information panels installed → Although they were installed later than planned, the objective was met, and 4 more panels than indicated in the GA were installed.

- Project website operational → objective reached. The number of visits received is indicated in section 6.3 of this report.
- Layman's report → A very comprehensive report has been published using an appropriate language for the general public, which meets the planned objectives, although it could not be distributed during the final seminar as it was not yet printed. The digital version was posted on the website and the paper version will be distributed during the After-Life.
- Informational and promotional materials created →Some changes have been made: the USB was replaced by the glass bottle, and the cloth bag by the simultaneous translation service Catalan-French during the final seminar. In all cases, these were materials or services to disseminate the project and transfer its results.

Main problems/setbacks encountered:

The installation of the panels is the part of the action that was most behind schedule. The decision to prioritise the completion of other actions that pose a threat to the continuity of the project has resulted in greater delays in this regard. Furthermore, due to the fact that panels had to be installed in several different natural parks, various administrative formalities had to be completed, both to reach an agreement regarding the panel design and to obtain authorisation to install them.

Prospects for continuing the action following completion of the project:

The digital materials created during the project will be available on the website, which will remain operational for at least 5 years following completion of the project. The panels will also remain in place for at least 5 years after project completion (hopefully much longer). All paper Layman's reports that have not yet been distributed will be distributed over the next few months during the various workshops that the project partners organise on a regular basis.

Action E3. Networking and exchange activities with other projects and bodies

Foreseen start date: 01/2019 Foreseen end date: 09/2023
Actual start date: 01/2019 Actual end date: 09/2023

Activities undertaken and outputs achieved:

This action has been coordinated by the CTFC but all partners have been involved in several of the networking activities.

1. Networking contacts

Throughout the project, 50 networking contacts and exchanges of information with entities and professionals have been made, in relation to the main topics dealt with in the Life Biorgest project: forest management, biodiversity, governance, Mediterranean scrubland, etc. In the deliverable 'Networking Report' (uploaded in the BUTLER application), a list of all these contacts is included.

2. Ties to other projects which have contributed to the Life Biorgest Project

Links have been consolidated with 11 projects that have contributed to the development of Life Biorgest. Below is a brief explanation of the links established with each of these projects (which is explained in more detail in the Networking Report).

Life MixForChange: this project contributed to the implementation and execution of Biorgest's individual tree management activities and close-to-nature forest management model, through its network of demonstrative stands.

Life Climark: In this project, multifunctional forest management is promoted through its financing with the creation of a local market for climate credits which value three ecosystem services (carbon sequestration, increased water resources and improved biodiversity). The entire process of quantifying the services and valuing biodiversity has been carried out based on analysis and contacts with the Biorgest project. Life Climark has provided the Life Biorgest project with information on the results obtained from the application of the PBI in several selected stands, which have been collected in the biodiversity and environmental information database (action C6.3 of Life Biorgest)

Life RedBosques: the group of experts from the RedBosques Project attended the meeting held on 27 November 2019 to discuss the most adequate indicators and criteria for measuring forest naturalness and biodiversity, and worked on a preliminary proposal of thresholds and weights for each of them adapted to the Mediterranean context. These have served as a basis for completing the deliverable of action A2.

Life Pinassa: In the permanent management plots of this project, for the conservation of the laricio pine habitat, dead wood was generated for the improvement of biodiversity. The information from these plots has provided the Life Biorgest project with technical indications on the generation of dead wood and on the relationship between direct and indirect biodiversity indicators (PBI).

Sincere Project: this project involves analysing the value of a region's ecosystem services and the stakeholders that contribute to the implementation of a payment mechanism for the provision of these services, which include biodiversity enhancement and conservation. The synergies and exchange of information established between this project and Life Biorgest have contributed to the development of different actions of both projects.

Life GoProFor: in the framework of this project, the CNPF has adapted the Potential Biodiversity Index (PBI) for Italy and translated the PBI documentation into Italian. This work has been carried out in close collaboration with the Biorgest project partners to harmonise the Catalan, French and Italian versions of the PBI. Biorgest has funded the operation of an International Committee of Experts (ICE) for the PBI, which includes members of GoProFor.

Life Demorgest: the contribution of this project has been established in two ways: Firstly, Biorgest has taken into account the previous work done by Demorgest in terms of obtaining the first versions of the PBI; and secondly, the new versions of the PBI have been used during the post-life monitoring of the plots included in Demorgest. This has contributed to the improvement of the index in different formations.

Life Adapta Blues: in the framework of this project, mechanisms have been explored to finance restoration actions in estuaries based on the climate services they provide. With the support of Life Adapta Blues and its expertise in the field of financing mechanisms and insurance, Life Biorgest has been able to adapt deliverable A.6 *Analysis of innovative financing mechanisms (direct and indirect) for biodiversity conservation in sustainable forest management.*

Proyecto Life Systemic: project involving three countries (Italy, Croatia and Slovenia) focused on genetic biodiversity, but which has points that can be closely related to Life Biorgest, as they carry out actions following the criteria of close-to-nature forestry and biodiversity monitoring (https://www.lifesystemic.eu/).

Integrate Network: the Integrate Network and Life Biorgest have collaborated very closely in the adaptation of the biodiversity module of the software used for forestry training in the Transfer Classrooms (Marteloscopes), which allows the simulation of felling and marking exercises (action E4.1 of Life Biorgest).

Proyecto Life4OAKForests: this project is carried out in Italy and Hungary and aims to identify the conditions of natural oak forests, which should be prioritised for nature conservation, as there is no natural oak forest left in both countries. In addition, the project aims to increase the biodiversity of EU priority oak forests (*91AA, *91G0, *91h0, 91I0 and 91M0) in Natura 2000 protected areas managed by National Parks.

3. Exchange trips to 2 European regions

Throughout the project, 2 trips have been made to 2 regions in Europe, in collaboration with other projects or entities, with the main objective of training technical staff in the application of good forestry practices, incorporating criteria of biodiversity conservation, adaptation to climate change and naturalistic forestry.

The trips carried out are:

- On 20-21 October 2021, a combined trip was made between Life MixForChange and Life Biorgest to the French region of Occitania (South of France). Eight people from the Life Biorgest technical team took part in the trip. Together with Silva France and CNPF Occitanie, they visited hardwood and coniferous forests in the region of Les Fenouillèdes and Lozère. At the end of the trip, a report with a summary of the visits and the technical documentation provided by the organiser (CNPF) was produced: "MixForChange Biorgest - Occitanie combined trip report".
- On 21-22 March 2023, a trip to Florence (Italy) was organised in the framework of two European projects (LIFE Biorgest and LIFE GoProFor). Eight people participated on behalf of LIFE Biorgest. During the trip, the SelPiBioLIFE pine forests were visited and a

working session was organised in which the following 4 projects participated: LIFE BIORGEST, LIFE 4 Oak Forests, LIFE GOPROFOR MED and LIFE SPAN. In this session, the actions and results obtained in each of the projects were presented, and different perspectives and points for improvement were shared. At the end of the trip, a report was made with the summary of the visits and the technical documentation provided: "Biorgest Networking trip report - Florence".

4. Expert Committee members

Two experts linked to the Life Redbosques and Life MixForChange projects are part of the Life Biorgest Expert Committee. These experts are:

José Antonio Atauri, Technical Office Europarc-Spain. Expert in the management of natural areas in the Natura 2000 Network and mature forests. Coordinator of the Life RedBosques Project.

Martí Rosell, Montnegre-Corredor Association of Owners. Expert in close-to-nature forest management. Participant in the Life MixForChange Project.

5. Workshop in the Transfer Classroom

As part of the networking activities, two workshops were held in "marteloscopes", to transfer the knowledge acquired and the tools developed in the project. As described in their respective reports, these workshops took place during the two exchange trips:

- A workshop on the marteloscope used by the Forêt Irregulière École (Florac), during the trip to France.
- A workshop at the marteloscope of SelpiBio, during the trip to Italy.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Networking report, including a list of all contacts and the interaction	09/2023	09/2023
(M) First networking trip completed	09/2021	10/2021

Actual results compared to expected results and calendar / Changes:

- At least 60 networking contacts, including experts in different aspects related to the project → Finally, contact has been established with 50 entities or experts with whom knowledge has been exchanged and some events have been co-organised.
- Consolidation of links and contribution to BIORGEST of at least 3 external projects → this objective has been largely exceeded as synergies have been created with 11 external projects.
- 3 exchange trips to 2 European countries/regions, initially to France and Italy → although
- 3 trips to 2 European countries/regions were foreseen in the GA, shortly after the start of the project it was decided that 2 trips would be enough, and that it would be optimal to make the most of them. Therefore, several of the project partners took part in each of these trips (a total of 8 people on each trip). The outcome of these two trips has been very positive for Life Biorgest.
- At least 1 expert from another project was invited to be part of the Expert Committee → actually there have been two people from two different projects who have been part of the Life Biorgest Expert Committee.

Action E4. Promotion of the replicability and transferability of the innovative management models

Foreseen start date: 07/2019 Foreseen end date: 09/2023
Actual start date: 07/2019 Actual end date: 09/2023

Activities undertaken and outputs achieved:

Sub-action E4.1. Adaptation and use of the Transfer Classrooms (TCs - marteloscopes) *(Aula de Transferencia -AT- in Spanish)*

This action includes 4 tasks in which all the work related to the Field Transfer Classrooms (AT-marteloscopes) has been carried out, as follows:

a) Proposal for the adaptation of the biodiversity module of the software used in the AT.

The aim of this sub-action was to adapt the software that was being used in the marteloscopes (field transfer classrooms) already existing in Catalonia to better suit the transfer of the approach and results of the Life BIORGEST project. After a period of prospecting and exchange, it was decided to adopt the software developed for the marteloscopes of the Integrate Network. To do this, the available data and their format had to be adapted to the requirements of the new software, as well as improving some of the Integrate software's functionalities to adapt it to the characteristics of the marteloscopes in Catalonia.

Thus, work was carried out in collaboration with those responsible for the Integrate Network to evaluate the potential of their software in comparison with the software used by the CPF, in relation to biodiversity issues. To this end, the Transfer Classroom in Ribera Salada (Solsonès) was used as a test bed. The work carried out consisted of:

- Transferring the dasometric and characterisation data from the classroom to the Excel format required by the Integrate Network.
- The Excel file was registered in the Integrate marteloscope database by the EFI technicians.
- Carrying out field tests to see the potentialities / shortcomings of each of the applications (Fig. 2).

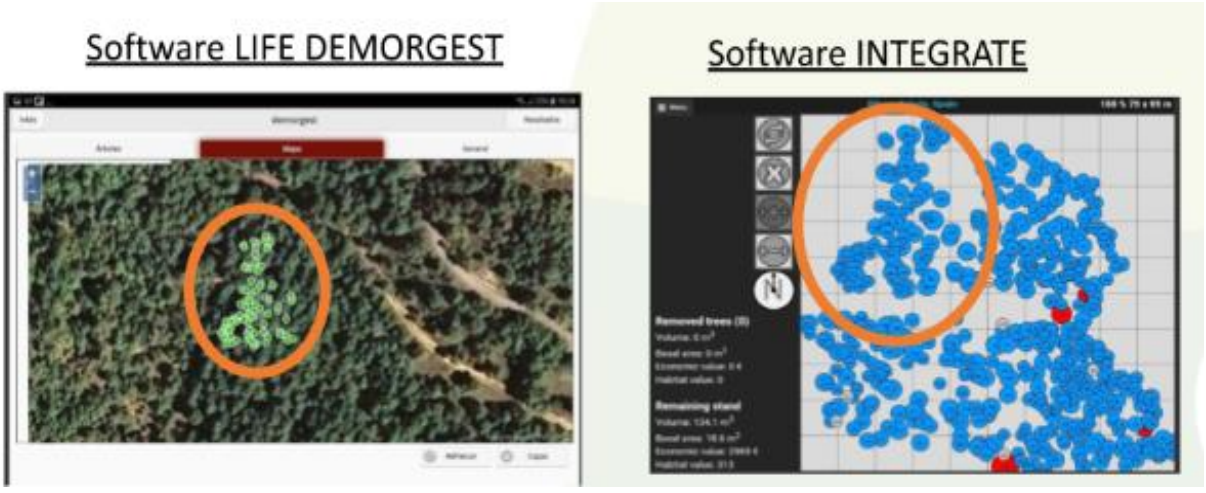
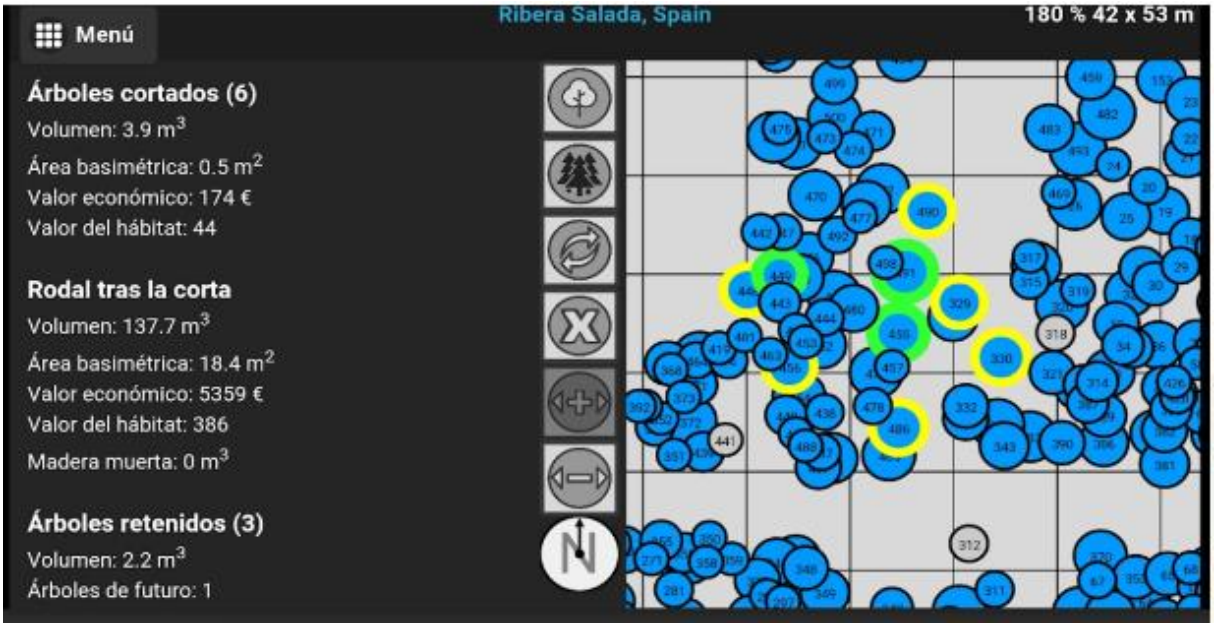


Figure 2. Comparison of the visualisation of the trees of the TCof the Ribera Salada, in each of the applications.

Following the results of the survey work carried out in 2021, it was decided to abandon the DEMORGEST software in favour of the Integrate Network software. Throughout 2022, work was carried out to adapt the Castellfollit, Ribera Salada and Vall d'en Bas ATs to the Integrate software. At the same time, work has been carried out with those responsible for the EFI

marteloscopes to review and improve aspects of the software, the most relevant of which is the possibility of being able to work by sectors. The translation into Spanish has also been revised and a first version of the text in Catalan has been prepared, pending final revision and incorporation into the software.



b) <u>Substitution of the creation of a new Transfer Classroom (marteloscope) in a holm oak (*Quercus ilex*) stand, as foreseen in the proposal, for a new agreement with the owners of the existing TC in the Poblet Natural Site of National Interest (PNIN)</u>.

The LIFE BIORGEST project proposal included the creation of a new marteloscope in a holm oak or mixed forest. After conducting the preparatory work and making an overall assessment as to whether creating the new marteloscope was worth the effort, an ideal location that would ensure fulfilment of the project's various objectives could not be found.At the same time, one of the CPF's 4 AT, the one located in Poblet, with an expired agreement, is located in a mixed Mediterranean formation of *Pinus sylvestris* with *Quercus ilex* (formation included in action C1) in the middle of a mature forest adjacent to a managed holm oak forest (TC Castellfollit, see attached map) and this was affected by a windstorm that generated a large amount of large dead wood. Furthermore, this TC is the only one in public ownership and is located in the Tarragona region, where, despite having the largest surface area of the Mediterranean formations on which the project is focused, there are no stands available for carrying out transfer actions.

For all these reasons, it was considered very suitable to be adapted to disseminate the knowledge generated in LIFE BIORGEST. Thus, it was proposed to substitute the creation of a new Transfer Classroom (marteloscope) in a holm oak (*Quercus ilex*) stand foreseen in the proposal, by the adaptation of the existing TC in the Natural Site of National Interest (PNIN) of Poblet. This modification was presented during the second visit of the external monitor and, after providing the necessary technical justification in the Midterm report, was accepted by the EC (as reflected in "Issue 33" of the CINEA letter).

In order to adapt the Castellfollit TC to the objectives set out in Action 4.1 of the Life BIORGEST project and to better integrate the biodiversity conservation criteria worked on in the project, the following adaptation work had to be carried out:

- Signing of a new agreement with the owners of the TC (deliverable): The mountain where the Castellfollit TC is located is publicly owned by the Generalitat de Catalunya and is managed by the board responsible for the Natural Site of National Interest in which it is located, the Poblet PNIN, with whom a new agreement has been signed.
- Updating of the dasometric data of the AT: updating of the information collected in 2015 for this AT, both in terms of diameters (to incorporate growth) and dead individuals after the effects of snow and wind in 2019 and 2020 and to review any errors detected.
- Extension of the TC to include the holm oak area: Inclusion of 121 new trees in the classroom (complementing the 620 already existing), painting the corresponding numbering, geo-referencing them and carrying out the dasometric measurements, wood quality and presence of dendromicrohabitats for each stand.
- Updating of the reference data sheet for the INTEGRATE software.

Photographs 66-70. Images of the Castellfollit AT, in the Poblet NIP, showing the enlargement works (top), the presence of holm oak (bottom left), the effects of the storm with the generation of dead wood (bottom centre) and the presence of other elements of interest for the objective of LIFE BIORGEST (bottom right).

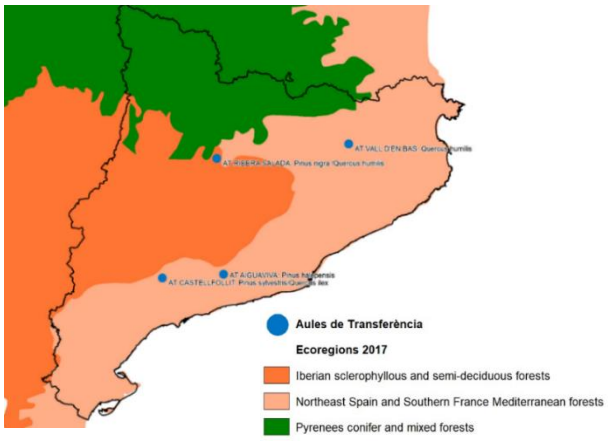
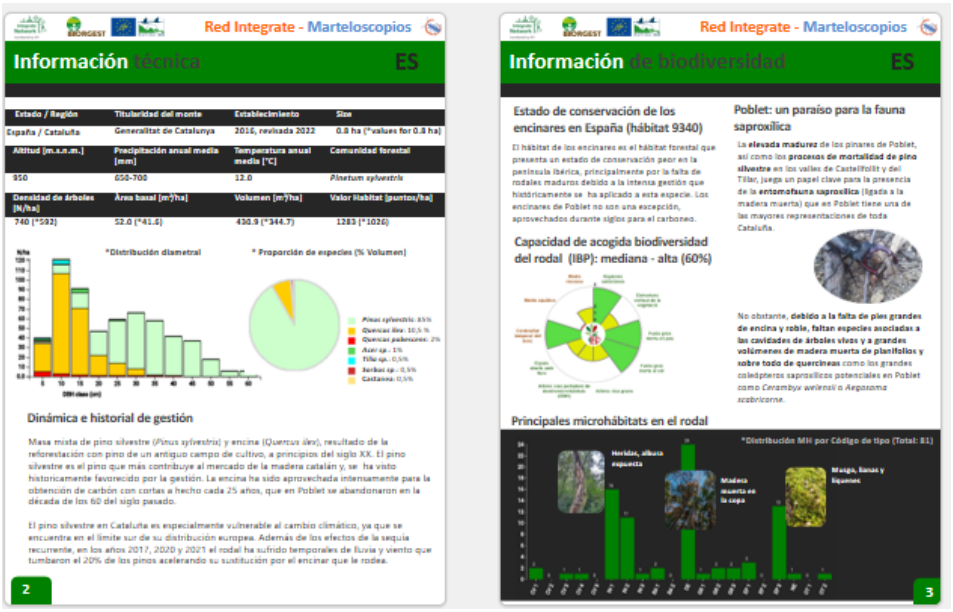


Figure 3. Location of the CPF's 4 TCs. It can be seen that the Castellfollit TC, situated in a mixed holm oak/Scots pine forest in the Poblet PNIN, is located in an ecoregion comprised of Mediterranean forest.

c) Information sheets to be used in the ATs

Within the framework of this action, different information sheets have been prepared to be used in the transfer activities carried out in the ATs -marteloscopes-, with the following structure (see deliverable):

1. Marteloscope folder sheet: in collaboration with the Integrate Network and maintaining its format, a sheet has been prepared with general information on the classroom (location, formation, management history and disturbances), dasometric information and biodiversity information.



2. PBI use plan in an AT
3. Material for posters and thematic sheets: Depending on the target audience and the training to be carried out, basic documentation has been prepared to generate posters, sheets and handouts on the following topics:
   i. Forest management plan: stand development, objectives, and priorities.
   ii. Reference silvicultural models at stand level: choice of model
   iii. Integrative silviculture: segregation/integration strategies, integration of biodiversity conservation criteria in management:
   iv. Identification of dendromicrohabitats (DMH).

v. Importance of dead wood
vi. Potential Biodiversity Index
vii. Grading of standing timber by technological quality

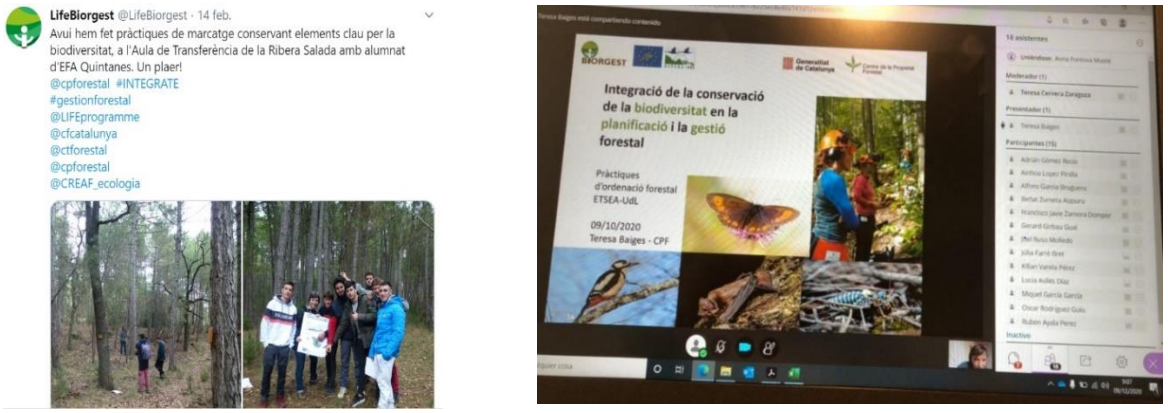
In addition, in the framework of Life Biorgest action E7.5 (see action E7.5) other material has been translated for the dissemination of the use of PBI and biodiversity enhancement measures, which can also be useful for TC activities:

- Microhabitat identification field guide (translation into Catalan).
- PBI folder/pamphlet: in collaboration with the CNPF and maintaining its format, the fact sheet on the 10 PBI factors has been adapted and translated into English, Spanish and Catalan.
- Document 'Species diversity in the forest: Why and how to integrate it into management'. Translation and adaptation into Catalan.
- Ten key factors for species diversity in forests. Understanding the PBI. Translation into English and Spanish.

d) Training sessions in the TCs (1/classroom/year)

Five workshops have been carried out (4 workshops in the TC and one online workshop during the COVID confinement). Four of them have been with students and one with active forestry workers. The 2022 and 2023 workshops have already been carried out with the new software, in the adapted TC of Castellfollit and with the files elaborated in the project.

- **12/02/2020:** Training session held in the Ribera Salada TC with students from the Mas Quintanas Forestry and Agriculture School.
- **09/10/2020**: Online training session with students from the Bachelor's Degree in Forestry Engineering at the University of Lleida (ETSEAL-UdL) – (practical training to identify and mark key elements).
- **15/12/2022**: students from the Bachelor's Degree in Forestry Engineering at the University of Lleida (ETSEAL-UdL). TC Ribera Salada.
- **16/01/2023:** Students of the higher degree of forestry technician from IES Mollerussa. TC Castellfollit (Poblet).
- **30/03/2023:** Active forestry workers from the Association of Forestry Work Companies ARESCAT. TC Ribera Salada.



Photographs 71-72. Image of a tweet about the 1st session (2019) organised in one of the CPF's TCs (left) and an image of the virtual training session held in 2020 (right).

<u>Sub-action E4.2.</u> Transfer workshops

The 4 transfer days initially planned were held, although due to Covid two of them had to be held online. These are:

- 30/09/2019, at the Can Calopa stand (C4): Workshop on preparing for natural dynamics in an Aleppo pine stand (organised by: CREAF)
- 18/09/2020, Can Buscastells stand (C3): Close-to-nature forest management in an oak forest + PBI (organised by: CTFC – CPF). Online workshop. See link: https://lifebiorgest.eu/exito-de-participacion-en-la-segunda-jornada-de-transferencia-del-life-biorgest.
- 16/04/2021, Els Saiols stand (C5.1): PBI diagnosis, integration of conservation measures into management and skidding channels stand (organised by: CPF). Online workshop. See link: https://lifebiorgest.eu/disponible-el-video-de-la-jornada-tecnica-que-muestra-la-aplicacion-del-ibp/
- 22/04/2022, in the C1 El Bruix stand: Firewood production integrating biodiversity conservation criteria in an holm oak forest and its value chain (organised by: CFC).

Photograph 73. Day held on 30/09/2019

Photographs 74-75. Day held on 22/04/2022

A folder with the program and list of participants is included as Annex 1 of this Final Report. Section 6.2 shows the total number of people who participated in these 4 days.

In addition to these transfer workshops, 4 additional workshops have been held due to the interest shown and the express request of some organisations and training centres. These are: a workshop in the Collserola stand for forestry degree students (09/04/2021), a workshop in a hall in Moià (21/07/2023), a workshop on biodiversity improvement measures and on the pilot

test of Goulottes (special system for extracting wood) in the NP Zona Volcànica de la Garrotxa, and a workshop for members of the CFC Board in the Can Buscastell stand (26/05/2021).

Sub-action E4.3. Specialisation courses on the application of forestry techniques

Both 3 courses (2 in Catalonia and 1 in Occitania) have been carried out, as planned in the GA:

- 1st specialization course: held in Catalonia on October 6, 7, 14 and 15, 2021, organized by the CTFC, the CPF and the CFC, and titled 'Naturalistic management and management of mixed forests for adaptation to change climate'. As informed to the EC, this course was organized jointly with the LIFE 5 CCA/ES000060 MIXFORCHANGE project. During the course, two online sessions were held, with several presentations by the Life Biorgest technical team and external experts and with a discussion table at the end; and two practical sessions in the field (one on the Garrotxa TC and another in demonstration stands of the Montnegre-Corredor).
- 2nd specialization course, held in Catalonia and Occitania:
    - Course held in Catalonia on June 27 and 28, 2023, organized by the CFC, CTFC, CPF and CREAF, and titled 'The integration of biodiversity conservation in forest planning and management'. The course consisted of an online theoretical session and a practical field session in which a practical example of the application of measures for the conservation and improvement of biodiversity in forest management was seen, in the Can Buscastell demonstration stand.
    - Course held in Occitania on September 21, 2022, organized by the CNPF and titled 'Prendre en compte la biodiversité dans la management de sa forêt: l'IBP au service des gestionnaires forestiers'. The course consisted of a practical session to learn how to use the PBI tool and discuss management recommendations to increase forest biodiversity hosting capacity.

The program and list of participants is attached in folder Annex 1. All presentations (ppt presentations and videos) of the online sessions are on the project website:

First course: https://lifebiorgest.eu/presentaciones-curso-de-especializacion-en-gestion-naturalistica-y-gestion-de-bosques-mixtos-para-la-adaptacion-al-cambio-climatico/

Second course: https://lifebiorgest.eu/presentaciones-curso-de-especializacion-en-gestion-naturalistica-y-gestion-de-bosques-mixtos-para-la-adaptacion-al-cambio-climatico-2/

Section 6.2 indicates the total number of people who participated in these 3 courses.

Sub-action E4.4. Final project seminar

The final seminar of the project was organized by the CFC and took place in Barcelona on September 21, 2023. In the morning, several presentations were given structured according to the following themes: 'private property, a key element for improvement and conservation of the forest', 'the evaluation of biodiversity and impact of forest management' and 'how to include biodiversity conservation in forest planning and management'. All project partners were responsible for at least one presentation. In the afternoon, 2 round tables were held: one titled 'Incentive and compensation for forest ownership to promote the implementation of biodiversity conservation measures' and the other 'Conservation of forest biodiversity in the context of climate change'. Experts from the Administration, research centres and representatives of forest owners associations participated in them, making very interesting contributions which helped generate debate and reflect on the challenges of forest management in the Mediterranean context. The General Director of Forest Ecosystems and Environmental Management, and the

General Director of Environmental Policies and Natural Environment of the Generalitat of Catalonia also participated.
The language used was Catalan and French, with simultaneous translation contracted to an external company.

The program and list of participants (75 people in total) are attached in folder Annex 1. All presentations (ppt presentations and videos) are found on the project website: https://lifebiorgest.eu/seminari-final-del-projecte-life-biorgest-la-millora-de-la-biodiversitat-mitjancant-la-gestio-forestal-i-el-paper-de-la-propietat-forestal/

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Renewal of agreement for the existing TC-Poblet	31/12/2019	26/06/2021*
(D) Biodiversity module of the TC software adapted to the approach developed in the project + information sheets	31/12/2019	31/12/2021
(M) First training session in the TCs	30/06/2020	12/02/2020
(M) First specialization course completed	30/04/2021	15/10/2021
(M) Final Seminar accomplished	30/06/2023	21/09/2023

As already explained in the Midterm report and subsequently accepted by CINEA, the two deliverables that were initially planned (1. Creation of a new TC and informative sheets, and 2. Biodiversity module of the TC software) were replaced by the deliverables indicated in the previous box.

In June 2021, the agreement was signed between the PNIN of Poblet and the CPF for the maintenance, updating and improvement of the Castellfollit Transfer Classroom (in Poblet). Additionally, a document was completed in December 2021 outlining actions taken in relation to the suitability of this TC to be used in disseminating project results, and particularly, in disseminating the application of an integrative forestry, that takes into account criteria for the conservation and restoration of biodiversity. This document, with its agreement attached as annex, constitutes the deliverable ‘Renewal of the existing agreement TC Poblet'.

Regarding the biodiversity module of the TC software adapted to the approach developed in the project + informative sheets, a document has been prepared (which constitutes the deliverable) that contains the following information: brief description of the network of marteloscopes in Catalonia and the Integrate Network; comparison between the Demorgest software, until now used in Catalonia, and the Integrate software; and steps taken for the adoption and modification of the Integrate software. In addition, all the information sheets and documents for the ATs are included.

Both two deliverables are posted in the BUTLER application.

Actual deliverables compared to expected deliverables and calendar / Changes / Main problems or setbacks encountered:

In this action, all the activities and products planned according to the GA have been carried out. The only change has been in the calendar of some activities due to the situation caused by Covid19 during 2020 and part of 2021. In the case of subaction E4.1, Covid prevented field training and international coordination meetings during this time and other project actions were prioritized. As for the first course, this was postponed until autumn 2021 since it was considered essential to be able to carry out in-person internships. Regarding the transfer days and in the AT, some of them were carried out electronically.

Prospects for continuing the action following completion of the project:

It is planned to continue using the Poblet AT, as well as the software designed for the AT. Furthermore, it is planned to carry out a qualitative improvement of the TC and to continue disseminating the developed material in future training sessions (See After- Life Plan).

Action E5. Communication and media dissemination

Foreseen start date: 04/2019 Foreseen end date: 09/2023
Actual start date: 02/2019 Actual end date: 09/2023

Activities undertaken and outputs achieved:

The first activity undertaken was to contact various press offices and choose one that could carry out the strategic media-related communication and project dissemination tasks. In January 2019, the quote submitted by the company '*Solá&Carós comunicació'* was selected, and the company started identifying the most strategic media outlets through which to publicise the project.

Subsequently, the Communication Plan was developed (action E1); '*Solá&Carós comunicació'* took part in this process by offering advice in certain areas. This Communication Plan included a timetable for the various press releases and conferences, which took place according to plan, although not on the exact dates.

The press releases (PRs) published until 30/09/2023 and the main topic addressed are as follows:

- 1st PR: Presentation of the project (February 2019) (done in Catalan and French).
- 2nd PR: First meeting of the Expert Advisory Committee, held on 29 May 2019 in Sant Celoni (Catalonia) (done in Spanish and Catalan).
- 3rd PR: Execution of the forestry work in the demonstrative stands owned by the Torroella de Montgrí Town Council, spanning 35 hectares of Aleppo pine forest.
- 4th PR: Completion of the forestry work and implementation of the biodiversity enhancement measures in the project's various demonstrative stands. Work on this press release began in 2020, although it was not released until 26/01/2021.
- 5th PR: Installation of nest boxes for bats and traps for Scolytidae (July 2021).
- 6th PR: Fauna and flora sampling to evaluate the improvement in biodiversity after two and a half years of forestry work (October 2022).
- 7th PR: Proposals from the Expert Advisory Committee to promote the improvement of biodiversity in forest management, of which the creation of a voluntary climate credit market for Catalonia stands out (May 2023).
- 8th PR: Celebration of World Biodiversity Day and commitment of Life Biorgest to the conservation and improvement of the biodiversity of Mediterranean forests (May 2023).
- 9th PR: Presentation of the Potential Biodiversity Index, a new tool to evaluate the capacity to host biodiversity of Catalonia's forests (June 2023).
- 10th PR: Results of the socioeconomic evaluation of the project and achievement of the objective of reinforcing property as a tool for the conservation and improvement of biodiversity (September 2023).

Even after the completion of the project (09/2023), another press release was written:

- 11th PR: Completion of the project and achievements, consensus and tools in forest management based on improving biodiversity (October 2023).

These press releases, which are attached to the deliverable "press archive" (posted on BUTLER), have been written by the press office contracted by the CFC. The technical information has been provided by the CFC, while the others partners have contributed by revising the releases prior to publication. Furthermore, the staff members of both the CFC and all other partners have addressed the media when required.

To mark the first meeting of the Committee of Experts on the Integration of Biodiversity Conservation into Forest Management (29/05/2019), a press conference was organised and attended by representatives from 2 local media outlets: *Radio Sant Celoni* and the newspaper *El 9Nou* (written press). On the occasion of the final seminar of the project, which took place in Barcelona on 21/09/2023, another press call was also held in which the media interviewed the General Director of Ecosystems and Environmental Management (Generalitat de Catalunya), the general secretary of the CFC and the forest engineer of the CTFC.

Photograph 76. Interview with Anna Sanitjas - General Director of Ecosystems and Environmental Management (Generalitat de Catalunya)

Photograph 77. Interview with Joan Rovira - General Secretary of the CFC

Photograph 78. Interview with Mario Beltrán - CTFC Forest Engineer

Below is a summary of the number of times the project has been mentioned, as a result of both the press releases and conferences, as well as due to direct demands from media outlets interested in the project.

Table 8. Number of media appearances per year that explain the main objectives and actions undertaken as part of the Life Biorgest Project.

Year	Online and/or written press and web platform	Radio / Podcast	Television
2019	8	2	1
2020	8	2	2
2021	11	2	-
2022	6	1	-
2023	6	-	2

The various news stories that have been published, ordered by date, are also available in the "Press" section on the project webpage.

The communication and media dissemination tasks have also been performed via the project's Twitter account (@LifeBiorgest), which currently has 641 followers (including other Life projects). Until 31/12/2023, 270 tweets in different languages about the project's developments have been posted. Both the CFC and the CREAF, CTFC and CPF have contributed by proposing tweets.

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) First press conference	06/2019	05/2019
(D) Press archive (clipping)	09/2023	09/2023

The 'Press archive' deliverable includes a list of appearances in the different media and all press releases sent.

Actual results compared to expected results and calendar / Changes:

Despite the fact that the delay in the conservation actions caused as a result of the health crisis (COVID-19) slowed down the publication of the press releases, the activities corresponding to this action have been carried out as foreseen in the Grant Agreement. Two press releases a year have been published and two press conferences have been organised, all of which have been covered by several newspapers and radio and television stations.

Prospects for continuing the action following completion of the project:

This action concludes together with the project. In any case, the information published on the website and the Twitter account will be available, at least, until 5 years after the end of the project. Furthermore, news of post-Life actions will be reported by the partner responsible for carrying them out.

Action E6. Preparation of technical articles and presentation of the project at technical conferences and congresses

Foreseen start date: 10/2019 Foreseen end date: 09/2023
Actual start date: 01/2019 Actual end date: 09/2023

Activities undertaken and outputs achieved:

Technical articles and participation in conferences, seminars and congresses have been the means used to present the project and its results to a specialised public. Throughout the years 2019-2023 a total of 21 technical-scientific articles related to the project have been published, and participation in 16 conferences/seminars and 2 classes of the Degree in Forestry Engineering. Below a table with general information on each published article and a table with the conferences/seminars in which a communication has been made are shown.

Technical articles:

Table 9. Published articles related to the project.

Title of article	Journal in which it was published	Field of the journal	Date of publication
The Life BIORGEST Project as a consensus instrument for enhancing forest biodiversity	Catalunya Forestal No. 141	Catalan forestry sector	September 2019
Forest maturity and biodiversity	Catalunya Forestal No. 141	Catalan forestry sector	September 2019
Development of the Potential Biodiversity Index (PBI): A thermometer for measuring the capacity to host biodiversity of (managed) forests in Catalonia	Silvicultura No. 80	Catalan forestry sector	Autumn 2019
PBI diagnosis and the implementation of biodiversity conservation measures in a productive cork oak stand	Silvicultura No. 81	Catalan forestry sector	Spring 2020
Conference on the extraction of timber products through canals and the integration of biodiversity conservation measures.	Silvicultura No. 82	Catalan forestry sector	Autumn 2020
Forestry criteria and models for integrating biodiversity into forest management: The Life BIORGEST Project	XXXVII Jornades Tècniques Silvícoles Emili Garolera	Catalan forestry sector	Autumn 2020
What's new with regards to the Potential Biodiversity Index?	Forêt-entreprise No. 255	French forestry sector	Nov-Desember 2020
Logging of wood products through logging chutes with integration of biodiversity in forest management	Silvicultura No. 83	Catalan forestry sector	Spring 2021
LIFE Ecological Connectivity Platform meeting summary report	LIFE Ecological Connectivity Platform meeting summary report	Europe	March 2021
Logging through logging chutes in the Garrotxa region in the framework of Life BIORGEST	XXXVIII Jornades Tècniques Silvícoles Emili Garolera	Catalan forestry sector	Spring 2021
Biorgest, to improve forest biodiversity.	Forêts d'Occitanie Nº15	French forestry sector	September 2021
Version 3 of the index of potential biodiversity is published, which completes the elaboration of this index of	Silvicultura No. 85	Catalan forestry sector	Spring 2022

rapid measurement of the potential biodiversity of a forest.			
Innovative projects: BIORGEST	Silvicultura No. 86	Catalan forestry sector	June 2022
Multifunctional management in laricio pine forests (Solsona)	Foresta No. 83	Spanish forestry sector	June 2022
Production of firewood integrating biodiversity conservation criteria in an oak forest and its value chain	XXXIX Jornades Tècniques Silvícoles Emili Garolera	Catalan forestry sector	June 2022
The relationship between bioeconomy and biodiversity through the use of logging chutes and the implementation of models for integrating biodiversity in forest management.	Actas del 8º Congreso Forestal Español	Spanish forestry sector	June 2022
The Potential Biodiversity Index (PBI) as a tool to support forest management: fundamentals and applications in Catalonia.	Actas del 8º Congreso Forestal Español	Spanish forestry sector	June 2022
L'Indice de Biodiversité Potentielle (IBP): la nouvelle version v3.0	Forêts d'Occitanie Nº18	French forestry sector	September 2022
A European overview of forest management experiments monitoring multi-taxa biodiversity.	Journal of Applied Ecology	European forestry sector	November 2022
A synthesis of multi-taxa management experiments to guide forest biodiversity conservation in Europe.	Global Ecology and Conservation, revista científica internacional en las disciplinas de ecología y biología de la conservación.	European forestry sector	June 2023
Enhancing biodiversity is compatible with sustainable and economically profitable forest management	Catalunya Forestal No. 158	Catalan forestry sector	November 2023

The last article published was written just before the end of the project (in September 2023) and includes a summary of the main results and conclusions of the actions implemented throughout these 5 years. Therefore, although it was published in November 2023, it is included in the Final report.

All partners participated in the writing of these articles.

All these publications are available on the project website.

Presentation of the project at conferences and congresses:

Table 10 lists all the national and international conferences, seminars, and congresses in which the project partners have presented the Life Biorgest project and its results. Among them, we highlight the following:

- XV National Congress of the AEET 2021: congress held at the Palacio de Congresos de Plasencia (Cáceres) from 18 to 21 October 2021. In order to participate in the Congress, it was necessary to submit an abstract which was approved by the Scientific Committee for presentation in oral format. Thus, Jordi Vayreda (CREAF) presented the paper entitled

'Life Biorgest: effect of different types of forest management on the biodiversity of Mediterranean habitats' in the scientific session SG.02: "Biodiversity" on the afternoon of 21 October.

- Spanish Forestry Congress: This national congress was to be held in June 2021 but due to the pandemic it was be held in June 2022, at the Palacio de Congresos de Lleida (Catalonia). During the phase of reception of proposals by the Congress Organisation, a summary was presented in order to present part of the results of the Life Biorgest project, and this was approved on 05/11/2020.

  The participation of Life Biorgest in the Congress took place in 3 different formats: On the one hand, in the framework of the Thematic Table 5 'Habitat conservation and promotion of biodiversity', the internationally validated version of the PBI was presented through the oral communication entitled "The Potential Biodiversity Index (PBI) as a tool to support forest management: basics and application in Catalonia" by Teresa Baiges (CPF). On the other hand, a technical visit to Solsonès was organised to discuss multifunctional management in laricio pine forests and a demonstration stand of the project was shown. The coordinators of the technical visit were Teresa Cervera (CPF) and Lluís Coll (University of Lleida). Finally, a poster was also presented on the experience of logging chutes and the implementation of biodiversity integration models in forest management carried out in the framework of the project.

  Both the video of the oral communication and the poster are shown in the links provided in the same text.

- XV World Forestry Congress: It was planned to be held in South Korea in May 2021 but due to the pandemic it was postponed to early May 2022. After submitting an abstract to participate in the Congress through a poster presentation, the poster was approved in November 2021. The title of the poster on display (mainly elaborated by the CNPF) is: '*Vers un outil commun à l'échelle européenne et du bassin méditerranéen pour prendre en compte la biodiversité dans la gestion forestière : l'Indice de Biodiversité Potentielle (IBP)'*. The congress provided an opportunity to present the Potential Biodiversity Index (PBI) to more than 15,000 people from more than 160 countries interested in forests and forestry.

Abstracts for participation in the 3 congresses have been posted on the BUTLER application.

Table 10. Events/conferences at which the Life Biorgest Project was presented.

Event/Conference/Congress	Date and place of event	Title of paper	Partner that presented the paper
Life RedBosques Project seminar "Management of Mediterranean forests in protected areas"	20-22/05/2019, Pinares de Rodeno (Teruel)	Innovative forest management strategies for enhancing biodiversity in Mediterranean forests	CREAF
Circle of Natural Park Volunteers	15/06/2019 Montnegre i el Corredor Natural Park	Introduction to the LIFE Biorgest Project	CREAF
1st Energy Transition and Territory Workshop: Forests	07/10/2019, Barcelona	The inclusion of conservation criteria in the management of forest areas	XCN

4th Meeting of Scholars from the Serralada Litoral Central and 8th from Montnegre i el Corredor	20/11/2019 Montnegre i el Corredor Natural Park	Demonstrative stands for enhancing biodiversity in Mediterranean forests	
Presentation of the project to the technical team from the DTES and DARP	04/12/2019 and 17/09/2020	Presentation of the Life Biorgest Project	CFC/CTFC and CPF
Subject Forest Management at the University of Lleida	Online, 23/11/2020	Presentation of the Life Biorgest Project	DTES of the Government of Catalonia, project co-financier
Net4Forest	Online 18,25/02/2021 05,12,18/03/2021	Conservation and Biodiversity in Catalonia. BIORGEST fieldwork	CTFC, CPF, CFC
XV Congreso Nacional de la AEET	18-22/10/2021 Plasencia, Cáceres	Life BIORGEST: Effect of different management types on meditarranean habitats biodiversity.	CREAF
IX Fòrum de recerca del Baix Ter	20/11/2021 La Tallada d'Empordà	Forest management for biodiversity improvement and climate change adaption	CTFC
Final European Conference LIFE GOPROFOR	Online 16-18/02/2022	Life Biorgest: Forest management strategies to enhance biodiversity in Mediterranean forests	CFC
World Forestry Congress	Poster presentation 2-6/05/2022	'Vers un outil commun à l'échelle européenne et du bassin méditerranéen pour prendre en compte la biodiversité dans la gestion forestière : l'Indice de Biodiversité Potentielle (IBP)'	CNPF
Conference: Forests and climate change adaption in Catalunya	Online 10-11/05/2022	Climate-intelligent silviculture, forest management for mitigation and adaption of catalan forests to climate change.	CPF
8º Congreso Forestal Español	29/06/2022 Lleida	The Potential Biodiversity Index (PBI) as a tool to support forest management: fundamentals and applications in Catalonia.	CPF
X Trobada d'Estudiosos de Sant Llorenç del Munt i l'Obac	22/11/2022 Sant Vicenç de Castellet	Life BIORGEST: Effect of different management types on meditarranean habitats biodiversity.	CFC
Emys foundation Conference "Sustainable management and biodiversity enhancement in forest properties"	Online 20/12/2022	How wood harvesting can favour biodiversity	XCN, CFC
Students visit Var y DIAM (Francia)	28/02/2023 Santa Coloma de Farners	Innovative forest management strategies to enhance	CFC

		biodiversity in Mediterranean forests. Incentives & Management Tools	

All of the documentation related to these presentations is posted in BUTLER application, together with the deliverable "3 summaries for congresses and seminars"

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) First article published	06/2020	09/2019
(D) 2 articles in international journals on forest and conservation biology fields	09/2023	06/2023
(D) 3 summaries for national and international congresses and seminars	09/2023	09/2023
(D) 4 technical articles in Spanish and French national or regional journals	09/2023	09/2023

All Deliverables have been posted in the BUTLER application.

Actual results compared to expected results and calendar / Changes:

The action has run smoothly, reaching the milestone (first article published) before the planned date, and with a very positive result of the dissemination of the project in the fields of science and technology.

In terms of articles, a total of 21 articles related to the project have been published, far exceeding the initial number planned (6). However, of all these articles, only one has been published in a scientific journal (the initial target was two). This is because the intention was to prepare a final article that included the results of direct biodiversity, but these were not obtained until the end of the project. Therefore, taking into account that the elaboration of a scientific article requires a great deal of dedication, it was considered more appropriate to work on the article during the After-Life. Work on the article is currently underway.

In terms of communications, the initial number of communications (5) has also been exceeded, as 16 conferences/seminars have been attended.

Prospects for continuing the action following completion of the project:

In order to continue presenting the final results of the project, as well as any other new information arising from now on, it is planned to continue with the publication of articles in technical and scientific journals, and with the participation in seminars and/or technical-scientific congresses. Specifically, as described in the After-Life Plan, it is planned to write 3 articles, one of which to be published in a scientific journal, and to participate in at least two seminars or working groups, either at regional, national or European level. This is explained in more detail in the After-Life Plan.

Action E7. Technical document edition for transference

Foreseen start date: 10/2021 Foreseen end date: 09/2023
Actual start date: 10/2021 Actual end date: 09/2023

Activities undertaken and outputs achieved:

Sub-Actions E7.1 and E7.2. Simple and complete guide to the assessment of maturity and biodiversity in Mediterranean forest stands.

Principal responsible: CREAF. The main aim of these two guides was to establish a common protocol for diagnosing the maturity and potential biodiversity hosting capacity at the stand level, using direct and indirect indicators for Mediterranean forest habitats. The guides define the indicators used, the rationale, the thresholds for assessing them and the common methodology and field sheet for carrying out the diagnosis.

The main differences between the two guides are:

- The Simple Guide is aimed at forest owners and foresters and contains only the sampling protocols needed to assess the maturity index and the potential biodiversity index at stand scale, using proxy indicators.
- The Complete Guide is aimed at forestry professionals, technicians from private entities and technicians from the public administration. Unlike the simple guide, it also includes sampling protocols to assess direct biodiversity for different taxonomic groups: birds, bats, mosses, saproxylic beetles, fungi and vascular flora.

The simple Guide has been translated and typeset in 3 languages (Spanish, English and Catalan) and the complete Guide in 4 languages (Spanish, French, English and Catalan). The translation into French and English was outsourced, while the translation from Spanish into Catalan was carried out by CREAF's own staff. Both guides are available in digital format in pdf and are published on the project website.

Sub-actions E7.3 and E7.4. 'Recommendations guide and technical measures for the improvement of biodiversity in Mediterranean forests. Integration in forest planning and management', and 'Manual of successful cases in biodiversity conservation in Mediterranean forests'.

Main responsible: CPF. In the project proposal, it was planned to edit, layout, translate and print these two documents separately. But when starting to draft them, all partners agreed that it would be more appropriate and useful to put them together in a single publication. After consultation through LIFE IT HELPDESK, and confirming that the new product would respect the content and length intended for each of the two original documents, and would not exclude any type of target audience, it was decided to issue a single publication with the title 'Guide of recommendations and technical measures for the enhancement of biodiversity in Mediterranean forests. Integration in forest planning and management -Lessons learned-'. This guide condenses the result of the work developed in the Life Biorgest project and is conceived as a useful tool to facilitate the integration of biodiversity conservation and enhancement in forest planning and management, with relevant information for forestry professionals and technical staff of public and private entities, as well as for forest owners and foresters.

At the moment, the guide is only available in Spanish and in digital format (it can be found on the project's website). According to the GA, it was planned to translate it into English, French and Catalan, and also to publish it in paper format, but this has been postponed until 2024 (as explained in the After-Life Plan). In the section 'Actual results compared to expected results and calendar / Changes / Main problems encountered' the reasons are explained.

<u>Sub-Action E7.5.</u> PBI related sheets

Main responsible party: CNPF. Comprises the following material, necessary for the implementation of the PBIC 3.0, by forest owners, managers, and technicians:

a) <u>Protocol and data collection sheets.</u>

The practical documents for carrying out PBI inventories are the result of the work of revising the definition of PBI carried out in actions A3, C5 and D1.2. They are presented in 2 forms, adapted to the context of use:

- documents adapted for use in Catalonia, written by the CPF in Catalan.
- documents for general and wider use, drafted by the CNPF in French with a standardised layout, and translated into Spanish and English.

There are 3 types of PBI documents:

- PBI definition sheets: these contain the definition of each factor and the thresholds used to assign PBI scores. The definition is completed with a list of frequently asked questions and a detailed description of the 3 typologies used by the PBI: dendromicrohabitats, aquatic environments and rocky environments.

  The version for Catalonia only includes the 3 typologies, as the factors are described in the data collection sheets and in the inventory protocol. The general Spanish version is intended for its use throughout Spain, allowing PBI tests to be carried out in regions other than Catalonia. The English version is intended for wider use in temperate Europe and the Mediterranean Basin, to cover countries and regions that do not have a version specifically adapted to their context.

- PBI data collection sheets: used to record PBI factors during field inventories. They are used to complement the inventory method documents and PBI definition sheets. Like the PBI definition sheets, the Spanish version is intended for its use throughout Spain, and the English version is intended for its use in temperate Europe and the Mediterranean basin.

- Data collection protocol or methods: describe the different methods that can be used depending on the objectives of the PBI inventory and the forest context in which they are to be used. The Catalan version is simplified for its use in Catalan forests, while the general version groups together all the methods tested since the creation of the PBI.

All PBI documents are in digital format and are available on the Biorgest, CPF and CNPF websites.

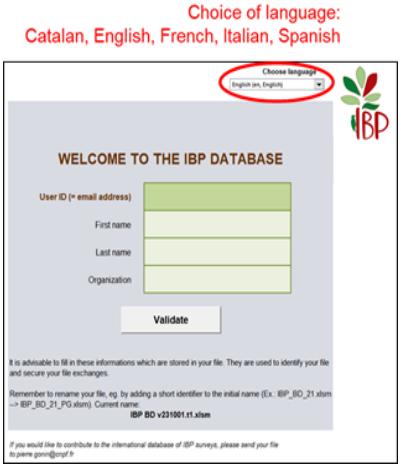
The translation of these PBI documents was done under the CNPF's 'External assistance' budget, but the layout was done by CPF and CNPF's own staff. The documents were not printed for 2 reasons: (i) future improvements can be more easily disseminated when the documents are in digital format, avoiding the need to discard obsolete paper versions (ii) large-scale distribution in paper format is more complicated and in digital format, the user can print only the number of copies he/she needs. The printing budget, which was not consumed, made it possible to subcontract the production/translation of PBI-related educational documents in Spanish and English (see point (c)). These documents were not foreseen in the initial proposal but are of utmost interest for the knowledge of PBI factors and means to integrate biodiversity in forest management.

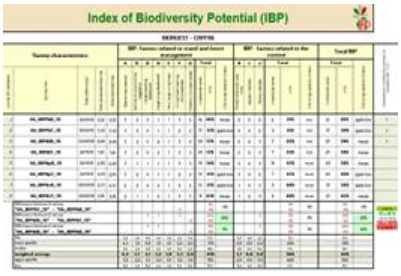
b) <u>Excel form</u>:

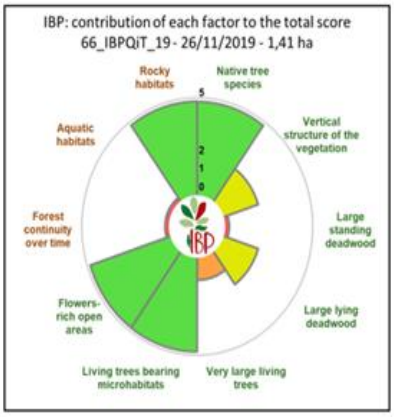
This is the file developed by the CNPF with the collaboration of other French entities and is shared with all regions using the PBI. It is used to enter the field data (allowing you to select the sampling method used), export the data to a database and produce the PBI graphs.

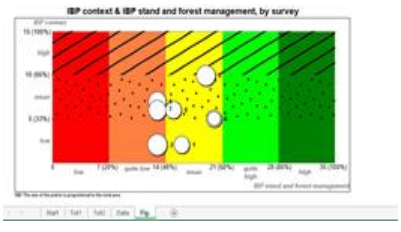
The work carried out by the CNPF in the framework of Life Biorgest consisted of adapting the French form to PBI 3.0 and modifying the content and programming to facilitate its translation into different languages. Subsequently, the CPF has translated this file into Catalan and Spanish, and the CNPF has translated it into English.

In the framework of the Life GoProFor project, translation into Italian has also been carried out.







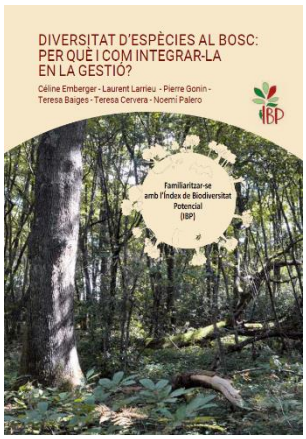


c) <u>Informative or pedagogical documents related to the PBI</u>

Within the framework of the Biorgest project, it was possible to develop additional technical documents explaining the interest in forest biodiversity based on the 10 factors of the PBI and the means of integrating biodiversity into management. These documents come from 3 documents produced in French by the CNPF for 3 different audiences, with more or less complete information levels.

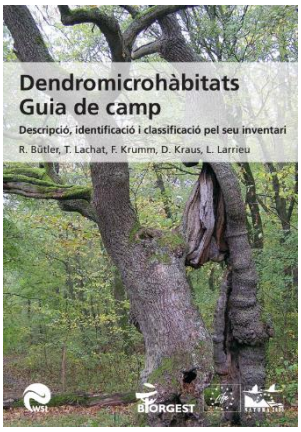
- **Leaflet "Our forests are full of life"** (4 pages). This document is intended for owners and the general public. Based on the 2019 French version and with the Life Biorgest budget, 2 versions were produced: one produced by the CPF in Catalan and Spanish for Spain, and another by the CNPF in French and English for distribution in Europe and the Mediterranean Basin. The document was published in digital format (available on the websites of Biorgest, CPF and CNPF) and in paper format in English, Spanish and Catalan (500 copies in English, 450 in Spanish and 500 in Catalan), paid for by the CNPF and the CPF. The paper copies have been distributed throughout the project, at transfer conferences, TC conferences, networking activities, ...

- **Technical document "Diversitat d'espècies al bosc: Per què i com integrar-la en la gestió"** (28 pages). This document is intended for owners. The CPF has adapted and translated the original French version of 2014 into Catalan and has made the layout based on the layout already created for the French version. This document is in digital format, available on the websites of Biorgest, CPF and CNPF.



- **Full and more extensive technical document "Ten key factors for species diversity in the forest: Understanding the PBI**" (62 pages). This document is intended for researchers and practitioners. It is an adaptation of the 2016 French version for distribution in Europe and the Mediterranean basin. In the framework of Life Biorgest and paid for by the CNPF, it has been translated into Spanish and English, and the layout has been done in both languages. This document is in digital format and is available on the Biorgest, CPF and CNPF websites.

- **Pocket guide to dendro-microhabitats** (60 pages). The above PBI documents are complemented by a field guide that describes 47 different tree-related microhabitats, indicates the recommended minimum inventory thresholds for each dendro-microhabitat and gives information on their frequency of occurrence and rate of replacement in the population. This guide was published in Switzerland, promoted by L. Larrieu, and now, with funding from Life Biorgest, the CPF has translated it into Catalan (through its own staff). The publication includes the Life Biorgest and EC logo on the cover, and the EU contribution sentence on the credits page. The guide is available in digital format on the websites of Biorgest, CPF, CNPF and WSL.



<u>Subaction E7.6.</u> Guide of recommendations for signing agreements with owners of forest properties for actions to improve biodiversity.

Main responsible: XCN. This guide brings forest property and environmental entities closer to the different types of existing contractual mechanisms to carry out actions to integrate biodiversity conservation in forest management on public and private properties, making it compatible with existing planning instruments. This guide presents most used mechanisms in private properties, such as custody contracts, and the most used ones in public properties, in this case administrative agreements. To facilitate the choice of the type of contract, a decision tree has been designed for decision making. The main contractual models are accompanied by an example and a model in the annex to facilitate their practical application.

The Guide has been edited, translated, and laid out in 2 languages (Spanish and Catalan). The translation from Spanish to Catalan has been carried out by XCN's own staff, and the layout task has been outsourced. As proposed by the monitor of the external monitoring team, the 'Final considerations' section has been translated into English and has been incorporated into the guide that was already laid out.

The guide is offered in digital format in PDF and is published on the project website.

<u>Subaction E7.7.</u> Compilation guide of innovative financing and incentive tools for the integration of biodiversity conservation in forest management and application recommendations

Main responsible: XCN. The guide brings forest owners, forest managers, public administrations, and custodian entities closer to the different types of innovative financing mechanisms and incentives that already existed or have been generated in parallel to the life of the project for the integration of biodiversity conservation in sustainable forest management. The explored mechanisms include public, private and public/private financing mechanisms and provide some guidance and recommendations to be able to implement them effectively in the Spanish context. Among the public mechanisms, the following stand out: fiscal incentives, such as the real estate tax, tax channels, such as the tax on carbon dioxide emissions, FEADER measures or the aids to enhance ecosystem services in sustainable forest management of forest lands with current forest planning instruments. Among the private or public/private mechanisms, carbon markets would stand out.

The Guide has been edited, translated, and laid out in 2 languages (Spanish and Catalan). The translation from Spanish to Catalan has been carried out by XCN's own staff, and the layout task has been outsourced. As proposed by the monitor of the external monitoring team, the

'Recommendations and guidelines' section has been translated into English, and has been incorporated into the guide that was already laid out.

The guide is offered in digital format in PDF and is published on the project website.

Deliverables (D) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(D) Guide to recommendations and technical measures to improve the biodiversity of Mediterranean forests. Integration in forest planning and management	06/2023	09/2023
(D) Manual of success cases in the conservation of biodiversity of the Mediterranean forest	06/2023	09/2023
(D) PBIC v3.0 related sheets	06/2023	06/2023
(D) Simple guide to assessing maturity and biodiversity in Mediterranean forest stands	04/2023	09/2023
(D) A comprehensive guide to assessing maturity and biodiversity in Mediterranean forest stands	04/2023	09/2023
(D) Compilation guide of innovative financing and incentive tools for the integration of biodiversity conservation in forest management and application recommendations	05/2023	07/2023
(D) Guide of recommendations for signing agreements with the ownership of forest properties for actions to improve biodiversity	06/2022	11/2022

Actual results compared to expected results and calendar / Changes / Main problems encountered:

Guide corresponding to subaction E7.1: initially it was planned to publish it in 4 languages (Spanish, French, English and Catalan), but the translation into French was finally discarded because the CNPF (French partner) considered it sufficient to translate the complete Guide.

Guide corresponding to sub-actions E7.3 and E7.4: As mentioned above, the two documents foreseen in sub-actions E7.3 and E7.4 have been combined in a single publication, and, within the life of the project, it has been published in Spanish and in digital format. It is clear that the preparation of this guide has been delayed, but the reasons are as follows: on the one hand, it was considered essential to have the results of actions D2 and D3 in order to draft the document; on the other hand, once the document was drafted, it was shared with representatives of the Department of Climate Action, Food and Rural Agenda (Generalitat de Catalunya), who showed great interest in the Guide. From this point on, several meetings were held to receive contributions from the Department and from all the partners, and the points to be updated were agreed upon. In addition, it was also considered appropriate to close the document once the final seminar had been held so that the main doubts and concerns of the members of the round tables and the attendees themselves could be expressed. In short, the priority was to be able to close a Guide of high technical quality, and for this reason there has not been enough time to publish the version in Catalan, English and French (as foreseen in the Proposal). This will be done within the year 2024, as explained in the After-Life Plan.

Files related to the PBIC v3.0 (E7.5): the schedule was met and additional documents were translated and formatted, thanks to the budget saved on travel and in the organization of meetings of the PBI International Committee of Experts, due to Covid. The translation was

difficult and time-consuming, as the documents contain many very precise technical terms, the translation of which must be validated by the country's foresters, and which must be used identically in all PBI documents.

Furthermore, within the framework of the Biorgest project, it was possible to develop additional informative or pedagogical documents, which were not initially planned, but which could be financed thanks to the external assistance budget line planned for the printing of the sheets related to the PBI, which was not executed.

There have been no changes in guides E7.2, E7.6 and E7.7.

Prospects for continuing the action following completion of the project:

The dissemination of the publications created during the project will continue to be a priority, focusing especially on the Guides published in this action E7.

During After-Life, and with the aim of extending the PBI in Europe, the translation of the PBI documents will continue, initially into Greek, within the framework of the Life GoProFor Med project, and into German and Dutch, within the framework of other collaborations. Therefore, the English translation carried out within the framework of Biorgest will be very useful, since for certain languages it will be easier to translate from English than from French. Furthermore, the English version will allow a very wide dissemination of the PBI in different European countries.

Action E8. Dissemination video edition

Foreseen start date:	01/2022	Foreseen end date:	09/2023
Actual start date:	01/2022	Actual end date:	09/2023

Activities undertaken and outputs achieved:

The partners that participated most actively in this action are the CTFC and the CFC. The steps taken to edit the informational video were as follows:

Firstly, in a project operation meeting, the content of the video was discussed, and all partners agreed that the objective should be to present the current situation of the Mediterranean forest, the objectives and actions of the project, as well as the climate change challenges, and raise awareness among the general public about the importance of making biodiversity conservation and forest management compatible. In addition, it was agreed to make a video with real images of the demonstrative stands and the option of doing it through infographics was ruled out. The CTFC presented a list of companies and professionals dedicated to audiovisual production, and highlighted the case of professional Jaume Sañé due to his extensive experience in editing nature videos. Given that there are not many people with this experience and that, furthermore, they reside in the place where the project is implemented, it was agreed to choose it as the first option (as long as the cost did not exceed the available budget).

Once the approximate duration of the video and the images to show were decided, Jaume Sañé presented us the budget and told us that he could provide his own images of fauna at no additional cost. Given that these types of images always have a very high cost and given the good references we had about the work of this professional, it was decided to hire his service.

Next, with the collaboration of all partners and based on the key messages defined in the Communication Plan (action E1), work began on the video script and the text for the voice-over. In parallel, two filming sessions were carried out in several demonstration stands. Technical personnel from the CFC, CTFC, CPF and CREAF participated in the sessions.

The result was a 4' 12" video aimed at the general public, with the voice-over in Catalan and with subtitles in English, French and Spanish so that each user can choose the language they prefer. The video includes an explicit mention of the financial support of the Life program, audible and legible.

Video link: https://lifebiorgest.eu/descubre-las-singularidades-del-life-biorgest-en-este-video/

The video was launched in November 2022 and since then it has been available on the project website (within the 'Project dissemination and dissemination products' section) and on the CFC YouTube channel. In addition, it has been disseminated through the Newsletter and through social networks. To date, 1,117 views have been recorded. Although it should be taken into account that it has also been broadcasted on several days with a prominent name of participants, as is the case of the final Seminar (action E4.4)

In addition to this informative video, within the framework of this E8 action, the Integrate+ network video "For good use of our forests: the integrative strategy" was also translated into Spanish and Catalan, focused on the alignment of forest conservation. biodiversity and sustainable wood production. The translation was done in February 2021 by the CPF. This video has been used in several virtual trainings during the period of Covid19 restrictions.

Video link: https://integratenetwork.org/videos/

Deliverables (D) and milestones (M) foreseen until 30/09/2023 according to the GA:

	Foreseen date	Actual date
(M) Definition of the script	09/2022	05/2022
(D) Edited video available online	12/2022	11/2022

Actual deliverables compared to expected deliverables and calendar / Changes:

This action has been developed without any problem, and the deliverable meets the expectations set forth in the GA.

Even though, it should be taken into account that, at the end of 2021 and after consulting with EASME, it was decided to reinforce this action and replace the cloth bags (action E2) with the editing of several videos of a few seconds duration ('information capsules'), since the Covid19 restrictions offered fewer possibilities of being able to distribute the bags. In any case, the truth is that in the end these capsules could not be carried out and it was decided to allocate the budget corresponding to the information capsules to hiring a simultaneous translation service for the final Seminar (highly recommended considering the participation of Spanish and French people).

Prospects for continuing the action following completion of the project:

This action concludes together with the project. In any case, the video will continue to be posted on the project website and on the CFC YouTube channel.

Action F4. Preparation of the 'After-Life Plan' Report

Foreseen start date: 04/2023 Foreseen end date: 09/2023
Actual start date: 06/2023 Actual end date: 09/2023

Activities undertaken and outputs achieved:

At the end of the project, the 'After-Life Plan' document was prepared, which summarizes the achievements of the Life Biorgest project and details the way in which it is planned to continue, both in terms of monitoring the demonstration stands, and disseminating and communicating the results and products of the project. It describes the actions planned during the five years following its conclusion (from October 2023 to September 2028), detailing when, by whom and with what sources of financing they will be carried out. In total, 20 actions are proposed to guarantee the maintenance of the results obtained and expand the impact of the project beyond the original financing period.

The target audience for the proposed actions is the following: people or organizations that own forests, forestry managers and companies, technical professionals, scientists and researchers, public entities related to forestry and environmental administration, and also society in general.

The partner in charge of writing the After-LIFE Plan has been the CFC, with the help of the other partners who have made contributions and reviewed the final document.

The document has been published in digital format in 4 languages (English, French, Spanish and Catalan), available on the project website.

As of today, in these 5 months since the project ended, some communication and dissemination actions have already been carried out, among which the virtual seminar held on October 24 focused on the results of the Life Biorgest project stands out. In the following two links the agenda and the video of the seminar itself can be consulted:

http://www.prisma-tic.cat/agenda/gestio-forestal-millorar-la-biodiversitat-en-boscos-mediterranis

https://www.youtube.com/watch?v=wosqPcuEjys

Deliverables (D) foreseen until 09/30/2023 according to the GA:

	Foreseen date	Actual date
After-LIFE Plan	09/2023	09/2023

In addition to being posted on the web (in all 4 languages), the deliverable has been added to the BUTLER application.

Actual deliverables compared to expected deliverables and schedule / Changes:

This action has been developed without any problem, and the deliverable meets expectations. The only change that has occurred is that the GA indicated that the After-Life Plan would also be published in paper format, but in the end, it has only been published in digital format. The reasons are: On the one hand, the translation costs from Spanish to English and French (into Catalan it was done by its own staff) and the layout of the 4 languages already exceeded the budget planned for the translation, editing and printing of the document. And, on the other hand, it was considered that it was not strictly necessary to print this deliverable since its dissemination among the people and entities to whom the document is to be sent can be done perfectly through digital format.

6.2. Main deviations, problems and corrective actions implemented

The deviations and problems that have been encountered so far during the project have been explained in the information on each action. However, broadly speaking, they may be summarised as follows:

- Change in the location of several demonstrative stands and a major delay in signing the agreement with the Sant Iscle de Vallalta Town Council, owner of the CasaNova de Maspons stand. As a result of this delay, the activities were pushed back until autumn 2020 (action C3).
- Refusal of the owner of the Can Barnench stand to commence the forestry activities, although the agreement had been signed on 18/02/2019. Fortunately, in October 2020, we reached an agreement with the owner to start the work (action C3).
- Modification of the deliverables of action E4. The deliverables foreseen in the proposal were: 1. Creation of a new TC and informative sheets, and 2. Biodiversity module of the TA software. After CINEA's acceptance was confirmed, these deliverables were replaced by the following: 1. Renewal of agreement for the existing TC-Poblet; 2. Biodiversity module of the TC software adapted to the approach developed in the project + informative sheets.
- Regarding the cloth bags (action E2), at the end of 2021, and after consultation with EASME, it was decided to replace them with the edition of several videos of a few seconds ('informative capsules') since the restrictions due to Covid19 offered fewer possibilities of being able to distribute the bags. In the end, however, these videos could not be produced and the planned budget was used to hire a simultaneous translation service for the final seminar.
- Of all the technical documents for transfer (action E7), the only ones in which there was a change were the guides for sub-actions E7.4 and E7.5. On the one hand, these two guides were published jointly and, on the other hand, the document is currently only available in Spanish and in digital format. Translation into English, French and Catalan and publication in paper format has been postponed until 2024. The reasons for this are well explained in action E7. In addition, it should be noted that in the framework of Life Biorgest, additional technical documents have been developed that are of great interest to explain the IBP and the measures to integrate biodiversity in forest management. And, in fact, the project budget has been fully implemented.
- Lastly, the biggest problem encountered during the life of the project has been the COVID-19 pandemic, which has affected the progress of some actions.

The actions most affected, in varying degrees, by the **restrictions imposed as a result of the COVID-19 pandemic** have been:

- Conservation actions C1, C2 and C5.2: The forestry work was already under way in several of the stands corresponding to these actions when the state of alert was declared due to COVID-19. The work was forced to stop, and when it was resumed, there was no longer time, in the case of stands with broadleaf trees, to finish the work before the trees entered the period of active sap flow (during which cutting trees is highly inadvisable). As a result, the work could not be resumed until autumn 2020. Previously, the Gloria storm also forced work to stop for several days. In the *Quercus ilex* stand in Occitania (action C5.2), the problem was that the company contracted to undertake the forestry work was unable to start the work on time, and another company ultimately had to be chosen.
- Actions D3 and D4: The delay in completing the forestry work affected in the following manner:

- Due to the delay in the forestry work in 2 Aleppo pine stands (see action C2), the passive traps for monitoring bark beetles, could only be placed in 4 of the 6 Aleppo pine stands (action D3).
- Although bat boxes should have been installed in spring 2020, the activity has been postponed until March 2021 to avoid that they could be damaged while the last forestry works were being carried out (action D3).
- The sampling for health status monitoring, which was scheduled for the month of September 2020, was postponed until September 2022 (the reason is explained in more detail in action D4).

  Even so, the final results of the project were not greatly affected by these deviations. In fact, during the last half of the project extraordinary sampling was incorporated, such as soil mycelia sampling and bat sampling by echolocation stations in the last year of the project. Saproxylic coleoptera were also monitored much more extensively than initially planned.

- Action D1: The second meeting of the Committee of Experts on the Integration of Biodiversity Conservation into Forest Management was scheduled to take place in mid-2020 but was postponed until October 2021 because it was prioritized to be held in a face-to-face format.
- Action E4: some training sessions that were originally supposed to take place on-site had to be done online.
- In some cases, the situation caused by COVID-19 also made it difficult to regularly compile the timesheets.

6.3. Evaluation of Project Implementation

The following table shows a comparison between the results achieved against the objectives and results foreseen in the Proposal for each of the actions.

Action	Objectives and results foreseen in the Proposal	Objectives and results achieved	Assessment
A1: Meetings with owners, drafting and signing agreements	To enter into cooperation agreements with the forest owners of all demonstrative stands.	The anticipated objectives and results have been achieved, as agreements have been formalised with all demonstrative stand owners. In cases in which the same owner has more than one stand, one single agreement has been established.	Although some of the stands included in the Proposal had to be changed at the start of the project, contact with forest owner members of the CFC and members of the CPF made finding demonstrative stands easier. In addition to the agreements, the owners have signed a commitment that goes beyond completion of the project.
A2: Definition of the baseline	Objective: To define the indicators and criteria that	Objective and results achieved. The report	Due to the almost null references of threshold

biodiversity indicators	constitute the baseline biodiversity values to take into account when designing the conservation measures. Result: Proposal for indicators and thresholds grouped by criteria for diagnosing biodiversity, naturalness, human footprint and spatial integrity.	"Adaptation of forest naturalness and biodiversity indicators, criteria and thresholds to the Mediterranean context" has been completed.	values for Mediterranean forest habitats, at the beginning of the project the report was delivered without the thresholds part. The proposal of thresholds has been worked throughout the project and finally they have been included in the "A comprehensive guide to assessing maturity and biodiversity in Mediterranean forest stands". In the Deliverable of this action A2 a brief explanation of the aforementioned guide has been added.
A3: Development of a Potential Biodiversity Index: the PBI_Med-Catalonia	Objective: To create a tool for diagnosing, in approximately 20 minutes, the state of a Mediterranean forest as regards its biodiversity value and the identification of possible enhancement measures. Result: Creation of a new version of the Potential Biodiversity Index for Catalonia, v2.1	Objective and results achieved. The new version, the PBI_Cat v2.1, has been developed, as has the associated data collection protocol.	This action was completed without problems. The project website contains all relevant information about the PBI and how to apply it. This way, it may be implemented by any forest owner, forest manager or forester.
A4: Initial diagnosis of the demonstrative stands: Characterisation and mapping	Objectives: To define each of the stands and characterise them from a silvicultural and biodiversity viewpoint. Results: Cartographic database with GIS and a Silvicultural and Biodiversity Report for each stand.	Objectives and results achieved. Each stand has been expertly appraised, and the report and cartographic database have been completed.	The Silvicultural and Biodiversity Report includes all information that was necessary to design the applicable management models for actions C1-C4 and C5.2. Although action A4 involved compiling information on legal restrictions and the preliminary results of the biodiversity characterisation, performed by direct assessment (bioindicators), this information may be found in other sections, as explained in further detail in section 6.1.

A5: Design of the forest conservation measures and forestry operations, drafting of the terms and conditions and processing of administrative permits	Objective: To design the forestry operations for each demonstrative stand and undertake the formalities necessary to carry out the forestry activities from actions C1-C4 and C5.2. Results: Programme for integrating conservation measures into forest management; terms and conditions for all the stands; and administrative permits processed.	Objective and results achieved. Prior to carrying out the forestry activities, the "Programme for integrating conservation measures into forest planning and management" was drawn up; the terms and conditions were given to the forestry companies; and authorisations were obtained from all relevant public authorities.	Preparing the "Programme for integrating conservation measures into forest management" involved a substantial amount of work, but the resulting document is highly useful thanks to the wealth of information it contains. This document has served as a basis for subsequent recommendations and technical measures for enhancing biodiversity.
A6: Analysis of the innovative funding mechanisms (direct and indirect) and contract models with owners to integrate biodiversity enhancement into sustainable forest management	Objective: To explore and assess contractual and funding mechanisms that facilitate the inclusion and adoption of conservation measures in forest management. Results: A document analysing the various land stewardship models and a document compiling information on innovative funding tools and incentives for integrating biodiversity conservation into sustainable forest management.	Objective and results achieved with the drafting of the two anticipated documents.	The deliverable addresses all aspects indicated in the Proposal. Contracting the services of several professionals to analyse the various innovative funding tools and incentives proved an excellent idea. Thanks to the ample experience of these professionals, the final document is remarkably high quality. In addition, the updating of the document on financing tools and incentives, with the incorporation of forestry measures contemplated in the new CAP 2023-2027, ensures that the document does not become obsolete.
B.1. Compensation to forest owners	Create a forest reserve and implement a compensation mechanism for the property.	A contract has been signed to waive logging rights for a period of 25 years for the purpose of stewardship of a 6 ha stand. This will guarantee the objective of creating a forest reserve and to use the stand for natural evolution.	The stand chosen to create a forest reserve is of exceptional natural and ecological interest since, following a maturity assessment, it was confirmed to be the 5th highest rated stand in Spain, with a maturity score of 6.8. Given the owner's interest in logging the stand, the signing of the contract is of utmost importance to ensure the conservation of its maturity. It should also be noted that the stand is located in a

			PNIN and in Habitat of Community Interest 9340.
C1: Implementation of management models to enhance biodiversity in managed Mediterranean forests dominated by *Quercus ilex*	Objective: To establish a set of demonstrative stands dominated by *Q. ilex* in which to implement innovative forest management models to improve the habitat's conservation status, increasing the diversity of the micro-habitats and their capacity to host species. Results: Implementation of innovative models in 4 demonstrative *Q. ilex* stands and a document containing the technical description of the innovative models applied.	The objective of implementing the innovative management models in the 4 demonstrative stands (30.93 ha, altogether) has been achieved. And the technical description document for these models has been completed. From the monitoring of forestry actions carried out (both in *Q. ilex* stands and in stands of *P. halepensis* and sub-Mediterranean oak species), it has been demonstrated that forest management can conserve and improve biodiversity and accelerate and incorporate processes associated with natural dynamics.	Overall, the companies selected to perform the forestry activities have been highly satisfactory. Even so, the monitoring work carried out by the partners responsible for each stand has been vital.
C2: Implementation of management models to enhance biodiversity in managed Mediterranean forests dominated by *Pinus halepensis*	Same objective and results as foreseen in action C1, but in demonstrative *P. halepensis* stands.	The objective of implementing the innovative management models in the 4 demonstrative stands (30.11 ha, altogether) has been achieved. And the technical description document for these models has been completed.	Same assessment as in action C1.
C3: Implementation of management models to enhance biodiversity in managed Mediterranean forests dominated by *Quercus ilex*, *Q.faginea* and *Q.canariensis*	Same objective and results as foreseen in action C1, but in demonstrative Mediterranean oak stands.	The objective of implementing the innovative management models in the 4 demonstrative stands (32.81 ha, altogether) has been achieved. And the technical description document for these models has been completed.	Same assessment as in action C1.
C4: Implementation of management models to prepare for natural dynamics	To prepare 6 stands to initiate a natural dynamics phase through demonstrative forestry activities which promote maturity and restore	Objective and results achieved. The demonstrative activities have been performed in the 6 stands (eliminating exotic species, increasing	The work has been completed in the due manner and on schedule.

	certain ecological processes.	deadwood, eliminating large-tree competitors and opening small clearings) in accordance with the established timetable. Altogether: 49.97 ha. The technical description document of the implemented model has also been prepared.	
C5: Implementation of conservation actions in Natura 2000 Network stands with production-oriented management, identified with the PBI_Med-Catalonia.	Objectives: To train and advise at least 19 owners (15 in Catalonia and 4 in Occitania); to obtain information that contributes to the development of compensation instruments; and to validate the PBI_Cat v2.1, giving rise to the PBI_Cat v3.0. Results: Diagnosis of and conservation measures implemented in 15 private stands in Catalonia and 4 stands in Occitania; final validation of the PBI_Cat v3.0.	Objectives exceeded. Finally, in Catalonia, 23 private stands were selected (with a total area of 235 hectares) in which the diagnosis was made based on the application of PBI_C v2.1. and the owners have acted by applying conservation measures. Of the 23 stands, 18 are located in Natura2000 Network sites. In Occitania, action has been taken in 4 stands, as planned. The IBP diagnosis and the marking criteria to take biodiversity into account were disseminated to 27 owners/owners and 13 forestry companies. Within the framework of this action, the PBI_v3 was defined and validated.	The action had the difficulty of addressing different objectives and all of them have been more than achieved. The fact of working on a significant number of farms has contributed to extend the interest in the application of biodiversity conservation criteria to other landowners.
C6: Integration of biodiversity enhancement measures into Mediterranean forest management policies and regulations.	Objective: To provide decision-making and information tools to adapt and integrate biodiversity enhancement measures and criteria into forest regulations, policy and planning (attaining Forest Planning Instrument status) within Catalonia. Results: Regulatory memorandum, creation of a database with biodiversity indicators and technical proposal for regulations, instructions and applications to integrate biodiversity in forest management.	The objectives and expected results have been achieved. Based on the review of European, state and regional regulations with an impact on forest planning and management and biodiversity, regulatory changes have been proposed that affect the planning of forests in Catalonia at the stand scale, specifically: 1. A working group has been established within the forest administration to reach a consensus on the best measures for integrating biodiversity	All the above results, immediately appreciable, will have continuity in the coming years, and are expected to conclude with the modification of ORDER ARP/122/2017, of June 13, regulating the FPIs and with the drafting of new ORGEST models. It is important to note that the management criteria provided by the project are being integrated into the planning and management instruments of the protected natural areas of Catalonia, at the moment both in the PEIN Alta Garrotxa area

		into forest management in the approval process of the different FPIs. 2. A set of improvements to be incorporated in the ORGESTs has been specified. 3. The inclusion of biodiversity integration criteria has been proposed in the proposed modification of Order ARP/122/2017, of June 13, by which the FPIs are regulated. 4. The regulatory bases have been published for the financing of biodiversity integration measures in forest management and for the creation of forest reserves based on the technical information worked on in the project. And the first subsidies have been announced for this purpose.	and in the Cadí-Moixeró Natural Park. It is also expected that the Generalitat de Catalunya (through the CPF) will continue to call for grants to encourage the ecosystem services of sustainable forest management. These subsidies are for the promotion of silvicultural practices to produce forest biodiversity associated with target trees, and the establishment of forest reserves. In this action it is also very positive to have created the database ahead of schedule, as it has made it possible to compile the information collected from the application of the PBI in the different actions of this project, as well as in other studies and parallel projects.
D1: Establishment and functioning of the Expert Advisory Committee	Objective: To set up and run a committee of experts that provides the partners advice as to how to properly complete the scheduled actions, as well as on specific technical aspects of these actions. Results: The CEIB (made up of 8-10 experts) is due to hold 3 meetings and the CIE (made up of 10 people) is due to hold 4.	The objective of creating a committee of experts divided into two teams, the CEIB (with 19 members) and the CIE (with 23 members), has been achieved. And all the meetings foreseen in the Proposal have been held.	We believe that the creation of these committees was an excellent idea. The CEIB is made up of individuals who have contributed a great deal to the project, while the CIE has done a fantastic job validating the PBI.
D2: Silvicultural assessment of the activities	Objective: To characterise, on a silvo-dasometric level, the state of the stands before and after the operations and to apply the PBI v2.1 before the activities and the PBI v3.0 3 years after completion of the activities. Result: Monitoring and action assessment report.	Objective and results achieved. The silvo-dasometric assessment was carried out before, after and at the end of the project in all the stands, and the PBI was applied before the interventions and at the end of the project. All the results have been included in the monitoring and	The action has been adequately developed. The report presents the results and conclusions regarding dasometric variables, understory, vulnerability to fire, biodiversity carrying capacity and maturity indicators.

		evaluation report of the actions.	
D3: Assessment of the biodiversity indicators	Objective: To demonstrate whether the forestry activities performed in actions C1-C4 have impacted, and to what degree, biodiversity. Results: Final report "Effects on biodiversity indicators by habitat and management model".	Objective and results achieved. Sampling of structural variables before, after and at the end of the project, and biodiversity characterization sampling before the interventions and at the end of the project (mainly). An assessment of how actions C1-C4 affect biodiversity is made in the final report.	Although the delay in the completion of the forestry actions caused some changes, the action has been carried out properly, and at the end of the project the results have been appreciated. It should be noted that developing the "Common sampling protocol for assessing forestry activities, biodiversity indicators and ecosystem functions" was an excellent idea. It covers all samplings from actions D2, D3 and D4.
D4: Ecosystem function assessment	Objective: To assess changes in certain ecosystem services. Results: Analysis of the effects of the various management models implemented in the project on ecosystem services by habitat.	The objective and expected results have been achieved. The following indicators have been evaluated: timber and firewood supply, carbon sink capacity, soil protection against erosion, fire protection and health status.	The action has been carried out adequately. Only one deviation has occurred in the assessment of health status. Additionally, sampling of wood cores has been incorporated to assess changes in annual wood growth. All the results have been included in the Report on the evaluation of the effects on ecosystem services according to type of management and habitat.
D5: Socioeconomic assessment of the project	To assess the economic and social impact of the project in the region of Catalonia, based on the evaluation of the various economic and social indicators (quantitative and qualitative) at the beginning and end of the project.	The objective and expected results have been achieved. At the start of the project, the methodology for assessing the socioeconomic impact was designed. Throughout the project, surveys have been conducted among the various stakeholders to evaluate the impact of the project on the local economy from a qualitative point of view, as well as the degree of knowledge and awareness of the issues addressed in the project by society at large.	The result of this action has made it possible to know the impact of Life Biorgest on the municipalities where the actions have been carried out and their area of influence.
D6: Monitoring of project	To regularly revise project progress and	As foreseen, project progress has been regularly	The Life KPI webtool already contains the

progress and Key LIFE Indicators	indicate possible deviations from the scheduled work plan. This objective involves monitoring a series of quantitative performance indicators, as well as Key Life Indicators.	revised. Furthermore, the Life KPI webtool was updated, filling in each of the selected indicators.	evaluation of each of the key indicators.
D7: Economic valuation of the implementation of measures to improve biodiversity and design of ownership compensation mechanisms.	Economic valuation of the costs and benefits of the actions and the development of proposals for incentives or economic compensation to the forest owners.	As indicated in the Proposal, the implementation of measures for the improvement of biodiversity has been economically valued and compensation mechanisms for the property have been designed. Everything has been included in a final report.	Several factors contributed to the success of the action: the hiring of a professional expert in the field, the contributions of different experts, and the holding of an internal discussion day on incentives for the conservation and improvement of forest biodiversity.
E1: Design of the logo and corporate image and implementation of the Communication Plan	Objectives: To secure maximum visibility for the project, ensuring aesthetic consistency and quality across the board and planning an effective communication strategy adapted to the various target audiences. Results: Project logo and corporate image and Communication Plan	Objectives and results achieved. At the start of the project, the logo and corporate image were designed and the Communication Plan was drafted.	The objective has been achieved in a satisfactory manner, as both the logo and corporate image have been used on all of the project's promotional materials and documents. As regards the Communication Plan, the level of detail with which it was drafted has proven extremely useful, as it provides clear guidelines and a clear timetable for all required tasks.
E2: General dissemination of the project: Promotional materials, project website, layman's report, information panels and newsletters	Objective: To maximum the project's visibility among the various target audiences. Results: Publication of dissemination material (3,000 informative brochures, 3 roll-ups, 200 USB and 500 bags), creation of a website (with 50,000 visits throughout the project), production and installation of 14 information panels, publication of 9 biannual newsletters, and publication of the	Objective achieved through: the production and subsequent dissemination of 3,790 informative brochures, 3 roll-ups, 200 promotional glass bottles of the project, the creation and continuous updating of the website (with a total of 32,866 visits), the publication of biannual newsletters (9 in total that have been consulted by 3,958 people), and the installation of information panels (18 in total). The Layman's report has also been published in digital	In terms of visits to the website, the result achieved so far is quite satisfactory, although the 50,000 visits indicated in the proposal have not been reached. In any case, it is expected that this number will increase since the website will remain active for at least 5 years after the end of the project. As for the dissemination materials, these have been very well received by the target audience. The Newsletter has 815 subscribers.

	Layman's report (100 copies in paper format).	and paper format (100 units).	
E3: Networking and exchange activities with other projects and bodies	Objective: Exchange of information with external entities engaged in matters similar to those addressed in the project. Results: 60 networking contacts, the strengthening of ties with and contributions to the project from 3 external projects, 3 exchange trips and at least 1 expert from another project invited to serve as part of the Expert Committee.	The objective has been fully achieved. Fifty networking contacts have been made, we have consolidated links with 11 projects that have contributed to the development of our project and two experts linked to the Life Redbosques and Life MixForChange projects have been part of the Life Biorgest Expert Committee. In relation to exchange trips, we have made one trip to France and another to Italy.	Although we have not reached the 60 networking contacts, the other networking activities have met and even exceeded our expectations. As for the exchange trips, it was decided that two trips would be enough, and that it would be optimal to make the most of them. Therefore, several of the project partners participated in each of these trips (a total of 8 people on each trip). The result of these two trips has been very positive for Life Biorgest.
E4: Promotion of the replicability and transferability of the innovative management models	Objective: To replicate the proposed conservation measures, offering training to end-users and other propagators not involved in the project. Results: Adaptation and use of the Transfer Classrooms (marteloscopes); 4 transfer workshops, which 25 people/workshop are expected to attend; 2 specialist courses, which 20 people/course are expected to attend; and a final seminar, which 50 people are expected to attend.	The objectives and results have been more than achieved. The biodiversity module of the software has been updated and 8 informative sheets have been prepared for its use in the TCs; 5 workshops have been held in the TC, with an average participation of 16 people/classroom; 4 transfer workshops with an average participation of 42 people/day; 3 specialization courses with an average participation of 75 people/course; and the final seminar, which was attended by 75 people. In addition to these activities already planned, 4 additional workshops were held due to the interest shown and the express request of some entities and training centers.	All the project's transfer activities have been very well received. In general, all of them have achieved a higher participation than expected according to the Proposal. In addition, the case of the last specialization course held in Catalonia stands out. In this case it was decided to repeat the practical session given the large number of people registered.
E5: Communication and media dissemination	Objective: To increase the visibility and impact of the project among the public at large. Results: 2 annual press releases, 2 press conferences, TV appearances and a Twitter	The objective and expected results have been achieved. Eleven press releases have been published, 2 press calls have been made and different media interested in the project have been attended. In addition, at the	We consider the result to be satisfactory. The project has appeared in 39 digital and/or written press outlets and on 7 radio programmes and 5 regional television programmes.

	account linked to the hashtag #lifebiorgest.	beginning of the project a Twitter account was created (@LifeBiorgest) from which 270 tweets have been posted.	
E6: Preparation of technical articles and presentation of the project at technical conferences and congresses	Objectives: To present the results of the project to a specialised audience. Results: Publication of 6 technical/scientific articles and participation in at least 5 national or international conferences, seminars or congresses.	A total of 21 articles have been published (20 in technical journals and 1 in a scientific journal), and the project has been presented at 16 seminars/events. In addition, the project has been presented to students from the Bachelor's Degree in Forestry Engineering on several occasions.	The results in terms of dissemination of the project in the fields of science and technology are considered to be very positive. The number of articles published in technical journals and the number of seminars/workshops in which the project has participated far exceeds what was initially planned. However, only one article has been published in a scientific journal. The reasons for this are well explained in action E6, and it should be noted that another one is expected to be published in the coming months (see After-Life Plan).
E7: Technical document edition for transference	Publication of 5 guides summarizing the work and knowledge acquired throughout the project, aimed at different target audiences. And publication of a Manual of success stories and information sheets related to the PBI.	The initial objective has been met, although two of the documents have been combined in a single publication. This publication (Guide of recommendations and technical measures for the improvement of biodiversity in Mediterranean forests. Integration in forest planning and management - Lessons learned-) had to be translated into Catalan, English and French, and published both in digital and paper format. With the project budget, only the guide was published in Spanish and in digital format. There has been no deviation in the other publications.	In this action, the 'Guide of recommendations and technical measures' has not been published in Catalan, English and French, but there is a commitment on the part of the CPF to carry out this work during the year 2024.
E8: Dissemination video edition	Objective: To multiply the social impact of the project.	The objective and the result indicated in the Proposal have been achieved. An informative video of 4' 12"	To date, 1,117 views have been registered. Although it should be taken into account that it has also been

	Result: production of an audiovisual document for dissemination.	has been edited for the general public and, in addition, the video of the Integrate+ network "For a good use of our forests: the integrative strategy", focused on the alignment of biodiversity conservation and sustainable timber production, has been translated into Spanish and Catalan.	broadcasted in several days with an outstanding number of participants, as is the case of the final Seminar. This number of views does not reach the 7,000 foreseen in the Proposal, but it should be taken into account that the video will continue to be uploaded on YouTube and the number of views is expected to increase.
F1-F3: Management and coordination actions	To ensure the project functions correctly from both a technical and administrative standpoint	The objective has been achieved throughout the project.	As mentioned throughout the Report, the project management has been carried out without any relevant problems. And the good understanding between all the partners has contributed to the smooth implementation of the project.

6.4. Analysis of benefits

6.4.1. Environmental benefits

In the forest stands in which biodiversity enhancement measures have been integrated, whether reference models at stand scale (ORGEST) or close-to-nature forestry (113.12 ha in total - 93.85 ha in Catalonia and 19.27 ha in Occitania), structural heterogeneity has increased, interspecific competition has been reduced, and specific diversity has been maintained and enhanced. Vulnerability to crown fire has been reduced in almost all stands and biodiversity carrying capacity has remained stable in 40% of the stands and improved in 40% of them. In addition, biodiversity has been conserved and processes associated with natural dynamics have been accelerated and incorporated in 49.97 ha which have been prepared for natural evolution. Overall, the activities carried out in all stands make the forests more resilient to climate change adaptation.

These benefits can be seen in 149.5 ha of the following Natura 2000 sites: ES5110001, ES5120001, ES5120004, ES5110024, ES5110011, ES5120016, ES5110010, ES5110005, FR9110111, FR9101483.

The benefits resulting from the project contribute to improving knowledge on how to manage Mediterranean forests, which in turn will help to improve the conservation status of these habitats as part of the European biodiversity strategy.

6.4.2. Economic benefits

A better understanding of how to manage forest ecosystems to make biodiversity enhancement and economic sustainability compatible, as well as a better understanding of financial mechanisms to promote biodiversity has been one of the strengths of this project and ensures its application in the future.

The project has had a positive impact on the local economy, particularly in terms of employment. 99 people have been involved in the project, of which 17 were hired by the project partners specifically for the project activities and 49 are additional subcontracted staff not associated with the project beneficiary organisations.

6.4.3. Social benefits

The training and capacity building sessions with a large number of participants, the articles published in technical journals, the more than 32,000 visits to the project's website and the dissemination of news in a wide range of media, allow us to affirm that the social impact of the project has been remarkable.

Demonstration actions integrating biodiversity enhancement criteria help to improve the reputation of foresters in society and to raise awareness of the importance of enhancing biodiversity through sustainable and multifunctional forest management that avoids rural abandonment and promotes vital forests capable of generating ecosystem services and hosting a resilient and diverse ecosystem.

From the survey of different types of stakeholders, the project has contributed to a better perception in society of the importance of integrating specific biodiversity enhancement measures into forest planning and management instruments, and there has been a high degree of general satisfaction with the training activities among participants.

The publication of the regulatory bases for the financing of measures to integrate biodiversity into forest management and for the creation of forest reserves will stimulate private forest owners to manage new forest stands with biodiversity criteria and thus increase employment.

6.4.4. Replicability

The scope of application of innovative practices can be very wide, both at local level and at the level of the whole Mediterranean Europe. In the framework of the project, the replicability of innovative management models has been promoted in stands where the owner had planned to act. Now, with the dissemination of all the knowledge acquired and the existence of incentives, it is expected to increase replicability in at least other areas of Catalonia and Occitania.

Another concrete result of the project is the creation of new forest itineraries for the Sustainable Forest Management Guidelines of Catalonia (ORGEST), which integrate biodiversity enhancement. The wide range of possibilities provided by these new routes will allow management approaches to be adapted to the different forest contexts of Catalonia and other Mediterranean climate regions, conserving and enhancing the biodiversity elements of each stand and adapting to different management criteria through multifunctional sustainable forest management.

On the other hand, the PBI has been validated by experts from 8 countries, and currently, apart from Catalonia, there is already a version adapted to Italy and France. In the rest of Spain, Greece and Switzerland the adaptation of the PBI is in progress, and work is beginning to adapt it to other countries such as Morocco, Algeria, Lebanon and Portugal.

6.4.5. Best practice lessons

The Life Biorgest project has demonstrated that forest management can conserve and improve biodiversity and accelerate and incorporate processes associated with natural dynamics.
The forestry actions developed allow progress towards the defined objective, although it should be noted that this is not achieved with a single intervention, but requires a long-term commitment to the implementation of the proposed forestry.

In addition to all the lessons learned in relation to specific measures and innovative practices to be integrated into forest management to conserve and improve the biodiversity of the Mediterranean forest, the following lessons have been learned during the course of the project:

- In stands managed on the basis of naturalistic silviculture a complete marking of the actions should be done. Marking can be considered after clearing in stands with poor trafficability, provided that the conservation of regeneration and minor stands of secondary, sporadic or rare species is taken into account.
- If clearing is planned, it should be partial and with the minimum intensity necessary to meet the fire prevention objective (if any), always ensuring a minimum of 30 % cover of scrub and affecting as little as possible floriferous and fleshy fruit-producing species.
- It is important to make sure that all the people marking (manager, owner, etc.) have the same selection criteria, and that they explain in detail the objective of the action and the treatment to be applied to the operating personnel. In any case, the technical direction of all work is essential.
- In stands managed on the basis of reference models, it is not strictly necessary to mark the felling, but it may be advisable to mark the key elements to be retained.

6.4.6. Innovation and demonstration value

The practices proposed in this project are of high demonstrative value. The creation of new biodiversity-integrated forest trails and new methodologies for assessing biodiversity potential is an important step forward both for Catalonia and for many other places in the Mediterranean region.
In addition, the project has provided knowledge on funding mechanisms (direct and indirect) and has contributed to the promotion of one such incentive that makes these proposed practices more attractive to landowners.

6.4.7. Policy implications

With regard to the integration of the results of the actions in the regulatory and forestry policy framework, regulatory changes have been proposed that have an impact on the planning of Catalonia's forests.

- A working group has been set up in the forestry administration to reach a consensus on the best measures for integrating biodiversity into forest management in the process of approving forest management instruments.
- A set of improvements to be incorporated into the Guidelines for Sustainable Forest Management in Catalonia (ORGEST) has been specified.
- The inclusion of biodiversity integration criteria has been proposed in the proposed modification of Order ARP/122/2017, of 13 June, approved by the Department of Agriculture, Livestock, Fisheries and Food, which regulates the forest management instruments in Catalonia, a process that will end with an adaptation of the instructions and applications for drafting the corresponding FPIs.
- The management criteria provided by the project are being integrated into the planning and management instruments of some of Catalonia's protected natural areas.
- The regulatory bases have been published for the financing of measures for the integration of biodiversity in forest management and for the creation of forest reserves based on the technical information worked on in the project (approved by Agreement of the Governing Council of the Centre for Forest Ownership - Department of Climate Action, Food and Rural Agenda - Resolution ACC/1786/2023, 23 May).

7. Key Project Indicators

In total, 17 key indicators have been selected for Life BIORGEST, with an impact on several actions depending on their scope and area of influence or the scale of analysis: Catalonia, Eastern Pyrenees and Mediterranean basin.

Once the monitoring has been completed for the entire project period, the deviations found are mostly positive in relation to the target values initially set. Regarding the snapshot of the first progress report, all indicator values have been met and exceeded for the most part.

The number of demonstration stands for actions C1-C4 and C5.2 has not changed compared to what was initially planned. On the other hand, the final number of stands in action C5.1 is higher. Therefore, the total area in which silvicultural treatments integrating biodiversity improvement measures have been applied is higher than initially proposed and, therefore, the values of indicators 1.5, 4.2.1, 4.2.2, 7.1, 7.3, and even 10.2, because it takes into account the number of owners who have actively participated in the project activities, are higher than those set at the beginning of the project.

The actions related to dissemination and transfer of knowledge, networking and training (indicators 11 and 12) have increased considerably compared to the initial values, mainly due to the high participation in conferences, courses and seminars. The number of people with improved skills or knowledge or who have changed their behaviour or practices thanks to the project (indicators 1.6) is also higher, except for the number of people who may have been influenced through dissemination or awareness-raising actions, which was probably overestimated at the beginning.

The values of the governance, employment and contribution to economic growth indicators (10, 13 and 14) have been mostly maintained.

8. Annexes

8.1. List of all deliverables presented in BUTLER

Name	Action
Compilation document of different innovative financing and incentive mechanisms for biodiversity conservation in the GFS, application recommendations	A6
Report. " Adaptation of forest naturalness and biodiversity indicators, criteria and thresholds to the Mediterranean context ".	A2
Renewal of agreement for the existing TC-Poblet	E4
Biodiversity module of the TC software adapted to the approach developed in the project + information sheets	E4
Technical description document on the implemented innovative management models	C3
Technical description document on the implemented innovative management models	C2
Report justifying and characterising the activities carried out in each stand	C4
Technical description document on the implemented innovative management models	C1
Report "Diagnosis and conservation measures in C5.1 stands".	C5
PBIC v3.0 and data collection protocol.	C5
Report on economic valuation of the implemented measures for the improvement of biodiversity and ownership compensation mechanisms design.	D7
Guide of recommendations for signing agreements with the ownership of forest properties for actions to improve biodiversity	E7
Regulatory memorandum for integrating biodiversity conservation into forest management.	C6
Technical proposal concerning regulations, instructions and applications for integrating biodiversity into forest management	C6
Minutes of the meetings of the International PBI Validation Expert Committee, with attendance list	D1
Edited video available online	E8
Report on field sampling + database of the biodiversity indicators results covering all 3 sampling stages	D3
Custody agreements signed with all owners of the selected properties	B1
Simple guide to assessing maturity and biodiversity in Mediterranean forest stands	E7
A comprehensive guide to assessing maturity and biodiversity in Mediterranean forest stands	E7
Compilation guide of innovative financing and incentive tools for the integration of biodiversity conservation in forest management and application recommendations	E7
Guide of recommendations and technical measures for the enhancement of biodiversity in Mediterranean forests. Integration into forest planning and management -Lessons learned-	E7

Final report: "Effects on biodiversity indicators according to habitat and management model".	D3
Final report: "Effects on ecosystem services according to type of management and habitat".	D4
Monitoring and evaluation of the actions report	D2
PBIC v3.0 related sheets	E7
Report: "Evaluation of the socio-economic impact of the project".	D5
Minutes of the experts in biodiversity conservation integration into forest management committee meetings, including attendance list.	D1
Networking report, including a list of all contacts and the interaction carried out.	E3
Minutes of coordination meetings	F2
Layman's report	E2
3 summaries for national and international congresses and seminars	E6
After-LIFE Plan	F4
Press archive of the project (clipping)	E5
Evaluation of the KPI indicators and update of the "LIFE KPI webtool" in the Final Progress Report.	D6
2 articles in international scientific journals in the field of forestry and conservation biology.	E6
4 technical articles in Spanish and French national or regional journals	E6

8.2. Documentation that does not correspond to any deliverable

In addition to the deliverables, the Final report includes a folder (annex 1) with the following documentation:

Name	**Action**
Program and list of participants of the Transfer Workshops.	E4.2
Program and list of participants of the specialisation courses in the application of silvicultural techniques.	E4.3
Program and list of participants of the Final Seminar of the project	E4.4