European Commission

Bringing nature back through LIFE

The EU LIFE programme's impact on nature and society

Study

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Edited by Ben Delbaere

Main authors: Lynne Barratt, An Bollen, Ben Delbaere, John Houston, Jan Sliva and Darline Velghe

Contributions by: María José Aramburu, Andrej Bača, Oskars Beikulis, Lars Borrass, Anne Calabrese, Stefania Dall’Olio, Jean-Paul Herremans, Sonja Jaari, Bent Jepsen, Mitja Kaligarič, Anastasia Koutsolioutsou, Andras Kovacs, Maud Latruberce, Ioana Gabriela Lucaciu, João Salgado, Camilla Strandberg Panelius, Audrey Thenard, Stanislaw Tworek, Ivaylo Zafirov.
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October 2020

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LIST OF ACRONYMS AND ABBREVIATIONS

BIO	LIFE Biodiversity project
CAP	EU common agricultural policy
CBD	Convention on Biological Diversity
CCA	LIFE climate change adaptation project
CCM	LIFE climate change mitigation project
DG ENV	EC Directorate-General for the Environment
EAFRD	European Agricultural Fund for Rural Development
EASME	Executive Agency for Small and Medium-sized Enterprises
EC	European Commission
EEA	European Environment Agency
Eionet	European Environment Information and Observation Network
ENV	LIFE Environment project
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
ESC	European Solidarity Corps
EWRR	early warning and rapid response (IAS)
FRV	favourable reference value
FV	favourable conservation status
GIE	LIFE governance and information project
HNV	High Nature Value
IAS	invasive alien species
IBA	Important Bird Area
IMPEL	EU Network for the Implementation and Enforcement of Environmental Law
INF	LIFE Information and Communication project
IP/ IPE	LIFE Integrated Project for Environment
IUCN	International Union for Conservation of Nature
MAES	Mapping and Assessment of Ecosystems and their Services
MFF	EU multi-annual financial framework
MPA	marine protected area
MS	EU Member State
MSFD	Marine Strategy Framework Directive
NAT	LIFE Nature project
NGO	non-governmental organisation
NNR	national nature reserve
PAF	prioritised action framework
PRE	LIFE Preparatory project
RDP	Rural Development Programme
RIMP	Regional IAS Management Plan
RSPB	Royal Society for the Protection of Birds (UK)
SAC	Special Area of Conservation (under the EU Habitats Directive)
SAP	Species Action Plan
SCI	Site of Community Importance (under the EU Habitats Directive)
SDG	Sustainable Development Goal
SFM	sustainable forest management
SNaP	LIFE Strategic Nature Project
SPA	Special Protection Area (under the EU Birds Directive)
UK	United Kingdom (of Great Britain and Northern Ireland)
U1	unfavourable-inadequate conservation status
U2	unfavourable-bad conservation status

Photo: Forest - Alp - LIFE05 NAT/RO/000176

1. Executive summary

1. Executive summary

1.1 ASSESSING THE IMPACT OF THE LIFE PROGRAMME

This report is produced in an important year for nature and biodiversity in the European Union (EU) and globally. The European Environment Agency (EEA) published an update of the State of nature in the EU (EEA, 2020), the European Commission (EC) assessed the outcome of its Biodiversity Strategy to 2020 and adopted a new Biodiversity Strategy for 2030, as part of the wider and ambitious European Green Deal. Globally, a new biodiversity strategy is under development and the United Nations Decade on Ecosystem Restoration is about to start.

The EU LIFE programme, Europe's key funding instrument for nature conservation, has since the start in 1992 focused its support to nature and biodiversity. It is therefore a good moment to take stock of its achievements and assess to what extent it has contributed to implementing the EU Birds and EU Habitats Directives (the 'Nature Directives') and its associated Natura 2000 network, and the EU Biodiversity Strategies.

Thousands of habitat restoration and species conservation projects have been co-funded by the LIFE programme across all EU Member States. To what extent are their results and successes reflected in the EU State of nature assessment? What have been their main merits? What lessons can we learn for future LIFE programme and project development? These are some of the questions that have been addressed by this study. They are illustrated by a large number of LIFE projects and best practice examples. We started the study by looking at the genuine improvements in conservation status or trends of habitats and species, as reported by EU Member States in 2019. We assessed which LIFE projects contributed to the reported improvements at the national, biogeographical and EU levels. We then complemented this information with local successes in protecting species and restoring habitats. Furthermore, we used the existing databases on LIFE projects to provide a number of European overview figures and graphs.

The outcome of the study, carried out in 2019-2020, is presented here for species and habitat groups, other biodiversity aspects, as well as a number of processes supporting nature conservation in Europe and the Natura 2000 network. We have derived a number of key messages as well as formulated recommendations for the future of LIFE, to ensure its unique role in conserving and restoring Europe's most precious habitats and species is maintained and strengthened well into the future.

1.2 KEY ACHIEVEMENTS OF THE LIFE PROGRAMME

For its almost 30 years of existence the achievements and the successes of the LIFE programme with regard to protecting nature in Europe are impressive. In particular, the LIFE programme:

- made a tremendous contribution towards the identification and designation of both the marine and terrestrial Natura 2000 network, and also plays a crucial role in defining site management regimes. For example, thanks to LIFE Spain identified and designated its marine Natura 2000 network and is now working on integrating its management in all relevant sectorial policies. In Europe, by the end of 2019, over 5,400 Natura 2000 sites had benefited from LIFE funding. Natura 2000 is the largest network of protected areas in the world and this is, to a large extent, thanks to LIFE;
- purchased tens of thousands of hectares of Europe's most rare and endangered habitat types and restored even more land (peatlands and coastal dunes mostly, but also grasslands and forests), leading in many cases to measurable recoveries of habitats such as seagrass beds and dynamic dune systems, and their associated species pools at either local or regional levels;
- safeguarded numerous species from extinction, either locally or for Europe as a whole. The programme has been particularly successful in recovering populations of birds of prey species such as the Bearded vulture, as well as other bird species such as the Azores bullfinch, Aquatic warbler and Blue chaffinch. Other species brought back from the brink include the Iberian lynx, the Brown bear, the Pyrenean desman and the Mediterranean monk seal;
- ensured the recovery of many local and endemic species, particularly plants and invertebrates that

are often overlooked by nature conservation. Also, a myriad of non-targeted species caught in the LIFE project 'slipstream' have benefited as a result of conservation efforts focusing on particular habitats or species;

- demonstrated the added value and effectiveness of transnational conservation approaches, particularly in relation to restoring fish migration routes and coherent site networks for migratory birds. Projects to improve wintering and staging grounds along flyways are boosting the population of several migratory bird species, such as the Lesser white-fronted goose, while the restoration of fish migration routes in Sweden has made it possible for the Atlantic salmon to return to spawning grounds after a lengthy absence;
- supported practical measures on the ground to prevent, control and eradicate invasive alien species (IAS). The programme was particularly effective in developing guidance, raising awareness, and producing tools to help stakeholders reduce the pressure by IAS on native species and natural habitats. The accumulated experience and know-how as well as awareness on the threats and impact of the invasive alien species helped adopting the EC IAS Regulation;
- supported the transition towards more sustainable agriculture, forestry and fisheries, for example through the development of conservation-oriented agri-environment measures under the common agricultural policy (CAP). Thousands of farmers and land managers across Europe joined agri-environmental schemes with the help of LIFE projects. They now receive CAP financial support for example, for supporting species-rich grasslands or hay meadows or implement management prescriptions for farmland species like the Aquatic warbler, Danube clouded yellow, Little bustard and many others;
- developed the knowledge base and data collection that is indispensable for evidence-based conservation and restoration;
- provided added value by demonstrating the social and economic benefits that nature provides. Facilitated and initiated dynamics in nature conservation like motivating, involving and providing private landowners from various sectors to engage in conservation measures which go beyond what they are obliged to do by law;
- supported a wider range of EU policies, such as human health and well-being and mitigation of climate change impacts;
- reached out to tens of millions of Europeans through a wide array of communication channels to become a recognised brand for nature conservation and restoration across Europe. LIFE has been without a doubt the most powerful communication tool for Natura 2000, changed attitudes towards nature conservation and provided a positive image of the EU to many of its citizens**;**
- served as a catalyst for long-overdue restoration, getting things done quicker and more effectively, and for attracting other (local) funds and stakeholders and involving them in the conservation efforts;
- punched harder than its weight in terms of budget through the mobilisation of national and other co-funding – and not just during project periods but afterwards as well, thereby ensuring long-term continuity. LIFE Integrated Projects (IPs), which mobilise complementary funds (from 2014 to 2018, 24 nature IPs have a cumulative mobilisation target of nearly €1,400,000,000), are a great tool for multiplying resources available for conservation work, and thus their approach would be scaled up with the introduction of Strategic Nature Projects (SNaPs) within the new LIFE programme phase (2021-2017), thus likely providing another fundraising boost.

Even though LIFE has not been sufficiently resourced to stop the overall decline of nature and biodiversity throughout the EU, the programme has been instrumental for many local and regional conservation suc-cesses in which habitat or species decline has either been halted or set back on the road to recovery. One thing is clear: the LIFE programme has prevented the state of nature in the EU from being worse than it would be otherwise. The Living Planet Report 2020 (WWF, 2020) shows that biodiversity decline in Europe is relatively lower than in other regions of the world, and points out that the LIFE programme, the EU Na-ture Directives and the Natura 2000 network are all of global significance.

In taking a hands-on conservation approach, LIFE is also helping to grow a community of public, NGO and private sector conservation practitioners. This increases their capacity to run the larger-scale projects needed to achieve ambitious targets within the EU Biodiversity Strategy for 2030.

LIFE is a 'Peoples Programme'! Everyone who has worked to make the LIFE programme successful over the years can be proud of their contribution. This report draws our

attention to the programme's many successes, but also indicates how much more vital work remains to be done in the coming years.

1.3 RECOMMENDATIONS

For increased and sustained impact of the LIFE programme and projects in the future, it is recommended to:

- maintain a focus on supporting projects with clear conservation and restoration targets, including where these are contributing to EU policy implementation needs, in particular those under the EU Birds and Habitats Directives and Natura 2000;
- actively stimulate project applications for species and habitats that are underrepresented, including threatened habitats and species included in the European Red Lists on species and habitats, as well as marine habitats and species;
- support implementation of national and regional long-term conservation strategies that lead to an upscaling of conservation outcomes, and that help developing more ambitious and larger-scale projects;
- strengthen cross-border networking and knowledge exchange, in some cases at the biogeographic level, between projects working on the conservation or restoration of similar habitat or species groups;
- encourage projects to actively share best practice through a wide range of channels, publish articles in specialised journals and magazines, and support networking with technical peers;
- strengthen the project development and management capacity in Member States and regions that are underrepresented as beneficiaries;
- publicise the LIFE programme and its results outside the LIFE community, in order to strengthen it even further and to gain the trust and involvement of non-insiders;
- ensure that projects embed targeted and well-designed monitoring from the very beginning, designed to measure progress towards conservation goals and to support evidence-based management;
- ensure that positive conservation results from LIFE projects in habitats and species not targeted by the projects are reported to demonstrate the projects' wider impact;
- encourage the communication of project outputs and outcomes to national authorities, for them to integrate the data in national databases and reporting so as to ensure the LIFE contribution is taken into account in EU progress reports;
- streamline LIFE Nature projects more closely with other strands of the LIFE programme using the concepts of ecosystem services and nature-based solutions as interface, also helping to mainstream nature into other policy sectors;
- provide more flexibility (on eligibility of expenses related) to actions outside the Natura 2000 network necessary to ensure a truly coherent Trans-European Nature Network.

Photo: Stržen watercourse - LIFE16 NAT/SI/000708 - © Jošt Stergaršek

2. General introduction

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2.1 ABOUT THIS REPORT

The year 2020 was an important year for European and global biodiversity policy. It was a year to evaluate to what extent the ambitious Aichi Biodiversity Targets agreed a decade ago by the international Convention on Biological Diversity (CBD) and the six targets of the European Union (EU) Biodiversity Strategy to 2020, aiming to halt the loss of biodiversity and ecosystem services in the EU, were achieved.

The processes of policy evaluation and development are accompanied by the publication of a number of milestone reports. In Europe, following the report in 2019 on the state of the European environment (EEA, 2019), a report is issued that presents the state of nature in the EU (EEA, 2020). This report, like its predecessor report (EEA, 2015) compiles and analyses the national reports on the implementation and outcome of the EU Birds Directive (1979, 2009) and the EU Habitats Directive (1992). A further milestone publication in 2020 is the final review report on the EU Biodiversity Strategy to 2020.

The Member State reports for the Birds and Habitats Directives were submitted in 2019 and the validated data are published in the Article 12 and Article 17 national summary dashboards on the website of the European Environment Agency (EEA). This forms one of the primary data sets for the 2020 EU State of nature report.

The year 2020 was also set to be the year in which new strategies and targets would be agreed, first at the global level during the 15th Conference of the Parties (COP) to the CBD in China, originally foreseen to be held in October 2020 but due to the Covid-19 outbreak postponed to 2021. Meanwhile, in May 2020 the European Commission (EC) published a follow-up EU Biodiversity Strategy for 2030, providing an important input to the global policy process and CBD/COP15.

In the light of this important year, and with the aim to support the implementation of the ambitious EU Biodiversity Strategy for 2030 and the global biodiversity agenda, the Executive Agency for Small and Medium-sized Enterprises (EASME) and the EC Directorate-General for the Environment (DG ENV) commissioned NEEMO EEIG to undertake this study. It aims to demonstrate the important contribution of the LIFE programme, since its creation, on the conservation and restoration of Europe's nature, as well as its contribution to wider biodiversity objectives and the United Nations (UN) Sustainable Development Goals.

This technical report is the result of work carried out in 2019-2020. It takes stock of what had been achieved throughout the years via LIFE co-funded projects, shares the enormous practical experience gathered through concrete conservation actions on the ground, provides evidence of working restoration techniques, and lessons learnt. We believe that this immense knowledge and experience is of great use to policy makers and practitioners and will definitely contribute to achieving the ambitious targets set in the EU Biodiversity Strategy for 2030 and the global biodiversity agenda.

Projects in this report are mentioned after their acronym, as featured in the LIFE project database, marked in bold text, with their first mention in a chapter hyperlinked to the LIFE project database record and with the unique LIFE project code included for ease of reference. Other standards applied in this report are for scientific species names that correspond to those in the annexes of the Nature Directives, conform with the EU State of nature report and in line with most recent taxonomy. Names of habitat types are as listed in Annex I of the Habitats Directive, written in full or shortened where appropriate, and accompanied by their habitat code as per Annex I.

2.2 METHODOLOGY

2.2.1 Assessing Member State reports

In 2019, as required by Article 17 of the Habitats Directive, Member States (MS) reported on the conservation status of the EU protected habitats and species present in the country at the level of biogeographical regions. Member States have also reported on the status and trends of bird species, as required by Article 12 of the Birds Directive. The data used for these assessments cover the period 2013-2018. Based on this reporting the current study assesses and demonstrates the extent to which LIFE projects contributed to the reported improved conservation status or trends of the EU protected species and habitats. This study complements previous overview publications on the impact of the LIFE programme.

To analyse the extent to which LIFE projects have contributed to the improvements of conservation status or trends we studied all reports as available in the Article 12 and Article 17 national summary dashboards[1] and in the respective European Environment Information and Observation Network (Eionet) web tools[2]. We extracted from the full set of all Member State reports (EU-28)[3] all positive trends or genuine positive changes in conservation status per habitat type or species per Member State and for each biogeographical region in the Member State. A positive change in conservation status is any shift from a given conservation status category in the previous reporting for 2007-2012 (see below) to a higher one, for which the Member State indicated that it concerns a genuine change (rather than improved knowledge or otherwise). A positive trend includes also those records that do not show an improvement in conservation status but for which Member States indicate that a positive trend in the overall status is observed.

National assessments are based on the 'conservation status' definition provided in Article 1 of the Habitats Directive, which classifies the conservation status of a particular species or habitat as 'favourable' (FV), 'unfavourable-inadequate' (U1) or 'unfavourable-bad' (U2), based on an evaluation of four parameters for species (other than birds) and habitats (EEA, 2015). In the current report, in line with the terminology of the EU State of nature report (EEA, 2020), the conservation status classes are referred to as 'good', 'poor' or 'bad' respectively. For birds, because they fall under a different directive, short- and long-term trends in distribution area and population are assessed, here also presented in terms of good, poor or bad.

If a species or a habitat in a biogeographical region within a country is in the same conservation status category as in a previous reporting round but there is a clear trend within the category, this is marked by the addition of the sign +, – or = to the conservation status code, indicating an improving, deteriorating or stable trend respectively.

The data reported should be treated and interpreted with care. This is because, within the provided reporting guidance, Member States have their own ways of collecting raw data and processing these into nationally aggregated conservation status information based, for some countries, on regional reports. Not all countries have the same types of nature monitoring networks or reported data coming out of LIFE projects to the same extent, for example. These are reasons why no statistical analyses can be carried out, nor can overall cause-effect relations based on implemented LIFE projects be demonstrated.

The extracted list with the positive trends and genuine improvements of all habitats and species was then used by the NEEMO experts, organised by regional team, to identify those LIFE projects that most likely contributed to the reported improvement. It should be noted that only in exceptional cases it is possible to state a firm cause-effect relation between a (series of) LIFE project(s) and a reported improvement. This is because, certainly at the aggregated Member State or EU level, other factors, such as general environmental condition or time lag, may influence trends. Also, one should be aware of a possible bias in the selection of LIFE projects in connection to improvements, as the selection may be influenced by the relative effort that experts were able to put into the selection exercise. In addition, not all Member States reported whether a change is due to a LIFE project.

Based on the approach described above, a total of 137 records were found with improving habitats in a given biogeographical region in a Member State to which LIFE projects contributed. Altogether, these records address 51 habitat types (out of the 233 listed in the EU Habitats Directive), reported by 18 Member States. Nearly half of the records (63) are from the Continental biogeographical region. Habitat types in all nine major habitat groups, as defined in Annex I of the Habitats Directive, are covered, although with big differences in representation. Most matches of improving habitats connected to LIFE projects are found in raised bogs, mires and fens, closely followed by forests, and coastal and halophytic habitats (Figure 1).

A total of 649 cases of improvements in species in a biogeographical region in a Member State (for birds: in the total Member State territory) were found that could be linked to the success of a LIFE project. These records cover 183 (sub)species (out of the over 1,250 covered by the Nature Directives) reported by 26 Member States. Over one third of the records are in the Mediterranean biogeographical region. Nearly two thirds of the records on species are in the group of birds (Figure 2).

1 www.eea.europa.eu/themes/biodiversity/state-of-nature-in-the-eu/article-12-national-summary-dashboards and www.eea.europa.eu/themes/biodiversity/state-of-nature-in-the-eu/article-17-national-summary-dashboards

2 https://nature-art12.eionet.europa.eu/article12/ and https://nature-art17.eionet.europa.eu/article17/reports2012/

3 *In this report we use the information from all States that are Members of the EU in 2019 i.e. EU-28.*

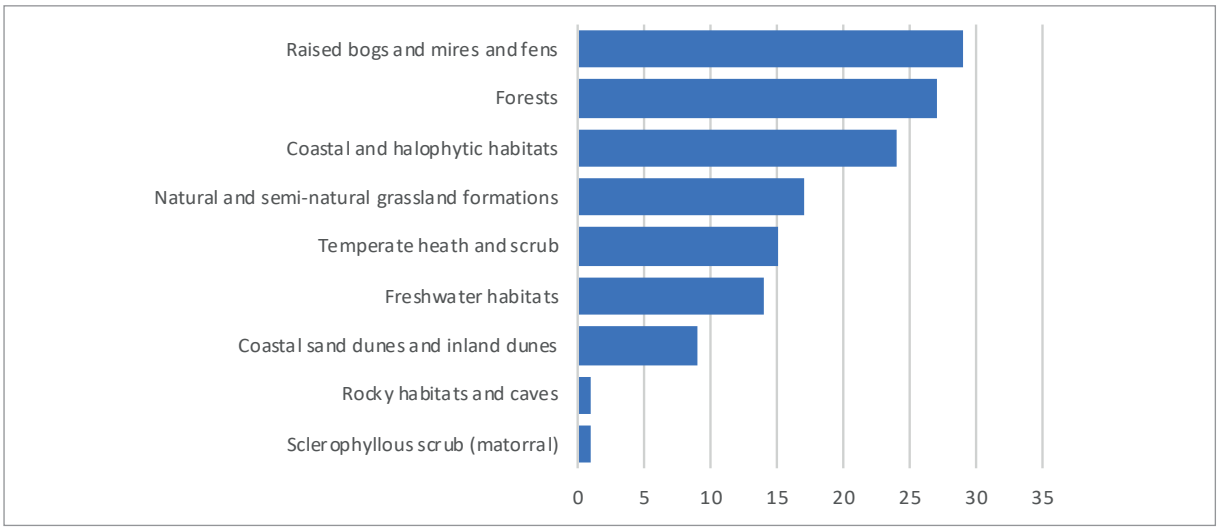
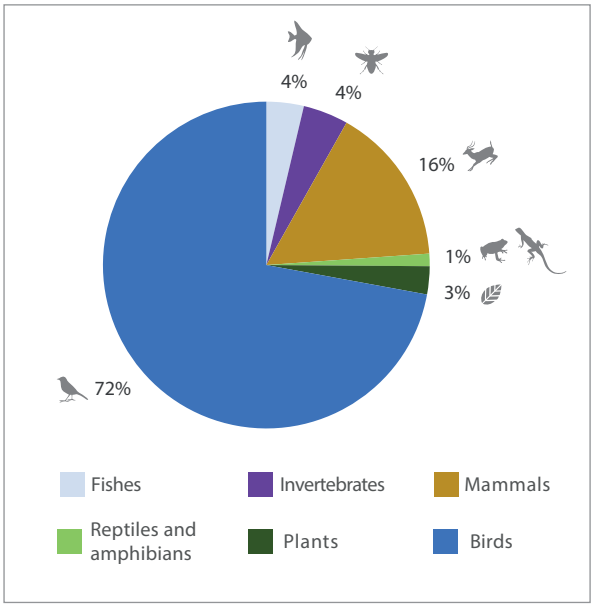


Figure 1: Number of records with positive trends for habitat types to which LIFE projects may have contributed, by habitat group (Source: Member State reports and NEEMO expert judgement, 2019)

Originally, the LIFE programme only funded projects targeting species that are listed in the annexes of the Habitats and Birds Directives. However, the 2014-2020 LIFE programme went further and has opened its scope to species and habitats listed as threatened in the European Red Lists and addressing broader biodiversity issues. The Red Lists identify extinction risk, main threats and concrete conservation measures and, among others, raise awareness of the role of species in European ecosystems. Most projects focusing on species recovery and habitat restoration are in the LIFE Nature strand (NAT). However, the programme can also help species groups and habitat types through other LIFE project strands, such as biodiversity (BIO), environment (ENV), climate change adaptation and mitigation (CCA and CCM), governance and information (GIE), and integrated projects (IPE).

Figure 2: Percentage of records with positive trends for species to which LIFE projects may have contributed, by species group (Source: Member State reports and NEEMO expert judgement, 2019)



2.2.2 Collecting examples of local impact

The examples of LIFE projects possibly contributing to improved conservation status or positive trends in habitats or species, collected according to the approach described above, give only a partial image of the large impact of the LIFE programme on nature conservation in Europe. The information presented by Member States has been aggregated and hides the many local conservation successes resulting from LIFE projects. The large number of project beneficiaries, project external monitors and others that constitute the European LIFE community and have been engaged in the programme for 28 years witness the fact that the LIFE fund has been essential in restoring a wide range of habitat types and protecting a significant number of species from extinction at local or regional level.

Therefore, a further selection was made of LIFE projects of which it is known that they have a significant positive impact on species or habitats locally or regionally. They are selected from the full range of LIFE projects since 1992, complementing the publication 'LIFE makes a difference' that highlighted the successes from 20 ex-post project visits carried out 5-10 years after the end of the project funding.

In addition to the impact on species and habitats, it is known that many LIFE projects have a major impact on processes that support and enable nature conservation at the local to national levels. Such processes include stakeholder engagement, governance, law enforcement, or fundraising. Also, aspects that support nature conservation by measures tackling wider biodiversity issues, such as combating invasive alien species (IAS), often are the result of LIFE projects. Examples of projects with best practices regarding such types of horizontal processes are presented in Chapter 5 and Chapter 6.

The selection of LIFE projects that brought a local/regional impact is made on the one hand by the external monitors that have been following LIFE projects for many years, experts who know the key project achievements and who are in touch with the project beneficiaries on a regular basis. On the other hand, key information sources are the databases that have been built and maintained since the start of the LIFE programme.

As more than 500 projects were selected by the monitoring experts for the study on local impacts, not all of them are presented in this report. In the selection process a good balance is sought in geographical representation, while ensuring that the selected projects serve as best practice illustrative examples.

The collection of selected high-impact project examples and the NEEMO database of all projects that contributed to the themes presented in this report serve as a repository of LIFE projects. A repository that complements existing sources, such as the LIFE project database, and that grows over time. A repository also that serves as an input to customised publications, events and other communication channels that help showcase the important role that LIFE plays in protecting and restoring Europe's unique natural treasures.

2.2.3 LIFE in numbers

In addition to the two components described above, the analysis of the Member State reports and the identification of LIFE projects with local impacts, a third component of the present study is the production of aggregate data. These data do not concern individual species or habitat types, nor do they focus on conservation status. Instead, they give a flavour of the scope and diversity of the projects that turn the LIFE programme investment into true impact on Europe's nature and biodiversity.

The questions for aggregate data were defined in an early stage and include:

- How much has LIFE invested in nature?
- Who is benefiting from LIFE funding?
- To what extent are habitats and species covered by LIFE?
- How much land has LIFE purchased?
- How does LIFE contribute to Natura 2000?
- To what extent does LIFE contribute to protected areas?

The results of this data analysis are presented in the relevant sections and give an overview of the full LIFE programme (1992-2018) in numbers, tables and figures. This output comes from aggregate data analyses, based on the databases described in Table 1. The challenge is that these databases cover different periods and represent most often only subsets of the full LIFE programme. As they have been created over a period of more than 25 years, the databases have different templates, sometimes different codes for Natura 2000 sites, different LIFE project references or codes and a mix of previous and current species names. This makes comparability difficult. Some databases allow for quantitative analyses by using filters, whereas other databases only work with pre-defined queries to get a number of LIFE project lists, but no quantitative data. For some databases, the data are not complete for certain years or periods, and errors were encountered indicating limited robustness of data. This means that manual steps consulting different databases are needed to correct for this as much as possible, to execute queries, while also checking monitoring files of individual LIFE projects in the internal NEEMO database LifeTrack Dory.

While the data and figures presented in this report might not be 100% accurate, we feel confident that they are within a range of a 10% error margin, due to extensive checks, and thus in principle valid to publish.

	Databases (period)	LIFE period					Comments
		LIFE I 1992-1996	LIFE II 1996-1999	LIFE III 2000-2006	LIFE+ 2007-2013	LIFE14 2014-2018	
LIFE related	Butler (1992-2017) & LIFE project database	■	■	■	■	■	Data on species, habitats and Natura 2000 sites for LIFE projects covering 1992-2018.
	Land Purchase Database (1992-2018)	■	■	■	■	■	Data 1992-2006 is partial. Since 2007 land purchase data has been recorded through data entry by LIFE beneficiaries at the end of the project.
	LTDory (2000-2018)			■	■	■	Internal Astrale/NEEMO database including LIFE project files with details
	Output indicators				■		Information on set indicators for LIFE+ projects (2007-2013).
	IDOM database				■		Pre-defined queries (flags, indicators) that generate list of LIFE projects (2007-2014).
	EASME KPI database				■	■	Quantitative data on a set of predefined indicators. Mainly projections, which are only real data once the LIFE project has finished.
non-LIFE related	Natura 2000 database				■	■	Updated version published in May 2020, including 2019 MS reporting
	Article 12 reporting			■	■	■	EU MS reporting on status and trends of bird species (2008-2012, 2013-2018).
	Article 17 reporting				■	■	EU MS reporting on status and trends of species and habitats (2000-2006, 2007-2012, 2013-2018).

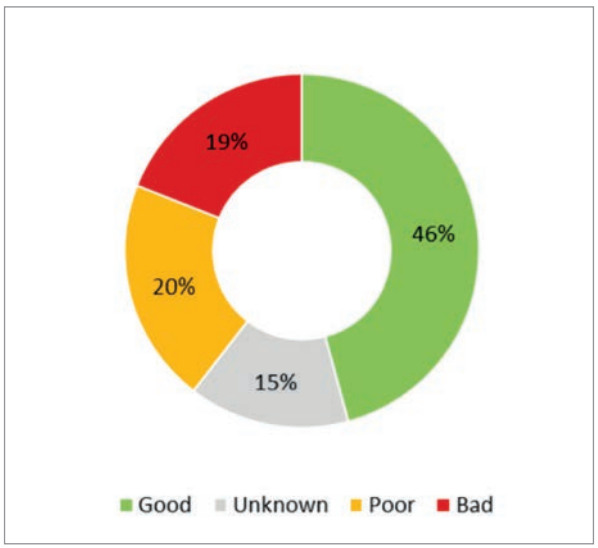
Table 1: Overview of databases used for the study, and their main characteristics

2.3 THE STATE OF NATURE IN THE EU

In 2020 the European Environment Agency published the third EU State of nature report (EEA, 2020), as described in the previous sections. The aggregated results for birds, other species and habitat types are presented here.

Population status assessments indicate that 46% of the assessed **bird species** have a good population status in the EU. This is 5% less than in the 2015 EU State of nature report. The proportion of poor and bad status of bird species together has increased by 6% in the same period and reached a total of 39%. The population status of 15% of the bird species in the EU is still unknown due to lack of reliable data regarding their population sizes and trends.

Figure 3: EU population status of bird species. Source: EEA, 2020
Note: The total number of species-level assessments is 463 (only one assessment per species is undertaken, regardless of the number of seasons it has been reported in).
Categories: Good (secure), poor (near threatened, declining, depleted), bad (threatened)



EU regional assessments for **animal (other than birds) and plant species** covered by the Habitats Directive show that more than a quarter (27%) are in a good conservation status. Compared to the previous reporting period, this indicates an increase of 4%. These differences are in most cases related to changes in assessment methods applied at EU or Member State level or to variations in data quality. Still, over half of the assessments report a poor (42%) or bad (21%) status. Though the number of regional assessments that are classified as 'unknown' has decreased from 17% to 10% since the last reporting period, it remains significantly higher than for the habitat assessments (4%).

Conservation status assessments for **habitat types** at the EU regional level show that while 15% of habitat assessments have a good conservation status, the vast majority have an unfavourable conservation status (45% poor and 36% bad). Compared to the last reporting period, the bad conservation status for habitats has increased by 6%. These differences are generally related to changes in the methods applied at EU or Member State level or are due to variations in data quality.

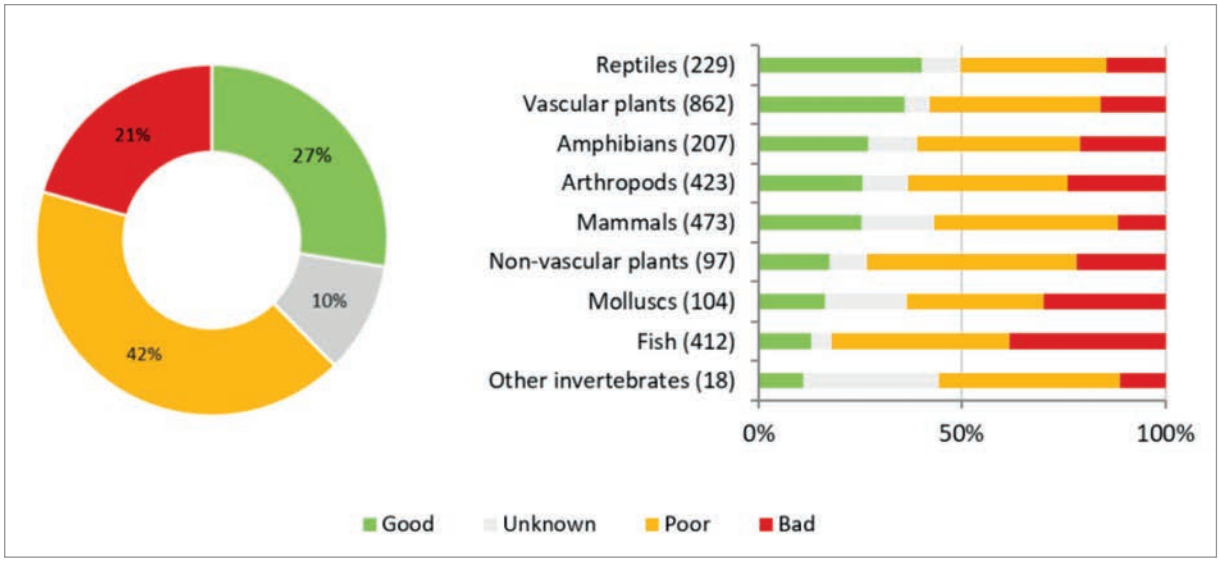


Figure 4: Conservation status of species at EU level (left) and conservation status per species group at EU level (right) (Source: EEA, 2020)

Note: Figures are based on the number of EU species assessments. The number of assessments per group is indicated in parentheses. The total number of assessments is 2,825.

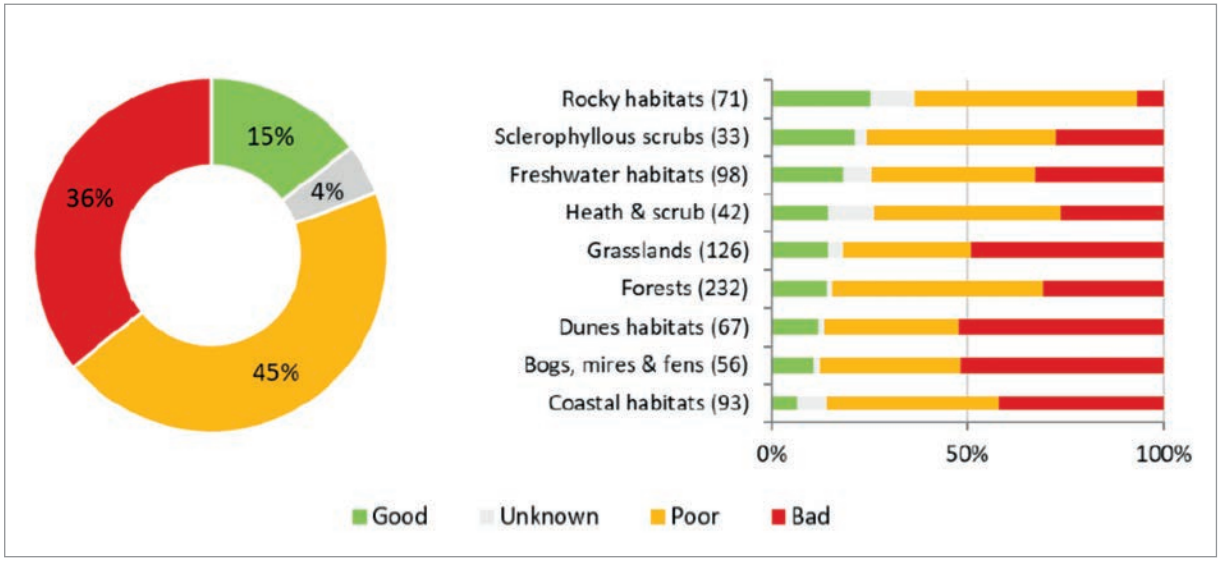


Figure 5: Conservation status of habitats at EU level (left) and conservation status per habitat group at EU level (right) (Source: EEA, 2020)

Note: Figures are based on the number of EU habitat assessments. The number of assessments per group is indicated in parentheses. The total number of assessments is 818.

2.4 EU NATURE LEGISLATION, NATURA 2000 AND THE WIDER CONTEXT

Much has already been written about nature policy and legislation in the European Union. The following is based on Sundseth (2008) and EC (2017).

Recognising the need to coordinate efforts for the conservation of Europe's biodiversity, the EU has put in place a series of wide-ranging laws which are now in force across 28 countries. Together, they set the standard for nature conservation within Europe and enable all Member States to work together towards the same goals and within the same strong legal framework to protect valuable habitats and species across their entire range within Europe, irrespective of political or administrative boundaries. They are also at the heart of the EU's commitment to halt biodiversity loss.

The Birds Directive was the first such law to be adopted as early as 1979. It protects all wild birds that are naturally occurring in Europe and aims to conserve key habitats of threatened, vulnerable or rare species and of migratory species in general.

This law was complemented, 13 years later, by the adoption of the Habitats Directive which introduced similar protection measures to that of the Birds Directive but extends its coverage to other rare, threatened or endemic plants and animals – over 1,000 species in total. For the first time, it also targets the conservation of some of Europe's most characteristic yet increasingly rare and threatened habitat types.

The two Directives represent the most ambitious and large-scale initiative ever undertaken to conserve Europe's biodiversity. They present a legally-binding approach to conservation by:

- adopting a holistic approach by giving equal priority to conserving habitats for wildlife as to protecting individual species. Jointly the Nature Directives protect about 1,500 animal and plant species and 233 rare habitat types;
- aiming for a coherent continent-wide ecological network of protected areas rather than protecting individual sites;
- recognising that man is an integral part of nature and that the two work best in partnership.

At the heart of the two EU Nature Directives lies the Natura 2000 network – a coherent ecological network of protected sites spanning all 28 EU countries. At the end of 2019, it covered 17.9% of the EU land area (785,018 km^2) and 9.7% of its marine territory (573,125 km^2) (EEA, 2020). The 27,886 Natura 2000 sites, covering 1.4 million km^2 are classified either as Special Protection Areas (SPAs) under the Birds Directive or designated as Special Areas of Conservation (SACs); and Sites of Community Importance (SCI) under the Habitats Directive. Many sites are both fully or partially SPA or SCI/SAC and are often also protected by other national or international designations (e.g. national parks, World Heritage Sites, Ramsar sites).

In December 2019, the European Commission presented the European Green Deal, an ambitious package of measures that should enable European citizens and businesses to benefit from sustainable green transition. One of its key aims is to protect, conserve and enhance the EU's natural capital.

Preserving and restoring ecosystems and biodiversity is central to this aim. In recognition of the EU not meeting some of its most important environmental objectives for 2020 and as part of the European Green Deal, the EU has adopted a new **Biodiversity Strategy for 2030**. This strategy builds on the conclusion of the Fitness Check of the EU Nature Directives that 'Improvements are needed both in their effectiveness and efficiency and in working in partnership with different stakeholder communities in the Member States and across the EU to deliver practical results on the ground'.

The overall aim of the EU Biodiversity Strategy for 2030 is 'to ensure that Europe's biodiversity will be on the path to recovery by 2030 for the benefit of people, the planet, the climate and our economy'. This milestone is to be achieved by implementing 17 commitments for protecting and restoring nature in the EU (see box).

The Strategy recognises that nature conservation efforts as still insufficient to halt the loss of species ('... the EU has legal frameworks, strategies and action plans to protect nature and restore habitats and species. But protection has been incomplete, restoration has been small-scale, and the implementation and enforcement of legislation has been insufficient') and calls for stepping up the protection and restoration of nature by improving and widening the network of protected areas and by developing an ambitious EU Nature Restoration Plan, including the deployment

Commitments of the EU Biodiversity Strategy for 2030: Bringing nature back into our lives

A coherent network of protected areas

1. Legally protect a minimum of 30% of the EU's land area and 30% of the EU's sea area and integrate ecological corridors, as part of a true Trans-European Nature Network.
2. Strictly protect at least a third (10%) of the EU's protected areas, including all remaining EU primary and old-growth forests.
3. Effectively manage all protected areas, defining clear conservation objectives and measures, and monitoring them appropriately.

An EU Nature Restoration Plan

4. Legally binding EU nature restoration targets to be proposed in 2021, subject to an impact assessment. By 2030, significant areas of degraded and carbon-rich ecosystems are restored; habitats and species show no deterioration in conservation trends and status; and at least 30% reach favourable conservation status or at least show a positive trend.
5. The decline in pollinators is reversed.
6. The risk and use of chemical pesticides is reduced by 50% and the use of more hazardous pesticides is reduced by 50%.
7. At least 10% of agricultural area is under high-diversity landscape features.
8. At least 25% of agricultural land is under organic farming management, and the uptake of agro-ecological practices is significantly increased.
9. Three billion new trees are planted in the EU, in full respect of ecological principles.
10. Significant progress has been made in the remediation of contaminated soil sites.
11. At least 25,000 km of free-flowing rivers are restored.
12. There is a 50% reduction in the number of Red List species threatened by invasive alien species.
13. The losses of nutrients from fertilisers are reduced by 50%, resulting in the reduction of the use of fertilisers by at least 20%.
14. Cities with at least 20,000 inhabitants have an ambitious Urban Greening Plan.
15. No chemical pesticides are used in sensitive areas such as EU urban green areas.
16. The negative impacts on sensitive species and habitats, including on the seabed through fishing and extraction activities, are substantially reduced to achieve good environmental status.
17. The bycatch of species is eliminated or reduced to a level that allows species recovery and conservation.

of nature-based solutions to contribute more effectively to the UN Sustainable Development Goals.

The European Green Deal also recognises that all EU policies should contribute to preserving and restoring Europe's natural capital. Named sectors include agriculture (with among others the adoption of a Farm to Fork strategy addressing the use of pesticides and fertilisers, and the new common agricultural policy, forestry (with the preparation of a new EU Forest Strategy), fisheries, and the blue economy.

2.5 THE EU LIFE PROGRAMME

Rooted in increased environmental awareness in the 1970s, the LIFE programme is the main source of EU funding for implementing the Birds and Habitats Directives and halting biodiversity loss. LIFE co-funds projects that work to conserve the species and habitats listed in the annexes of the two Nature Directives, across the entire Natura 2000 network, including the marine areas.

2.5.1 How much has LIFE invested in nature?

The LIFE programme was launched in 1992 and has had an annual call for LIFE Nature proposals, except for 2001. In addition, there were LIFE Biodiversity projects for the period 2008-2017. Overall, the LIFE programme has co-funded 1,754 LIFE Nature and Biodiversity projects, for a total of €2.85 billion. On average the LIFE programme funded 67 projects per year, ranging from 33 to 101 projects per year (Figure 6). During the last five years, a significantly lower number of LIFE projects has been accepted but with a relatively higher budget per project and the introduction of LIFE Integrated Projects for Environment (IPE) for nature. Overall, the LIFE Nature budget has gone up, reflecting an increased EU commitment to nature and biodiversity conservation and restoration, while also including more Member States with the expansion of the EU. The LIFE Nature and Biodiversity sub-programme under the current EU multi-annual financial framework (MFF) 2014-2020 is set at €1.2 billion[4]. This trend will be continued in the years to come. For the upcoming MFF 2021-2027, the LIFE Nature and Biodiversity budget is proposed at €2.15 billion[5].

4 *LIFE multiannual work programme 2014-2017 and 2018-2020.*
5 *https://eur-lex.europa.eu/resource.html?uri=cellar:ad186f8e-6587-11e8-ab9c-01aa75ed71a1.0001.02/DOC_1&format=PDF*

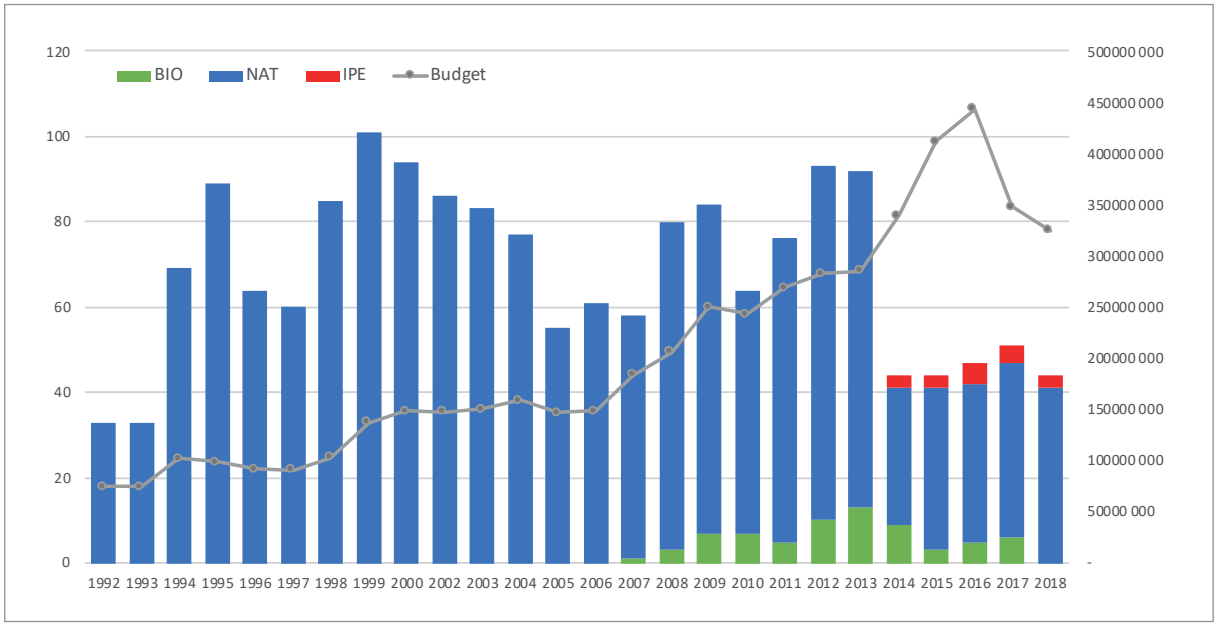
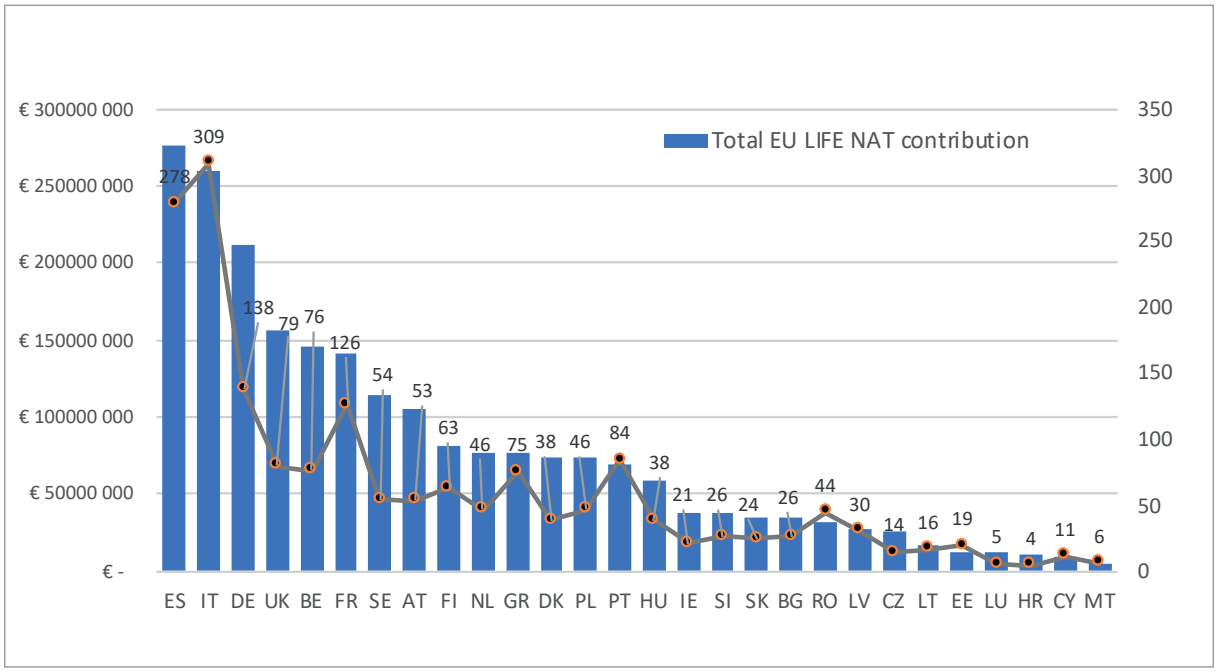


Figure 6: Total number of LIFE NAT and BIO and LIFE IPE nature projects per year, along with the total annual budget contribution, covering the LIFE 1992-2018 period

When looking at the geographic spread of LIFE projects across Member States, the large EU countries like France, Spain, Sweden, Germany and the United Kingdom have a high number of LIFE projects (Figure 7). Countries that more recently joined the EU (e.g. Croatia, Malta, Estonia, Latvia and Cyprus) have much fewer projects. The number of LIFE projects and EU budget contribution per Member State corresponds roughly with the country size and/or number of years since EU membership. Some of the lower numbers also indicate that overall less LIFE project applications have been submitted, due to less familiarity with the programme. However, through LIFE Info Days, outreach is done to encourage more beneficiaries to apply.

Figure 7: Overall EU budget contribution and number of LIFE NAT projects per EU Member State (1992-2018)



2.5.2 Who benefits from LIFE?

A diverse group of beneficiaries has benefited from co-funding from the LIFE programme on nature and biodiversity. Several thousand beneficiaries have been involved in LIFE Nature projects, with most projects including several beneficiaries. An analysis of 1,729 LIFE Nature projects from the 1992-2018 period (Figure 8) gives an indication of the type of coordinating beneficiary that manages the projects. Almost half (45%) of all coordinating beneficiaries are general public authorities. Of these, 23% are regional authorities, 13% local authorities, and 9% national authorities. Another 12% represent national park or nature reserve authorities. Almost a third (29%) of all LIFE Nature projects are managed by NGOs and 7% by universities and research institutions. In contrast to LIFE Environment projects, private companies only manage 2% of the LIFE Nature portfolio. Development agencies and intergovernmental bodies cover the other type of beneficiaries (5%).

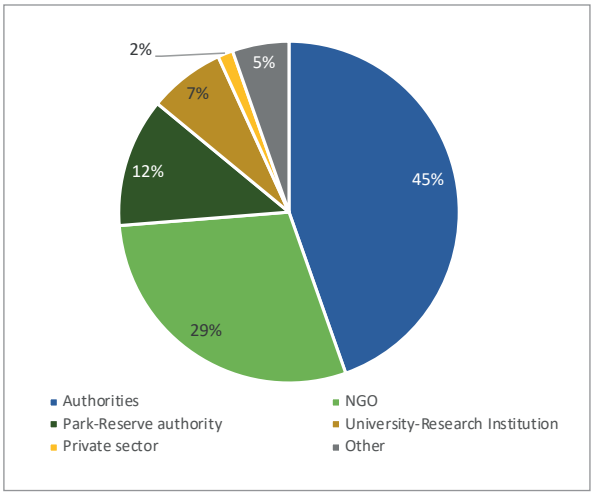
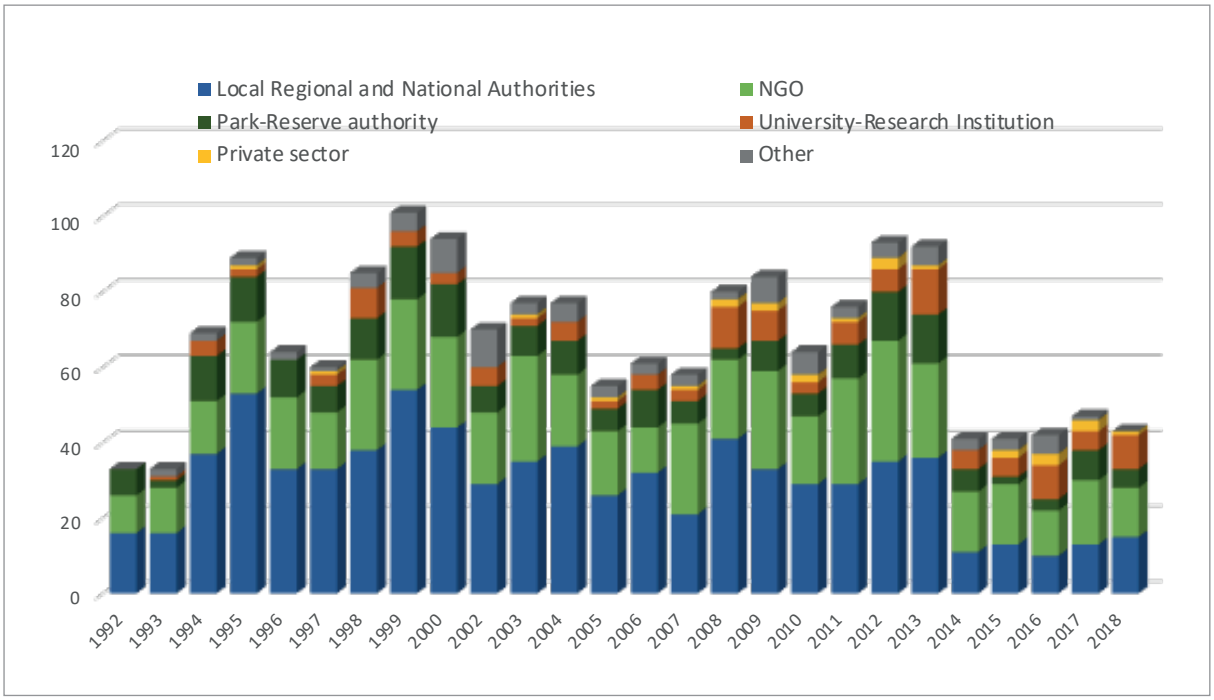


Figure 8: Share of coordinating beneficiaries leading LIFE projects, by type (1992-2018) (n=1,729)

When looking at coordinating beneficiaries of the LIFE programme over the years, the same overall share between types is visible and maintained for the first 21 years (Figure 9). However, in the last five years, there seems to be a larger diversity of beneficiaries managing LIFE Nature and Biodiversity projects. While private companies are overall less likely to manage LIFE Nature projects, they were almost absent in the first 12 years of the LIFE programme, while there are some in more recent years. An interesting trend is also that universities and research institutes increasingly act as project coordinators over the years and that the share of general public authorities is decreasing.

In the latest funding period, LIFE Integrated Projects for Environment (IPEs, usually referred to as IPs) were introduced to promote a more strategic and joined-up approach to

Figure 9: Diversity of coordinating beneficiaries of LIFE projects over the years (1992-2018). (n=1,729; Y-axis = No of coordinating beneficiaries)



helping Member States implement key environmental and climate legislation. The 15 nature IPs funded in the period 2014-2018 plan to make use of more than €1.2 billion for Natura 2000 from EU agricultural and regional funds and other sources, on top of LIFE's €164 million contribution. This funds a wider range of important actions, identified in the Member States prioritised action frameworks (PAFs). The PAFs are planning tools at regional or national level (depending on the responsibilities for nature conservation in each Member State) that help integrate priority actions for nature into relevant EU funding programmes.

2.5.3 What's next? LIFE in 2021-2027

In June 2018, the European Commission (EC) proposed a Regulation establishing a new LIFE programme for 2021-2027. The aim is to enhance LIFE so that it better contributes to Europe's environmental goals, in particular to speed the shift towards a clean, circular, energy-efficient, low-carbon and climate-resilient economy; and to halt and reverse biodiversity loss, thereby contributing to sustainable development. This will also help achieve the ambition of the European Green Deal to implement the Sustainable Development Goals and to preserve and restore ecosystems and biodiversity.

Subject to approval by the European Council and European Parliament, the new LIFE programme will have a 60% budget increase (to €5.45 billion in current prices) and four sub-programmes:

- Nature and Biodiversity
- Circular Economy and Quality of Life
- Climate Change Mitigation and Adaptation
- Clean Energy Transition

In the EC proposal, the conservation of nature and biodiversity, including marine ecosystems, remains an important area of action for LIFE (with a proposed 40% of the LIFE funding) and will help contribute to EU commitments under the Convention on Biological Diversity.

A new type of project will also be introduced. 'Strategic Nature Projects' (SNaP) will support programmes of action in Member States for the mainstreaming of nature and biodiversity policy objectives into other EU policies, such as agriculture and rural development. This will involve leveraging relevant funds to implement these objectives.

The 'fitness check' of the Nature Directives highlighted the strategic role that LIFE plays in supporting the implementation of the EU Biodiversity Strategy to 2020. The new EU Biodiversity Strategy for 2030 has a clear ambition to protect and restore Europe's nature. To meet its needs the Strategy estimates that at least €20 billion a year must be invested on nature priorities, including Natura 2000 and green infrastructure. This investment will require mobilising private and public funding at national and EU level, including through a range of different programmes (such as LIFE) in the next EU budget.

Photo: Roseate terns - LIFE05 NAT/F/000137- © Hervé Ronné

3. LIFE improves – contribution to preserving Europe's protected species and habitats

3. LIFE improves – contribution to preserving Europe's protected species and habitats

3.1. LIFE MAKES A DIFFERENCE FOR BIRDS

3.1.1 The EU Birds Directive

There are 533 bird species in Europe and 451 bird species in the EU-28. Member States adopted the EU Birds Directive (79/409/EEC) in April 1979, which makes it the oldest piece of EU legislation on the environment and one of its cornerstones. Amended in 2009 (2009/147/EC), it gives protection to all wild bird species within the territory of the European Union. The Directive applies to the birds themselves, as well as their eggs, nests and habitats.

The strength of the Birds Directive is that it matches the need for habitat conservation, particularly for the 194 threatened species listed in Annex I and other migratory birds, with the protection of the species themselves, but listing, in Annex II, 82 species which can be hunted under certain circumstances. Habitat loss and degradation are the most serious threats to the conservation of wild birds, and the Directive places emphasis on the protection of wetlands of international importance. It establishes a network of Special Protection Areas (SPAs) including all the most suitable territories for the species in Annex I. Since 1994, all SPAs are included in the Natura 2000 ecological network, established under the Habitats Directive (see Section 3.6).

3.1.2 Summary on birds

Even though the Birds Directive is arguably the EU's most successful and comprehensive environmental directive, the 2020 State of nature report (EEA, 2020) shows nonetheless that for birds there was an overall decline of 5% in good population status between 2012 and 2018. In all, 46% of species assessed were in a good status, 39% were in a poor or bad status and 15% had an unknown status. More worrying is the fact that the proportion of Annex I and II species listed as 'secure' (good status) has also declined by 9% since 2015, and this is despite the special conservation measures provided to these species.

Agriculture has had highest impact on breeding populations, followed by forestry and urbanisation. For passage migrants and wintering birds the main pressures are species exploitation (i.e. hunting and illegal killing), followed by urbanisation and agriculture. Predation of eggs and chicks is also a major threat to some species. Overall, agricultural development and land use is the main threat to bird populations. The two most common agricultural issues impacting bird populations are the abandonment of grassland management and intensive grazing by livestock.

Nevertheless, positive short- and long-term population trends are reported, especially for wetland and marine birds, with smaller improvements noted in farmland and forest populations. The LIFE programme is recognised as being an important mechanism in helping Member States to deliver the Bird Directive's conservation objectives. The seeds of success were sown early on because the Birds Directive already benefited from LIFE predecessor funding from the Community Environmental Action (ACE) programme. The first LIFE projects were thus able to hit the ground running and immediately improve the SPA network before first entering a phase of improving habitats and then progressing to species conservation through targeting species on the LIFE priority list developed by the ORNIS committee on behalf of the EU[6]. The balance of projects mentioned in the sections below reflects the LIFE effort with more wetland (43%) and grassland (30%) projects than those for forests (16%), coastal areas (10%) and heathland (1%) (EU, 2012). While this reflects the importance of wetlands for birds, it also highlights some potential gaps in the portfolio.

Nevertheless, birds top the LIFE charts with 585 projects targeting bird species between 1992 and 2018. As a result, improvements in the population status of many bird species can be attributed, if not wholly then in part, to LIFE projects.

6 https://ec.europa.eu/environment/nature/conservation/wildbirds/life_priority/index_en.htm

Many of these success stories are well known and have already been told in previous publications; this account updates some old favourites and introduces some new stories that have yet to be told.

KEY MESSAGES

LIFE (and ACE) have been major contributing factors to the successful implementation of the Birds Directive. The EU Member States recognise LIFE's contribution, and projects are often cited in Article 12 reports. Habitat management benefits many species, and wetlands have been the main focus for this in the LIFE programme. LIFE is responsive to changing needs by directing activity to where it is most needed - e.g. the priority species list. The innovative aspect of LIFE allows new methods and techniques to develop and proliferate. LIFE supports the extensive network of NGOs around Birdlife International in successful partnerships. Through a focus on raptors, many species, once persecuted, are now enjoying spectacular recoveries. LIFE supports species recovery from diagnosis of problems to repeat interventions resulting in a return to self-sustaining populations.

3.1.3 Status and trends

Member States report on the status of all bird species every six years through the processes elaborated in Article 12 of the Birds Directive. Since 2012, this reporting is harmonised with reporting under Article 17 of the Habitats Directive to produce the joint EU State of nature report. The data presented in the 2015 and 2020 EU State of nature reports (EEA, 2015; EEA, 2020), based on reporting under Article 12 of the Birds Directive, are compared in Figure 10.

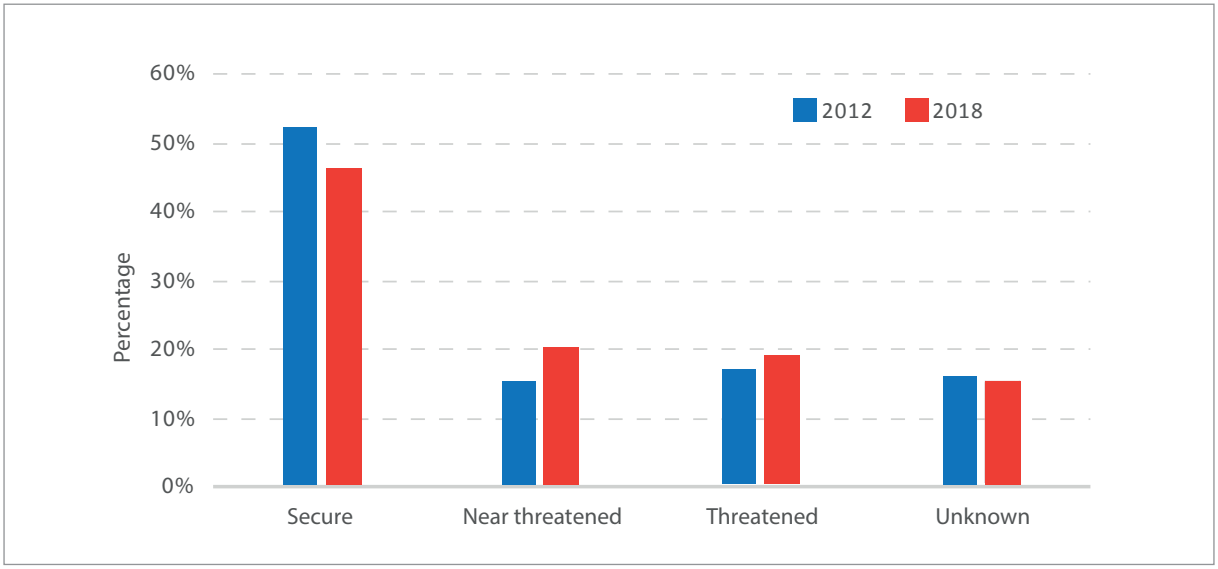
The 2020 State of nature report indicates that 46% of bird species assessed (463 taxa[7]) have a secure population status, 5% less than in 2012. The proportions of near- threatened and threatened species have increased to 20% and 19% respectively (increases of 6% and 2% respectively) and the proportion of species with unknown assessments is 15% (compared to 16% in 2012).

When considering trends in bird populations the Article 12 assessments look at short-term trends of 12 years (2007-2018) and long-term trends of 38 years (1980-2018). It is quite a complicated picture but the headline figures show that, for short-term trends for breeding birds, about half of species are either increasing (23%) or stable (28%) and a third of species (29%) are declining with the remaining 20% unknown; for wintering birds, even though about two thirds are either increasing (45%) or stable (15%) there are now more species declining (29%) in the short-term trend than in the long-term trends (12%).

The conservation status of all European birds (451 taxa) was updated in 2015 with the publication of the European Red List of Birds. For the EU-27 (data did not include Croatia) the study confirmed that three quarters of the spe-

7 *Compared to 455 taxa assessed in the 2015 State of nature report.*

Figure 10: Trends in Article 12 reports for 2012 and 2018.



EU Status	Good	Poor	Bad	Unknown
Birds Directive	Secure	Near Threatened (declining or depleted)	Threatened	Unknown
IUCN Red List	Least Concern (LC)	Near Threatened (NT)	Critically Endangered (CR), Endangered (EN) or Vulnerable (VU)	Not evaluated or Data Deficient (DD)

Table 2: Classification comparison between the Birds Directive and IUCN Red List.

cies are Least Concern (LC) but also showed that 18% of Europe's wild bird species are Critically Endangered (CR), Endangered (EN) or Vulnerable (VU), i.e., (82 species) and 6% (26 species) Near Threatened (NT), a similar figure to a previous study in 2004.

The classification of species status used in the Birds Directive and in the IUCN Red List varies in nomenclature but there is generally a good match in terms of conservation status. The three classification systems are illustrated in Table 2: this part of the report generally adopts the Birds Directive classification.

Separate to Article 12 reporting, trends in common bird populations are tracked in European Bird Census Council indices for common farmland birds and common forest birds. Between 1990 and 2016 the farmland birds index declined by 32% and the forest bird index declined by 3%, reinforcing the concern over declines in farmland species.

In addition to habitat loss and degradation many birds are also threatened by over-exploitation, persecution, land use change (through agriculture) and different land use practices, risk of collision with power lines and wind turbines, use of chemicals and illegal killings (see also Section 6.2 on wildlife crime).

EU actions through the implementation of the Birds Directive include developing Species Action Plans (SAPs) for about 50 Annex I species and Management Plans for 13 huntable Annex II species, drawing up a list of 54 priority bird species for funding under LIFE (guaranteeing 75% EU co-financing for relevant projects) and supporting NGOs within the BirdLife International partnership.

3.1.4 LIFE programme response

The EC ACE-Biotopes Programme 1984-1991[8] helped to get the Birds Directive off to an early start especially with the establishment of Special Protection Areas (SPAs). The EU LIFE publication 'LIFE for Birds' reported on progress 25 years after the launch of the Birds Directive and highlighted the important contribution the LIFE programme had made to protecting critical habitats for birds and in helping to establish and expand the network of SPAs. The following 15 years have seen these actions stepped up with greater emphasis on target species and marine SPAs.

Since the launch of the LIFE programme the EU has allocated over €500 million for LIFE projects helping to maintain or improve the conservation status of over 200 bird species[9].

Highlights of LIFE programme activity include:

- improving the habitats for all birds through a focus on Annex I species and the network of SPAs and the needs of migratory species during passage and on wintering grounds;
- helping with the preparation of SAPs such as **EuroSAP** (LIFE14 PRE/UK/000002) which updated several action plans, prepared new plans and developed the SAP tracking tool;
- helping with the identification of Important Bird Areas (IBAs) and SPAs, for example the work of the **MALTA SEABIRD PROJECT** (LIFE10 NAT/MT/000090) which led to the designation of eight marine SPAs in 2016;
- supporting actions for the priority species for LIFE identified by the ORNIS Committee, which was established to assist the EC with the implementation of the Birds Directive. LIFE projects have targeted 49 out of 54 species included in the current list (2014). These species include both widespread species and island endemics such as the iconic Azores bullfinch (*Pyrrhula murina*) found only on the island of São Miguel;
- encouraging international efforts for conservation based on flyways, such as the staging posts through Eastern Europe for the migration of the wild Fennoscandian population of Lesser white-fronted goose (*Anser erythropus*) from its breeding grounds in arctic Norway to Lake Kerkini in Greece (**Anser-Eur** - LIFE05 NAT/FIN/000105) as well as a programme for conservation of the Bearded vulture (*Gypaetus barbatus*) across the whole of the Alps;

8 *Action Communautaire pour l'Environnement* – the predecessor financial instrument.

9 https://ec.europa.eu/easme/en/news/life-and-birds-40-years-eu-birds-directive

- re-introduction of species where they were regionally extinct such as the case of the Golden eagle (*Aquila chrysaetos*) in Ireland through **Golden eagle** (LIFE00 NAT/IE/007145): by 2018 there were five breeding pairs;
- supporting the many national bird conservation groups: BirdLIFE Partners drives most of the projects with funding, capacity building and networking for sharing expertise, and developing international and cross-border actions;
- funding of actions to help tackle persecution, wildlife crime, invasive species and threats, such as electrocution on power lines, often with the direct assistance of private operators, such as electricity companies;
- raising the profile of many species, even to iconic status, such as the Spanish imperial eagle (*Aquila adalberti*), through the awareness-raising work included in all projects;
- engaging positively with land users, hunters, fishermen and other stakeholders to promote solutions to problems and to develop new ways of working for the benefit of birds such as the LIFE information project **Birds Directive** (LIFE08 INF/UK/000204) working with the farming sector and focusing on agri-environment schemes;
- supporting monitoring and research on populations and the success of management measures.

Examples of best practices and innovative actions in managing habitats for birds implemented by LIFE Nature projects during the first 20 years are collected in the publication 'LIFE managing habitats for birds'. The publication 'LIFE & Wildlife Crime' also gives examples of projects addressing specific threats to birds. Further case studies are given in 'LIFE for birds' and 'LIFE improves NATURE'.

The aspect of continuity within LIFE project conservation efforts seems to pay off for many species. In fact, outstanding improvements are generally observed for species that have been targeted by successive LIFE projects, with key implementation measures that are maintained over time. This shows the importance of well-designed and targeted projects and of continued action over the years until the species reaches a satisfactory and stable conservation status.

For many of Europe's most endangered bird species, such as the Aquatic warbler (*Acrocephalus paludicola),* their preferred habitats would soon become overgrown and unsuitable without repeated human intervention (e.g. regular mowing and grazing). The LIFE programme has repeatedly shown that it is possible to educate farmers, land managers and landowners to implement farming methods that also benefit the habitats in which Europe's threatened bird populations thrive. Indeed, the positive contribution of the LIFE programme to the conservation status of *A. paludicola* species is acknowledged in the most recent EU State of nature report (EEA, 2020).

Since the establishment of the LIFE programme support for endangered bird species and their habitats has focused on practical conservation, restoration and management actions in Natura 2000 network sites. The specific targeting of LIFE funding (75% co-financing) to the most endangered species through the ORNIS Committee has been a success. The most frequently targeted species, all of which have either a Species Action Plan or a Management Plan, are shown in Table 3.

Table 3: Most frequently targeted species in the LIFE programme with a Species Action Plan or Management Plan.

Species	Name	Number of LIFE projects (LIFE project database)	IUCN category: European Red List of Birds (EU-27)	Plan review date (on DG ENV website)
Botaurus stellaris	Eurasian bittern	82	LC	1999
Crex crex	Corncrake	66	LC	2006
Falco naumanni	Lesser kestrel	32	LC	2011
Aythya nyroca	Ferruginous duck	31	LC	2006
Gypaetus barbatus	Bearded vulture	30	VU	2018
Hieraaetus (Aquila) fasciata	Bonelli's eagle	29	NT	1997
Neophron percnopterus	Egyptian vulture	27	VU	2008
Aegypius monachus	Cinereous vulture	25	LC	2018
Aquila (Clanga) pomarina	Lesser spotted eagle	21	LC	1997
Larus audouinii	Audouin's gull	21	LC	1996

Species	Common Name	Member State	LIFE projects
Acrocephalus paludicola	Aquatic warbler	Lithuania	**Baltic Aquatic warbler** (LIFE09 NAT/LT/000233); **LIFEMagniDucatusAcrola** (LIFE15 NAT/LT/001024)
Botaurus stellaris	Bittern	Belgium	**Dommeldal** (LIFE05 NAT/B/000091); **Triple E Pond area M-L** (LIFE08 NAT/B/000036); **LIFE Hageland** (LIFE11 NAT/BE/001067); **LIFE Delta** (LIFE15 NAT/BE/000760)
Coracias garrulus	Roller	Greece	No projects, but **ROLLER LIFE+** (LIFE13 NAT/HU/000081) had regional impact.
Falco vespertinus	Red-footed falcon	Hungary	**F.VESPERTINUS HU/RO** (LIFE05 NAT/H/000122)**; REDFOOT** (LIFE11 NAT/HU/000926)
Gypaetus barbatus	Bearded vulture	Greece	**Gypaetus** (LIFE98 NAT/GR/005276); **Gypaetus II** (LIFE02 NAT/GR/008492)
Otis tarda	Great bustard	Hungary	**OTISHU** (LIFE04 NAT/HU/000109)
Sterna dougallii	Roseate tern	United Kingdom	**Roseate tern** (LIFE14 NAT/UK/000394)
Tetrax tetrax	Little bustard	France	**Little bustard** (LIFE96 NAT/F/003207); **RENF TETRAX** (LIFE04 NAT/FR/000091)

Table 4: Improving bird species conservation status through LIFE.

Lessons from completed projects can inform future habitat management actions and thus improve or maintain the conservation status of targeted bird species. Many LIFE projects have contributed to improving the population size or conservation status of birds.

Looking into the possible overall impact of the LIFE programme on the status of Annex I birds, Table 4 lists records for breeding species where the long-term trend 1980-2018 has been *decreasing* but where the short-term trend 2007-2018 has been *increasing* (i.e. there has been a turning point). The data represent genuine changes as reported by the Member States in their Article 12 report and so suggests that LIFE projects may have assisted in improving the conservation status of these species.

Halting declines in breeding populations is also a priority for LIFE, and the examples in Table 5 show where the long-term trend has been decreasing but the short-term trend is stable (i.e. the decline has been halted).

The Royal Society for the Protection of Birds (RSPB) is an experienced UK NGO with involvement in over 30 LIFE projects. The RSPB has developed a strategy for species recovery[10,11] which shows how any successful recovery is a journey from using monitoring to detect problems and then following the stages of diagnosis (research), testing solutions (research delivery) and recovery management through to the goal of sustainable management (Figure 11). This model applies to almost any species recovery work and, based on RSPB's experience, LIFE funding is most effective at the recovery management stage in making a real push for self-supporting populations. For example, with the help of LIFE funding the Bittern (*Botaurus stellaris*), Capercaillie (*Tetrao urogallus*), Corncrake (*Crex crex*) and Stone curlew (*Burhinus oedicnemus*) are all at the recovery management stage in the UK.

10 www.rspb.org.uk/globalassets/downloads/documents/conservation--sustainability/safeguarding/safeguarding-species.pdf
11 http://ww2.rspb.org.uk/Images/100_species_tcm9-262042.pdf

Table 5: Halting long-term decline through LIFE.

Species	Common Name	Member State	LIFE projects
Alcedo atthis	Kingfisher	Slovakia	**LIFE BeeSandFish** (LIFE12 NAT/SK/001137)
Aythya nyroca	Ferruginous duck	Slovakia	**AYBOTCON** (LIFE09 NAT/SK/000395)
Crex crex	Corncrake	Slovenia	**Crex Slovenia** (LIFE03 NAT/SLO/000077)
Crex crex	Corncrake	Ireland	**Termoncarragh** (LIFE00 NAT/IRL/007128)
Lullula arborea	Woodlark	Luxembourg	**LIFE Grassland Luxembourg** (LIFE13 NAT/LU/000068)
Porzana porzana	Spotted crake	Netherlands	Several fen restoration projects including **A better LIFE for Bittern** (LIFE13 NAT/NL/000167); **LIFE+GP** (LIFE13 NAT/NL/000079)

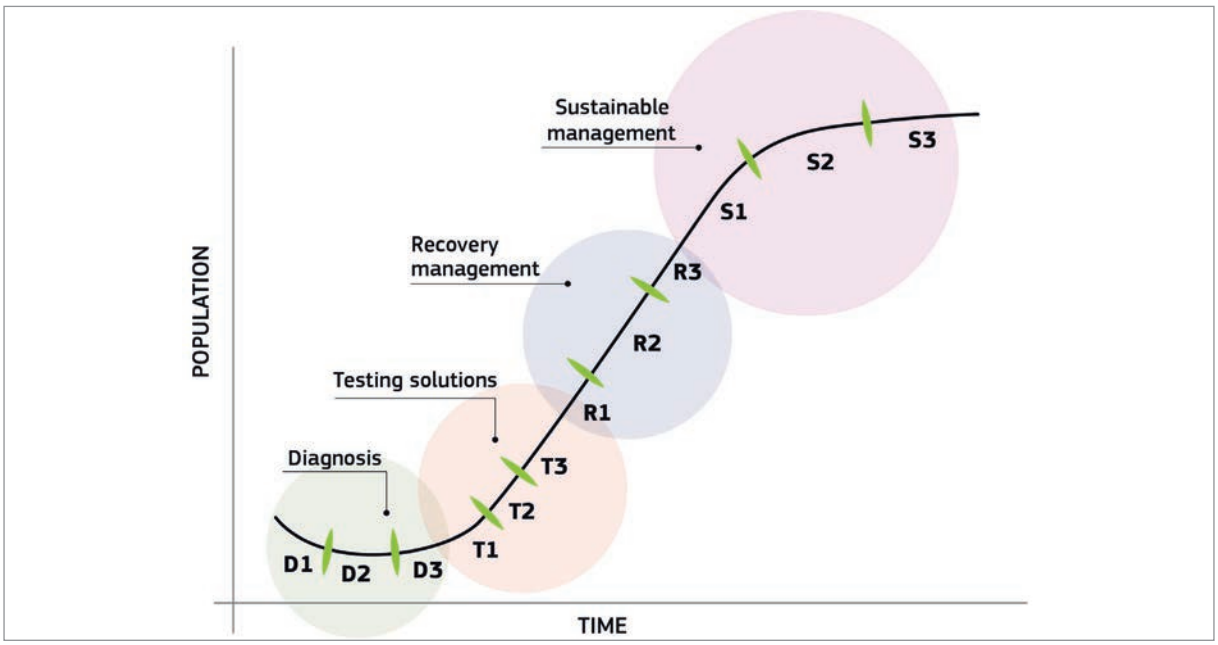


Figure 11: The Species Recovery Curve (after RSPB: Safeguarding species)

As the distribution and conservation status of most bird species is intimately linked to the habitat in which they live, we have organised the LIFE projects featured in this document according to four main habitat types: marine and coastal, wetland, grassland and farmland, and forest. In addition, birds of prey are treated separately, as they span a range of habitat types and are also susceptible to some different threats such as poisoning of their food supply. There are many LIFE projects featuring birds which are success stories and the most prominent have already been written about, some on more than one occasion, in previous LIFE publications. In this document we have tried to focus on some of the lesser known successes and, while we will refer to the more well-known cases, we will attempt not to repeat information that can be found elsewhere. The distinctions between these habitat types are often blurred as some species rely on more than one habitat to survive and this is recognised in the text.

Marine and coastal birds

The first EU LIFE publication on birds covering the first 25 years of the Birds Directive (EU, 2004) notes that 12% of bird projects featured marine birds and specifically mentions Cory's shearwater (*Calonectris diomedea*), Balearic shearwater (*Puffinus mauretanicus*), Zino's petrel (*Pterodroma madeira*) and Audouin's gull (*Larus audouinii*) as examples of endangered, localised or endemic species which benefited from the initial LIFE financing through conservation of their nesting sites and addressing the main limiting factors for their survival.

In the 'LIFE managing habitats for Birds' publication the important work of defining marine IBAs and potentially expanding the SPAs for marine birds featured three pioneering projects: **IBAMarinha** (LIFE04 NAT/P/000213), **IBA MARINAS** (LIFE04 NAT/ES/000049) and **INDEMARES** (LIFE07 NAT/E/000732). The vital work started by the **INDEMARES** project is now being implemented in the Spanish **LIFE-IP INTEMARES** (LIFE15 IPE/ES/000012) (see also Section 3.7.2). The same publication featured finding solutions for Audouin's Gull in Catalonia **Larus Cataluña** (LIFE02 NAT/E/008612), and protecting Fea's petrel (*Pterodroma feae*) and Zino's petrel in Portugal **SOS Freira do Bugio** (LIFE06 NAT/P/000184). The latter two examples focused on preserving adequate habitats for species, control of competitor species and in the latter case: reduced human impact from killing. One thing is clear, ground nesting seabirds are vulnerable to widespread predation and the Brown rat (*Rattus norvegicus*) is one of the main predators. While numbers can be controlled on islands, eradication on the mainland remains challenging.

In France, **LAG'Nature** (LIFE07 NAT/F/000193) and **LIFE+ ENVOLL** (LIFE12 NAT/FR/000538) through the restoration and enhancement of wetland and coastal habitats had a likely impact on the breeding populations of a variety of bird species whose trend is assessed as 'increasing' for the period 2012-2018: Sandwich tern (*Thalasseus sandvicensis*), Little tern (*Sternula albifrons*), Common tern (*Sterna hirundo*), Mediterranean

gull (*Ichthyaetus melanocephalus*), Slender-billed gull (*Larus genei*), and Black-winged stilt (*Himantopus himantopus*). **LIFE+ ENVOLL** implemented a variety of measures in nine Natura 2000 sites in the south of France, which included the restoration and/or installation of 36 breeding 'rafts', the improvement of the water regime over 491 ha, the training for Natura 2000 site managers, and a local education and dissemination campaign. During **LIFE+ ENVOLL** the total number of breeding pairs of all species increased from 10,000 to 18,000 in the project area.

Yelkouan shearwater

The Yelkouan shearwater (*Puffinus yelkouan*) features briefly as a success story in the brochure 'LIFE Improves NATURE' and the factsheet 'LIFE is good for Nature!'. Three LIFE projects in Italy and three in Malta are credited with helping to improve the conservation status of this species which is considered to be secure with increasing long- and short-term trends in both countries. The species only breeds on isolated islands of the central and eastern Mediterranean. The European population is listed on the Red List as vulnerable, although with an increasing population size, and the main threats are predation by rats, litter, fishery bycatch, stranding caused by light pollution and invasive alien plants around nesting sites.

In Malta, LIFE secured breeding sites by eradicating rats and providing artificial nests. The following projects contributed to this success story: **GARNIJA-MALTIJA** (LIFE06 NAT/MT/000097), **MALTA SEABIRD PROJECT** and **LIFE Arcipelagu Garnija** (LIFE14 NAT/MT/000991). See also EU (2018a) and the LIFE makes a difference ex-post study for more information on these Maltese projects. One of the most important findings to come out of these projects is that although protecting the onshore breeding habitats is critical to their long-term survival, the importance of protecting the birds in their offshore habitat is equally essential – and arguably the threats here are more difficult to address.

Based partly on the success of these projects, **LIFE Artina** (LIFE17 NAT/HR/000594) aims to identify marine SPAs at sea in southern Croatia for this species and eradicate rats which are the main predator. Hopefully, this project will have the same success as its predecessors in the revival of this shearwater.

Roseate tern

One species that has never featured before is the Roseate tern (*Sterna dougallii*) which is listed in Annex I of the Birds Directive. This species, a priority for funding through LIFE, is classed as rare in Europe by BirdLife International and is also a species of European Conservation Concern. It breeds in just two areas of Europe, namely the Azores and the far northwest. This north-western metapopulation is spread across a small number of sites in France, the UK and Ireland. In 2005, the French sites were targeted through **Dougall** (LIFE05/NAT/F/000137) where the main threats to the species were predation by Red fox (*Vulpes vulpes*), American mink (*Neovison vison*), and Peregrine falcon (*Falco peregrinus*). The project successfully controlled the mammalian predation through fencing the nesting areas and they also installed a photovoltaic energy supply to one location, removing the wind turbine which caused significant mortality locally. The continued presence of the predators in some locations meant that at the end of the project there was still work to do.

In the UK, *S. dougallii* has declined since a high point in the 1960s. The cause of this decline is not fully understood, but contributing factors are thought to include predation and disturbance at breeding colonies, loss of nesting sites, emigration to Ireland, and trapping and/or fishing impacts on the wintering grounds in West Africa. Five UK SPAs have the Roseate tern as an interest feature, but only one of these supports an established population. So, **LIFE14 Roseate tern** (LIFE14 NAT/UK/000394) set out to improve the conservation prospects of this species in the UK and Ireland with an overall aim of contributing to a longer-term goal of improving the conservation status of Roseate tern right across Europe through working on sites with potential for expanding the colonies. Still ongoing, the project has already successfully eliminated a wide range of bird predators (gulls, ravens, crows). Controlling bird predators can be problematic and the project has developed a new technology – aerolaser gull scarers – to control numbers. The mammalian predators (foxes, mink, rats, otters) can be equally difficult as methods to control rats are very different from those needed to control otters (*Lutra lutra*). The team networked with practitioners in France to share their experience to enable replication of their work at the French colony sites. Pest species are controlled using baited traps, whereas anti-otter and geese fencing has been erected where needed. In addition, nesting habitat enhancements, such as nest boxes, vegetation management and installation of platforms have all been used to increase the area

available for colonisation. The most dramatic interventions have been coastal management through the construction of bunds and breakwaters and shingle recharge on some beaches. One clear message is that there is no 'one size fits all' solution, and concrete conservation actions need to be tailored to meet the suite of threats and the site conditions. The result is that there has been a positive change (30% increase in number of pairs across all colonies) in the conservation status of this species in the UK and Ireland, the strategic approach of the project supports the EU Species Action Plan[12], and the work done in Western Africa has reduced the number of birds taken through trapping. Overall, the future for this metapopulation of the Roseate tern does indeed look rosy!

Wetland birds

There is quite an overlap between marine and coastal and wetland species. Wetlands are being converted to other uses and are also vulnerable to climate change and yet they support a wide range of bird species, such as ducks, waders and other waterfowl. Article 4 of the Birds Directive requires Member States to pay attention to the protection of wetlands and particularly to wetlands of international importance. As a result, wetland birds feature heavily in the LIFE portfolio: projects targeting this habitat often benefit a wide range of bird species because inland wetlands, arguably the habitat suffering the most contraction in Europe, are the main habitat for over 100 endangered bird species. So, from the very beginning of the LIFE programme, the restoration of wetland habitats has been a top priority for projects and in the EU (2004) review of the contribution of the LIFE Nature projects to the Birds Directive, an impressive 34% of projects at that time featured wetlands. The programme has continued to build on the results of these first successes and these first few examples illustrate how concerted and concentrated action over a long period can gradually have a positive impact on the conservation status of species groups.

A little-known success story is Gulf of Finland (LIFE03 NAT/FI/000039) which was one of the first projects to address the importance of well-established flyways for migrating birds in Finland. The 12 wetland restoration sites chosen within the project were all of high conservation value but threatened due to changes in agricultural practices and close proximity to densely inhabited areas. By restoring the wetlands, introducing cattle grazing and vegetation management, the project secured a Northern Coastal Gulf of Finland flyway for several bird species included in the Birds Directive and simultaneously secured good conservation status for several specialised wetland species of the Habitats Directive. Several of the restoration areas targeted were among Finland's most famous bird conservation areas. Today, these areas function as important resting and nesting areas for the birds, leading to a continuous increase in wetland bird populations in the area, according to the 2017 ex-post study. Research from the project shows that the funds invested in wetland management not only correlated with an increase in common species, but also with an increase in red-listed species (35 species mentioned in Annex I of the Birds Directive altogether).

In Sweden, three projects aimed at creating breeding sites for water birds through the restoration of suitable habitats: GRACE (LIFE09 NAT/SE/000345), LIFE Coast Benefit (LIFE12 NAT/SE/000131) and LIFE+ Vänern (LIFE12 NAT/SE/000132). **GRACE** restored 988 ha of valuable overgrown semi-natural habitats in the Swedish Archipelago. The project targeted 10 species listed in the Birds Directive. **LIFE Coast Benefit** improved the quality of grassland habitats on 2,600 ha of southeast Swedish coast. Wetland habitats with their content of flora and fauna were also restored and 26 ha of new wetlands were created by filling in ditches. Water returned to these areas and so did the birds. **LIFE+ Vänern** restored important breeding and staging sites for bird species listed in Annex I of the Birds Directive, around Lake Vänern in Sweden. The project also decreased disturbance at bird breeding sites. Concrete conservation actions included the clearing of vegetation overgrowth on 214 skerries (small islands), which were important for colonies of breeding birds; clearing grassland habitats on 98 ha; restoring by burning of grassland and heather on 28.7 ha; and restoring 17.7 ha of Western taïga forest habitat through controlled burning. Grazing was reintroduced on 114 ha of pastures. Two breeding islands for birds were also built. The project targeted 11 species listed in Annex I of the Birds Directive. The aforementioned projects have undoubtedly contributed to increasing populations of the following species: Caspian tern (*Hydroprogne caspia*), Bar-tailed godwit (*Limosa lapponica*), Arctic tern (*Sterna paradisaea*), Little tern *(Sternula albifrons),* Sandwich tern *(Thalasseus sandvicensis),* Barnacle goose (*Branta leucopsis*), White-tailed eagle (*Haliaeetus albicilla*).

Successive projects targeting the coastal polders and wetland habitats of Natura 2000 sites in Bel-

12 https://ec.europa.eu/environment/nature/conservation/wildbirds/action_plans/docs/sterna_dougalii.pdf

gium have improved the habitat conditions for a variety of waders and other species relying on these habitats for feeding and breeding: Flemmish polders (LIFE99 NAT/B/006295), UITKERKSEPOLDER (LIFE03 NAT/B/000023), ZTAR (LIFE09 NAT/BE/000413), and LIFE Oostkustpolders (LIFE12 NAT/BE/000252). Taken together, these projects may be considered as a meta-project because they targeted the same habitats and improved conditions for many species over hundreds of hectares. The following species are assessed as 'increasing' in Belgium over both the short term and long term, partly thanks to the LIFE programme support to coastal and wetland habitats over the years: Shelduck (*Tadorna tadorna*), Redshank (*Tringa totanus*), *Thalasseus sandvicensis*, Whinchat (*Saxicola rubetra*), Avocet (*Recurvirostra avosetta*), Mediterranean gull (*Larus melanocephalus*), Bluethroat (*Locustella luscinioides*), Common snipe (*Gallinago gallinago*) and Tundra bean goose (*Anser fabalis rossicus*). The projects have purchased land, then restored the hydrology and the topography of the wetlands/grasslands and maintained the systems using specific grazing regimes and, in some cases, expanded the Natura 2000 network. Involving the farming community and capitalising on the benefits of agri-environment schemes to continue to deliver nature conservation has been key to maintaining this habitat through management contracts, with the lead beneficiary to manage the restored meadows. Some proactive farmers have even exploited new business opportunities by rearing cattle breeds (e.g. Blonde d'Aquitaine) that are better adapted to the saline grasslands, need little veterinary involvement, and offer high-valued meat that can be marketed as a local product.

Other species have also benefited (and not only birds) even if their conservation status has not, as yet, shown recovery. An ex-post visit carried out in 2017 concluded that the **ZTAR** project had very successfully restored salty polder habitats and their associated species, which continue to be under pressure from urbanisation and intensification of agriculture. Habitat restoration has been particularly beneficial for the Black-tailed godwit (*Limosa limosa*) and *Tringa totanus*, and the first breeding attempt by the Eurasian spoonbill (*Platalea leucorodia*) was observed in 2016.

Although most projects provide multiple benefits for a range of species, there are some amazing individual success stories.

Avocet

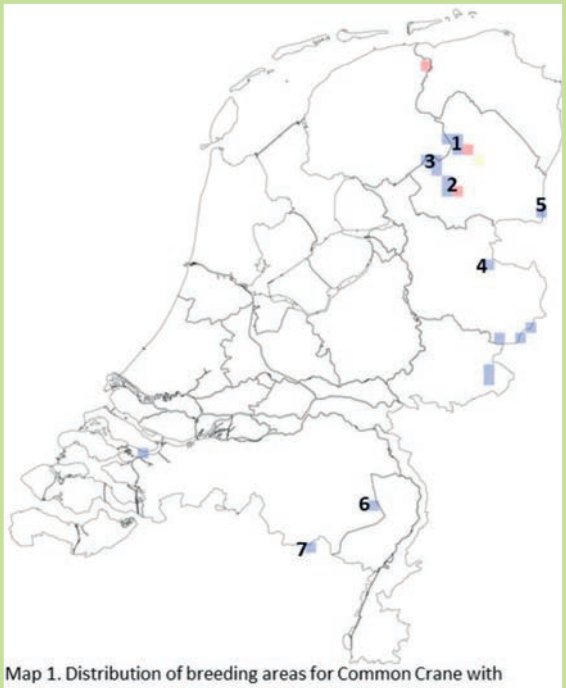
The successive projects implemented over large polder areas in Belgium (listed above) also contributed to the positive trend of the Avocet (*Recurvirostra avosetta)*, with an increase in the number of breeding pairs. The success of the series of projects for *R. avosetta* may be attributed to the fact that the nesting area of the species is limited and the requirements for the nesting sites are very precise, illustrating the value of projects targeting specific species with specific habitat requirements and a limited range. Several other LIFE projects have the Avocet as a target species and the species shows an increasing trend not only in Belgium but also in the UK and Spain.

In the UK, the Avocet is seen as a key species in the story of conservation: indeed, the Avocet is the logo of the UK's largest bird NGO, the RSPB, itself a recipient of over 30 LIFE projects. The Avocet represents a spectacular recovery of a bird once extinct in the UK, but which reached record numbers in lagoons and estuaries in England in 2015. The first reappearance of *R. avosetta* was in 1947 in East Anglia, where the coastal marshes were flooded to defend the UK against potential invasion, and it has been expanding northwards and westwards ever since. LIFE projects have been part of this recovery and actions have focused on creating new breeding sites safe from predators through some fairly ambitious managed realignment of the coastline. Projects like Alde-Ore (LIFE08 NAT/UK/000199) and its predecessor Wild Ness (LIFE97 NAT/UK/004245), TaCTICS (LIFE07 NAT/UK/000938) and saline lagoons (LIFE99 NAT/UK/006086) look more like engineering projects than nature projects! Earth moving equipment features heavily in these projects, as coastlines are reshaped to provide better habitat for bird nesting and feeding. Although a project, or series of projects, may successfully halt the decline of a species there is always a need for recurring management.

In Spain, Delta LAGOON (LIFE09 NAT/ES/000520) had a significant impact on the Avocet population present in the Ebro Delta (wintering and passing). LIFE-SALINAS (LIFE17 NAT/ES/000184) seeks to improve the nesting and breeding conditions for waterfowl in the SPA Salinas y Arenales de San Pedro del Pinatar, which includes *R. avosetta*.

In the spotlight: Long-term restoration attracts Common crane to breed again in the Netherlands

Another back from the brink success story features the Common crane (*Grus grus*) which has not bred in the Netherlands for centuries. Thanks to the expansion of the German population westwards, and the intervention of several LIFE projects which have been actively restoring areas to enhance the habitat for cranes in three locations (Fochteloërveen, Dwingelderveld and Engbertsdijkvenen), cranes are once again breeding in the Netherlands.



Map 1. Distribution of breeding areas for Common Crane with indication of numbers of the areas of the different LIFE projects. (Source/ Sovon Vogelonderzoek Netherlands, Vogelatlas 2013-2015)

In Fochteloërveen, LIFE projects Fochteloërveen (LIFE99 NAT/NL/006280) and the Dutch crane resort (LIFE08 NAT/NL/000193) improved hydrological conditions and restored the habitat through rewetting and zoning human activity to reduce pressure and expand the area resulting in a larger block of undisturbed breeding habitat, which is a prerequisite for this species to breed successfully.

"Healthy Heath" (LIFE08 NAT/NL/000192) was a large-scale restoration project in the National Park Dwingelderveld which restored intensively used agricultural land into wet and dry heathland. The hydrology was restored and a public road was removed, while enlargement and rewetting of the area reduced noise and disturbance. The project united different stakeholders, public authorities, the forestry agency, water board and a nature NGO. The project originated from the need to create water storage protecting local communities and farmers from extreme weather, was then linked to the ecological needs of the target habitats. Since the project closed in 2013, the numbers of breeding pairs of cranes and the breeding success is rising. Indeed, the success is spilling over to another area close to the Dwingelderveld and Fochteloërveen, where cranes have been breeding successfully in 2017 and 2018. The success may in part be due to the habitat restoration efforts of the recently completed LIFE going up a level (LIFE13 NAT/NL/000162).

The third area where cranes were found breeding is the Engbertsdijkvenen. Between 2006 and 2008, the project Engbertsdijkvenen (LIFE06 NAT/NL/000075) dramatically changed water levels by installing dams. AddMire LIFE (LIFE18 NAT/NL/000636) will continue the good work with the hydrological restoration for the conservation of raised bogs. In 2018, 32 pairs were observed in the Netherlands and more areas were colonised (among which Bargerveen, Mariapeel and Groote Peel), now expanding the crane breeding area to the east and south of the Netherlands. Here habitats and hydrology were restored at a large scale in the projects Bargerveen (LIFE04 NAT/NL/000206), Peelvenen (LIFE11 NAT/NL/000777) and Life+GP (LIFE13 NAT/NL/000079).

Despite these successes, threats like predation and drought, two risks that have a large impact on the breeding success, still exist. Drought not only limits food availability but also increases predation. A large increase of cranes was observed in 2018, but mainly due to drought only seven chicks were raised.

Dalmatian pelican and Pygmy cormorant

The aim of Mikri Prespa (LIFE02 NAT/GR/008494) was to improve the conservation status of the Dalmatian pelican (*Pelecanus crispus*) and the Pygmy cormorant (*Microcarbo pygmaeus* syn. *Phalacrocorax pygmeus*), both priority species for LIFE, but it was also expected to be of direct benefit to at least 18 other species listed in the Birds Directive. More specifically, the project aimed to increase the variety of habitats and the surface of water meadows, at the same time creating an integrated system of water and vegetation management on lake Mikri Prespa on the border of Greece and Albania. A key action envisaged was the rehabilitation of an old sluice so that the volume of water flowing out of the Mikri Prespa into the Megali Prespa, a large lake to the north, would be sufficiently controlled. In order to manage the vegetation, the project planned controlled grazing by Water buffaloes and cutting by mechanical means on the basis of a management plan already drawn up in 1996 by the Society for the Protection of Prespa. Although it is difficult to establish a scientifically sound connection between the project's actions and the conservation results, it is a fact that during the duration of the project the Dalmatian pelican population increased from 600 to 1,200 pairs. This change was reported in 2006-2007, thus, near the completion of the project. Today (confirmed during the ex-post visit in 2018), the population is estimated at around 1,200-1,500 pairs. Similar positive results were recorded for the Great white pelican *(Pelecanus onocrotalus)* and the Pygmy cormorant. This may be attributed to the fact that the project opened areas for feeding, whereas before there were extensive reedbeds. A success also related to the project's actions was the reappearance of the Glossy ibis (*Plegadis falcinellus*) in the spring of 2007, a characteristic wet meadow species absent for 35 years in the area, due to the increase of the water level in areas cleared of reed. The Great egret (*Ardea alba*) has also benefited from the project, also due to the wet meadows as its population increased from 15 to 70 pairs and started to show this positive trend after 2007. Here, the LIFE project made a significant contribution to the implementation of the Birds Directive, as the *P. crispus* colony in the site covered by the project is the largest in the world.

Grassland and farmland birds

As the EU (2014) publication LIFE for Birds points out, lowland farmland includes habitats on which some species are widely dependent. Examples include low-intensity hay meadows, a crucial habitat for Corncrake (*Crex crex*), traditional hand-cut sedge meadows for the Aquatic warbler (*Acrocephalus paludicola*), diverse mixed farmland landscapes for the Partridge (*Perdix perdix*) and Red-backed shrike (*Lanius collurio*) or dry grasslands and extensive dry cereal cultivation in southern, central and eastern Europe, habitat for several species of birds of prey and the Great bustard (*Otis tarda*). These birds have featured in several LIFE publications to date which can be consulted for further reading.

Key messages from the 2020 EU State of nature report are that farmland and forest (see next section) birds have the lowest rates of improvements (9%). Moreover, status assessments of bird species show an exceptionally high rate of non-secure populations at 75% for species present on farmland. Short-term population trends for farmland birds reveal 58% as deteriorating, 18% as stable and 15% as improving, which echoes the trend of the common farmland bird index. Basically, there is a significant decline in populations with no signs of recovery.

Previous LIFE projects focusing on these bird populations have met with some success, although the scale and nature of the problem means that for a project to be successful it needs to operate over a wide area or promote a change in behaviour across a significant target group.

An example of managing large areas for grassland species can be found in Germany where a series of projects have focused on the Dümmer, a large lake in southern Lower Saxony. With a surface area of 13.5 km^2 and an average depth of only 1 m, the lake is an important biotope for water birds and migratory species. The story starts in 1998 with the Re-Wetting of the Ochsenmoor on the Dümmer (LIFE98 NAT/D/005085) when the beneficiary purchased land and restored the hydrology to 1,000 ha using 23 adjustable weirs to regulate the flow; the resulting grasslands were then leased to farmers in the summer under bird-friendly, long-term contracts. Then came Westliche Dümmerniederung (LIFE02 NAT/D/008456) which rewetted a further 1,200 ha of land using the same techniques. Positive results on bird populations were already being felt when the project closed in 2007. Then, in 2010, came Wachtelkönig&Uferschnepfe (LIFE10 NAT/DE/000011) which targeted habitat improvements for two species: *Crex crex* and Black-tailed godwit (*Limosa limosa*). Again, the project acquired land and put in water control measures which would be effective over 2,000 ha of land; the rewetted land is already showing promise, but some locations have yet to prove attractive to the target species. The story is not yet complete, however, as there is a

new Integrated Project, **GrassBirdHabitats** (LIFE19 IPE/DE/000004), which will purchase an unprecedented 20,000 ha of land bordering the Dümmer, control the water levels through advanced hydrological techniques to restore the habitats and then promote a farming business model for managing wet grassland birds to improve the effectiveness of agri-environmental schemes. The project builds on the success of the previous LIFE projects where the two re-wetting exercises have led to a steep increase in Common redshank (*Tringa totanus*) numbers. All in all, 10 breeding species which had disappeared from the grasslands have already returned. The project includes the development of a strategic plan for the Atlantic Region for grassland bird conservation linked with a plan for West Africa, an essential location for the migratory species.

In contrast, the **Birds Directive** project focused on trying to change the behaviour within the farming community across the entire UK. The project offered farmers a free survey of bird species on their farm and then advice on what techniques they could employ to improve the habitat for the 15 target species. This was all delivered by the beneficiary's own agricultural advisers. They provided advice to 1,000 farmers covering an area of over 200,000 ha with an estimated 100,000 ha entering agri-environment schemes. The beneficiary still promotes farm advice on the website and still has a really good relationship with farmers but although the scale of the project was significant, the beneficiary could only reach 3% of all the farmers in the UK in a 10-year timespan. The Farm Wildlife website was a major output of the project: it is still available today and has been upgraded with a much wider range of treatments from beetle banks to rush pastures to wildflower meadows. Many of the case studies are contributed by the farming community, but even with all this effort it is difficult to determine positive trends in farmland bird populations.

Great snipe

The Great snipe (*Gallinago media*) is listed as near threatened on the IUCN Red List because it is thought to be experiencing a moderately rapid population decline, owing primarily to habitat loss and degradation, as well as hunting pressure. There has been a widespread decline in the EU, too: the population is estimated at 4,600-7,400 calling males. The destruction and deterioration of the Great snipe's habitat is the major cause of its decline. Intensive drainage of marshland and the intensification of farming have greatly reduced the extent of suitable breeding and feeding habitat. Furthermore, large numbers are shot every year. Despite the overall decline, **LIFEGALLINAGO** (LIFE11 NAT/PL/000436) has succeeded in stabilising the population of the species in two key SPAs in Poland. More than 300 ha of the Great snipe's habitats are already under active protection, even if this is not reflected in the recent Polish Article 12 report (with the population estimated for 250-450 calling males both the long-term and the short-term population trends were reported as decreasing). The project and SPA guidelines continue through an ongoing follow-up project - **LIFEGALLINAGO ACTION PLAN** (LIFE17 NAT/PL/000015).

Aquatic warbler

The Aquatic warbler (*Acrocephalus paludicola*) has been featured in a number of LIFE publications and is the rarest globally threatened passerine bird of mainland Europe with a very small world population of only 13,500-21,000 pairs and is, quite rightly, a priority species in the LIFE programme. Once widespread and numerous on fens, mires and wet meadows, this habitat specialist has disappeared from most of its former key range due to habitat loss and degradation. With its habitats nowadays dependent on human land use and being extremely susceptible to changes in traditional land use, it is now effectively a conservation dependent species. Habitat loss, as well as drainage and unfavourable land use (cessation of extensive farming or intensification of farming), which decrease habitat quality remain the principal threats. Several projects implemented in Poland, Germany and Lithuania have tackled this problem starting with **Aquatic Warbler project** (LIFE05 NAT/PL/000101), through **Baltic Aquatic Warbler** (LIFE09 NAT/LT/000233), **Biomass use for Aquatic Warbler** (LIFE09 NAT/PL/000260), to **Renaturyzacja II_LIFE_PL** (LIFE13 NAT/PL/000050). The first conservation step was usually to restore the natural water level – through closing of ditches, building of sluices and adjusting the operation of water pumps. High water levels also prevent growth of trees and bushes on marshes. The second step was to introduce actions which imitate the raditional but abandoned farming practices – mowing or grazing – to eliminate reed or bushes and maintain appropriate vegetation structure.

LIFEMagniDucatusAcrola (LIFE15 NAT/LT/001024) carried out a translocation of birds from Belarus to support the local population. All these efforts led to a positive population trend reported by Poland and Lithuania. The population of Aquatic warbler increased by 20% in the Biebrza Valley, its main area in Poland. **LIFE PALUDICOLA** (LIFE16 NAT/ES/000168) adopts similar measures in Spain through land purchase, controlled grazing, removing

biomass, improving hydrology, and controlling predators, notably American mink. Significantly, the project is acting on this species' main spring and autumn migration routes between Europe and Africa. The impact of the early LIFE projects on this species is acknowledged in the EU State of nature report (EEA, 2020).

White stork

Another example of a farmland bird species whose population has been increasing in certain countries thanks to the LIFE programme is the White stork (*Ciconia ciconia*). A significant reduction of mortality of the White stork has been achieved in the most important SPA in Poland by making electrical installations safe in **ochrona bociana białego** (LIFE09 NAT/PL/000253). The project also increased the food base for the White stork by constructing ponds and installing hydrological control, thereby creating more favourable breeding sites for prey species. As a result, a significant increase of the breeding success of *C. ciconia* has been observed in the project area, which certainly contributes to the overall positive population trend of this species, as mentioned in Poland's latest Article 12 report. Similar actions are carried out in **LIFEciconiaPL** (LIFE15 NAT/PL/000728). The project covers the centre of the White stork's distribution in Poland (north-eastern part of the country) including 18 Natura 2000 sites. Although the project is unlikely to have contributed to the latest results reported in the Article 12 report there are good indications that the increasing trend will be maintained.

A Lithuanian project for White stork conservation, **White Stork Conservation** (LIFE07 NAT/LT/000531) was also very successful. It identified priority areas for species protection, built artificial nests and made energy infrastructure safer for the birds. The White stork's breeding inventory carried out in Lithuania in 2010 revealed a doubling in the number of nests compared to 1994. It can be assumed that the LIFE project had a significant contribution to this. Nevertheless, the trend for the White stork's breeding population in Lithuania has been decreasing, according to the latest Article 12 report.

Forest birds

The status of forest birds is not a major concern in the EU although about a third of Annex I bird species are forest-related and recent surveys have found that more than 30% of bird species linked to forest habitats had an unfavourable conservation status. The 'common forest birds' index, based on evaluation of 34 species, shows no decrease in the 1990-2017 period.

Several LIFE projects have targeted the grouse species of European forests, including the Capercaillie (*Tetrao urogallus*) with 21 projects and the Hazel grouse (*Bonasa bonasia*) with 14 projects. Actions which favour these species are working with foresters and hunters to improve the forest structure for the species, reducing recreational disturbance and reducing mortality from collisions with fences. Local improvements to Capercaillie populations were achieved by a number of projects, including several focused specifically on the species, including **Capercaillie** (LIFE02 NAT/UK/008541) where urgent action has initiated the recovery process which is now being carried forward by habitat improvement actions in **LIFE 100% favourable** (LIFE18 NAT/UK/000838).

LIFE projects have greatly assisted with the conservation of rare and endemic species in the Azores, Madeira and the Canary Islands. Included in this set are the following LIFE priority species: White-tailed laurel pigeon (*Columba junoniae*), Azores bullfinch (*Pyrrhula murina*, see also 3.7.7), and Blue chaffinch (*Fringilla teydea).*

Blue chaffinch

The Blue chaffinch (*Fringilla teydea*) is endemic to the Canary Islands and is restricted to pine forests of Gran Canaria. It is classified as near threatened by the IUCN. The small population size, predation (especially by feral cats), coupled with degradation and decline of its habitat (partly due to recurrent fire events) are the main threats. In 2007, a major fire event affected the largest pine forest in the Island, which reduced by half the Blue chaffinch population (estimated at c. 140 individuals in 2007 after the fire). The projects **Inagua** (LIFE07 NAT/E/000759) and **LAMPROPELTIS** (LIFE10 NAT/ES/000565) addressed these threats and this has resulted in a steady increase of the population over the years and a small expansion of the distribution area, although it is still at risk and recurrent monitoring and management are crucial to ensure the subspecies' survival. The population had recovered to pre-fire levels by 2011, and has continued to increase since then. The project **LIFE+PINZON** (LIFE14 NAT/ES/000077) carried out several translocations of individuals from the main site 'Inagua' to establish a new population at 'La Cumbre', where 29 pairs are now breeding. Recent data (2019 estimations) indicate a population size of 430 individuals.

White-backed woodpecker

As highlighted in the EU Biodiversity Strategy for 2030, there is concern about the conservation of old growth forests and their associated wildlife, such as the Western taï-

ga forest in Sweden and Finland, home to the white-backed woodpecker (*Dendrocopos leucotos*) and targeted by projects White-backed woodpecker (LIFE95 NAT/S/000517) and Western taiga (LIFE95 NAT/FIN/000102; see also 3.7.7). The species population is increasing in Finland but remains rare and threatened in Sweden. LIFE project actions have included developing habitat networks, increasing the proportion of broadleaved trees by removing conifers, creating and maintaining dead hardwood habitat and creating clearings. Without such measures, which benefit a broad range of species, the forests would gradually become dominated by spruce trees which are unsuitable habitats for nesting and feeding of *D. leucotos*.

European nightjar

Forest, open scrub and heath provide a mix of habitats favoured by several species including the Nightjar (*Caprimulgus europaeus*) and Woodlark (*Lullula arborea*). Several projects in Belgium[13], together forming a meta-project, improved the open habitats by the removal of coniferous forests and other exotic plantations and thus creating nesting conditions for these species. Almost all of these projects reported an increase of nesting birds on the project sites. An ex-post visit to Liereman (LIFE04 NAT/BE/000010) conducted in 2018 showed that *C. europaeus* and *L. arborea* experienced an enormous boost after the project. The number of Woodlarks increased from three territories in 2005 to 18 territories in 2015. The number of Nightjars was not so spectacular, but partly because there was no information about the population size at the start of the project. The population in 2010 was estimated at 10 breeding pairs, while 12 territories were occupied by calling males in 2018, so the trend is stable or even slightly increasing. THAT'S-LIFE (LIFE13 NAT/UK/000451) targeted lowland raised bog restoration – but as the SAC was also designated for the European nightjar it was important to monitor the impact of the works as the objective was also to increase the population by 15% which was achieved by the end of the project. However, the real successes were in the monitoring techniques that were adopted and the knowledge gained of the feeding ranges and breeding habits of this quite elusive species. The results confirm that the impact of the LIFE projects on birds can be significant locally, substantially contributing to the overall conservation status of a given species at the national level.

Birds of prey

Birds of prey are a frequent target of LIFE projects and the contribution of the LIFE programme to their protection is undisputed. Since the early days of the LIFE programme, raptors (33%) together with water birds (34%) comprised most of the bird projects (EU, 2004) and have understandably featured significantly in many of the LIFE publications on birds. These publications contain information about iconic species such as the Spanish imperial eagle (*Aquila adalberti*), where 24 LIFE projects have contributed to an improvement in its conservation status, Bonelli's eagle (*Aquila fasciata* syn. *Hieraetus fasciatus*), Greater and Lesser spotted eagles (*Aquila clanga* and *A. pomarina*), Black (Cinereous) vulture (*Aegypius monarchus*), Griffon vulture (*Gyps fulvus*), Red footed falcon (*Falco vespertinus*) and Saker falcon (*Falco cherrug*). The species most featured is the Bearded vulture (*Gypaetus barbatus*) with an up-to-date summary of the impact of six LIFE projects which addressed main threats in the Alps, Massif Central and Andalusia and resulted in an increasing population trend in France and Spain between 2008 and 2012. These species are all LIFE priority species.

The species that follow are birds of prey whose stories have not yet been told.

White-tailed eagle

According to Member State reports in 2019, populations of White-tailed eagle (Haliaeetus albicilla) are increasing in Finland, Lithuania, Slovakia, Denmark, Poland, the Netherlands and Sweden. A series of 24 LIFE projects carried out between 1995 and 2017 has been influential in this recovery.

The first LIFE project in Finland, Sheltering threatened species (White-tailed eagle) in the Baltic archipelago (LIFE95 NAT/FIN/000099), focused on acquisition and purchased 200 ha of land and 25 ha of water which did not require any management interventions for an estimated 50 to 100 years! The Kokemäenjoki-LIFE (LIFE06 NAT/FIN/000129) project was the largest wetland restoration project ever done in Finland and the experience gained has benefited similar projects. The restoration of the overgrown 440-ha Puurijärvi lake involved: excavation, dredging and reclamation to produce more extensive open water areas; mire restoration accomplished through building dams and filling drainage ditches; forest habi-

13 *Including Saint Hubert, MILITAIRE GEBIEDEN (LIFE03 NAT/B/000024), Liereman (LIFE04 NAT/BE/000010), Cx SCAILLE, NATURA2MIL (LIFE05 NAT/B/000088), PLTTAILLES, Life Grote Nete (LIFE05 NAT/B/000090), Dommeldal (LIFE05 NAT/B/000091), Life Averbode (LIFE06 NAT/B/000081), LIFE Turnhouts Vennengebied (LIFE06 NAT/B/000084), HELA (LIFE06 NAT/B/000085), PLTHautes-Fagnes, PAPILLONS, Life Abeek (LIFE08 NAT/B/000035), LIFE Kleine Nete (LIFE09 NAT/BE/000411), Life Itter en Oeter (LIFE09 NAT/BE/000416), Ardenne liégeoise, Most-Keiheuvel (LIFE11 NAT/BE/001061) and Life Hageland (LIFE11 NAT/BE/001067).*

tats restored by clearing coniferous trees; building three small islands for breeding birds; and excavation of small ponds and mud depressions for targeted wader species. The project supported other national measures to save the species and nowadays there is a viable and increasing population of an estimated 550 pairs with a positive population trend.

In Lithuania, LITCOAST (LIFE05 NAT/LT/000095) restored over 1,600 ha of seashore habitats including coastal grasslands and dunes, designated new Natura 2000 sites, and prepared and adopted management plans and monitoring schemes for three coastal Natura 2000 sites. Most importantly, the project constructed 20 artificial nesting platforms for the White-tailed eagle and Black kite (*Milvus migrans*).

The SENNERESTSK (LIFE06 NAT/SK/000114) project in Slovakia restored the water regime on almost 1,000 ha of wet meadows. The improved water level in the national nature reserve positively affected bird habitats and populations, including the White-tailed eagle, which started to breed for the first time ever in the reserve. This success was followed by the Danube birds conservation (LIFE07 NAT/SK/000707) which restored dried-up river branches and oxbows, river connectivity, lowland meadows, floodplains and wetlands. These habitats all provide long-term resting, feeding and nesting habitats for 15 targeted bird species. As a result of the project actions, the improved conservation status of certain target bird species and their habitats was confirmed, with new nesting pairs and a population increase recorded for the White-tailed eagle.

Several similar projects have led to the successful increase of this species, mostly through habitat restoration, but the Polish LIFEZONE (LIFE13 NAT/PL/000060) and Bulgarian LIFE BIRDS on POWER LINES (LIFE16 NAT/BG/000612) projects, tackled a different threat – powerlines. Insulators on power transformers were installed within the feeding grounds of the species in Poland and prototype bird-friendly pylons are being installed in Bulgaria to reduce mortality caused by collision with overhead powerlines in priority areas in Natura 2000 network sites and key corridors between them.

Egyptian vulture

The Egyptian vulture (*Neophron percnopterus*) is another LIFE priority species which is globally threatened. In Europe, the breeding population is estimated to 3,000-4,700 breeding pairs. European populations have declined by 50-79% over the last three generations, which made the species a frequent subject of protection in LIFE projects (at least 27 projects targeting the species since 1995). Of all these, Return of the Neophron (LIFE10 NAT/BG/000152) is particularly worthy of presentation as a success story.

Over the last 30 years the *N. percnopterus* population in the Balkans has declined by more than 80%, with no more than 70 pairs remaining. The population trend of the species is declining in both Bulgaria and Greece, according to Member State 2019 reports. The reasons for this can be found not only on its breeding grounds on the peninsula, but also along its flyway between the Balkans and sub-Saharan Africa. However, the **Return of the Neophron** stabilised the Egyptian vulture population in this part of Europe. The project team satellite tagged the birds which improved knowledge on migration routes and bottlenecks, mortality hotspots and wintering areas. They developed a habitat model for 87 breeding territories in Bulgaria and Greece to identify critical habitat features for territory selection and abandonment. Over five years, the project provided food, established supplementary feeding stations ('vulture restaurants'), implemented a nest-guarding programme, operated two anti-poison dog units in Greece and insulated over 450 critically dangerous pylons in Bulgaria and Greece with the support of electricity distribution companies, which significantly reduced the risk of electrocution. Perhaps most remarkably, the project succeeded in getting a powerline in Sudan disconnected thanks to collaboration between the Bulgarian Society for the Protection of Birds, BirdLife Jordan and BirdLife Sudan, thereby saving dozens of vultures from electrocution each year.

As a result of project activities, the Egyptian vulture became a well-known endangered species and perceptions changed positively, with the birds now considered as harmless and useful due to their cleaning services. Now, Egyptian Vulture New LIFE (LIFE16 NAT/BG/000874) is implemented to reinforce the easternmost European Egyptian vulture population by delivering urgent conservation measures to address major known threats at breeding grounds and also along the flyway.

Lesser kestrel

The Lesser kestrel (*Falco naumanni*) is a priority species for LIFE and featured in the 'LIFE managing habitats for birds' brochure and the Life makes a difference ex-post

study. The species has suffered a general decline throughout Europe since the 1960s, mainly linked to changes in farming practices and in the rural environment in general (intensive farming, for example, leading to a reduced insect food supply and fewer buildings available for nesting). An important part of the European population is found in the south of France, Spain, Portugal and Italy. The species has been slowly but steadily recovering in France, Portugal and Italy since the 1990s. The population (current short and long-term) trends are increasing because of the implementation of conservation plans and of successful targeted measures such as installation of nesting boxes and reintroduction.

While the Portuguese story has already been told (EU, 2012; 2018a) the a great success story from France is yet to be heard. Back in 1996, only one colony of 42 pairs resided in the SPA site 'la plaine de Crau' in France. The project **Faucon crécerellette** (LIFE97 NAT/F/004119) increased the knowledge of the species and set the basis for a long-term conservation programme. The project implemented measures such as the installation of 135 nesting boxes, radiomonitoring and bird-ringing, grassland management, and also identified other sites that could potentially be re-colonised by the species. Based on project results, a national action plan was prepared, covering the 2002-2006 period and defining priorities and actions for *F. naumanni* in La Crau and potential additional sites. A few years later, **LIFE TRANSFERT** (LIFE05 NAT/F/000134) was implemented in two SPAs in France (Aude) and one in Spain (Extremadura), from 2005 to 2009. The project succeeded in creating a new population in France thanks to a reintroduction programme. Twelve nesting pairs were observed in 2009 in the new site. A captive breeding centre was also set up as part of the project and has been operational since then. Habitat management guidelines were developed and nesting boxes installed in several breeding sites in France and Spain. The project also resulted in the preparation of a new national action plan for the period 2011-2015. Reintroduction continued after the end of the project, as well as other concrete field measures. The overall positive impact of the conservation and reintroduction measures partly implemented thanks to the LIFE programme is reflected in the increasing trend of the species in France for the last 20 years. There are now six breeding sites along the Mediterranean coast in France and the population is now being maintained in good conservation status in the French sites.

3.2 LIFE MAKES A DIFFERENCE FOR OTHER SPECIES

3.2.1 Species protection in the EU Habitats Directive

The EU Habitats Directive ensures the conservation of a wide range of species of flora or fauna (other than birds) that are of Community interest because they are endangered, vulnerable, rare, or endemic to the EU.

The Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. Together with the Birds Directive it forms the cornerstone of Europe's nature conservation policy and establishes the EU-wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments.

Over 1,000 animal and plant species listed in the Directive's annexes are protected in various ways:

- Annex II species (about 900): core areas of their habitat are designated as sites of Community importance (SCIs) and included in the Natura 2000 network. These sites must be managed in accordance with the ecological needs of the species.
- Annex IV species (over 400, including many Annex II species): a strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites.
- Annex V species (over 90): Member States must ensure that their exploitation and taking in the wild is compatible with maintaining them in a favourable conservation status.

The European Commission (EC) has published guidance on species protection to help Member States correctly implement the Directive's provisions. EU Species Action Plans are developed to restore the populations of certain species across their range within the EU. The EC also promotes the conservation of Europe's five species of large carnivores and supports the European Red Lists of Threatened Species, developed by the IUCN to provide an overview of the conservation status of c. 6,000 European species, so that emergency action can be taken to protect those threatened with extinction.

The Natura 2000 network offers a haven to Europe's most threatened species and aims to ensure the long-term survival of 1,395 animal (other than birds) and plant species, listed in the annexes of the Habitats Directive. Looking at the LIFE programme (1992-2017), it includes a total of

Species group	Number of LIFE projects	Number of species covered	Share of annex species covered (%)
Birds	585	226	45%
Mammals	328	71	56%
Invertebrates	226	74	43%
Plants	166	255	39%
Fish	161	60	33%
Amphibians	145	36	58%
Reptiles	97	25	24%

Table 6: Coverage of species groups in LIFE projects. (Note: All EU-28 bird species are covered under the Birds Directive whereas, for other species, only those requiring designation of SACs (Annex II), strict protection (Annex IV) or management measures (Annex V) are listed (i.e. apart from birds the EU directives do not cover all species)

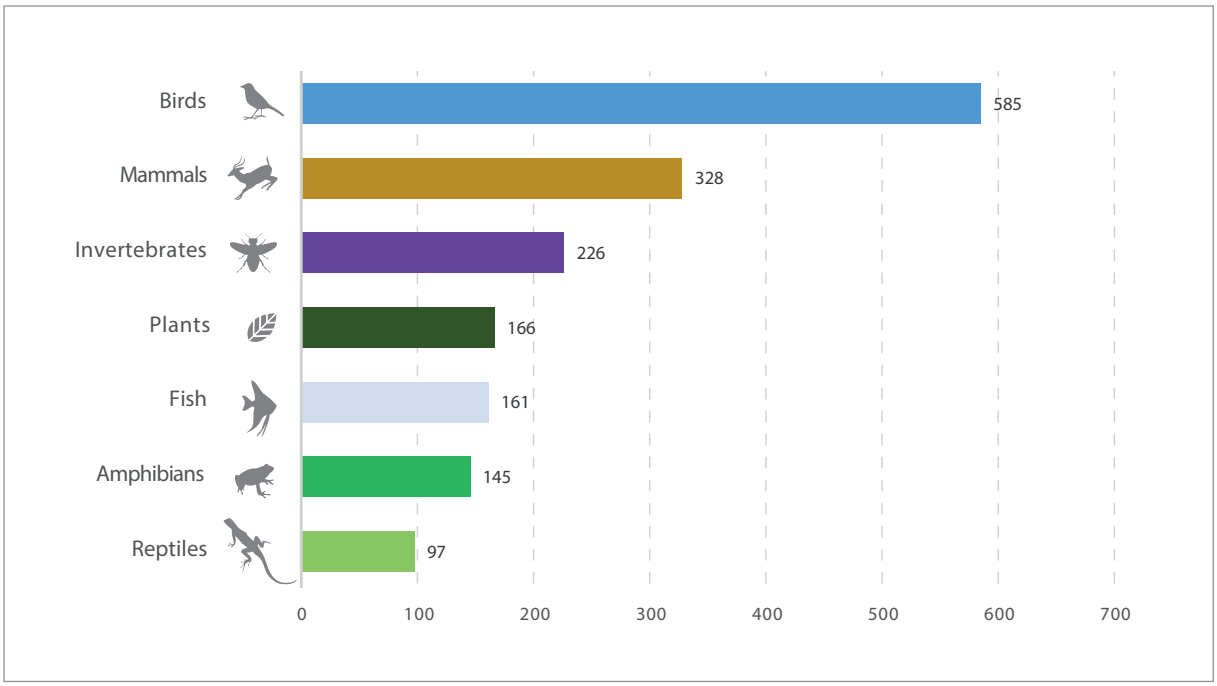
1,574 Nature projects, of which 1,122 include measures to protect species (often multiple species from different taxonomic groups), mostly in combination with habitat restoration measures. Out of these LIFE projects, the majority (585) focus on birds (Figure 12, Figure 13). This is not surprising, given that birds have traditionally been a key focus of conservation action and all bird species are covered by the Birds Directive (Figure 15).

Out of the 1,122 projects including measures for species, 328 address measures for the conservation of a total of 71 mammal species. With only 127 species in Annex II and IV of the Habitats Directive, mammal projects are well represented in the LIFE portfolio. It is fair to say, especially for the earlier phases of the LIFE programme, that there was a programme bias towards the charasmatic larger species, such as Brown bear (*Ursus arctos)*, Iberian lynx (*Lynx pardinus*), Wolf (*Canis lupus*), and European otter (*Lutra lutra*) (Table 7).

It is encouraging to see that invertebrates, including arthropods, molluscs and other species, come in third position with 226 LIFE projects on 74 different species. This is a recent evolution, reflecting the notion of invertebrates' important role in terms of delivering ecosystem services (among others reflected by the EU Pollinators Initiative) and the fact that many species are suffering population decline.

There is a total of 166 LIFE projects with a strict focus on plant species from the annexes of the Habitats Direc-

Figure 12: Number of LIFE projects (1992-2017) per taxonomic group (n = 1,122), with several projects addressing multiple species from within the same group, but sometimes also other taxonomic groups



tive, covering a total of 255 species, which shows that this large group (with 652 Annex II and IV species) is still underrepresented in the LIFE portfolio. Finally, the LIFE fish, amphibian and reptile projects include respectively 161, 145, and 97 LIFE projects on 60, 36 and 25 species.

Looking at actual coverage of species by LIFE projects compared to the total number of species per taxonomic group as in Annex II and IV of the Habitats and Birds Directives (Figure 14), we see that for amphibians there is 58% of species coverage, followed by 56% for mammals. Forty-five percent of all bird species in the annexes of the Birds Directive are targeted in LIFE projects, 43% of invertebrates, and 39% of plant species. For fish (33%) only a third of species are covered by LIFE projects. Finally, only one in four (24%) reptile species from the Habitats Directive is included in LIFE projects. These data give a general indication of species gaps in terms of LIFE project focus per taxonomic level, without being able at this stage to provide fuller details on the actual species involved per taxonomic group.

Figure 13: Number of species per taxonomic group covered by LIFE projects (1992-2017)

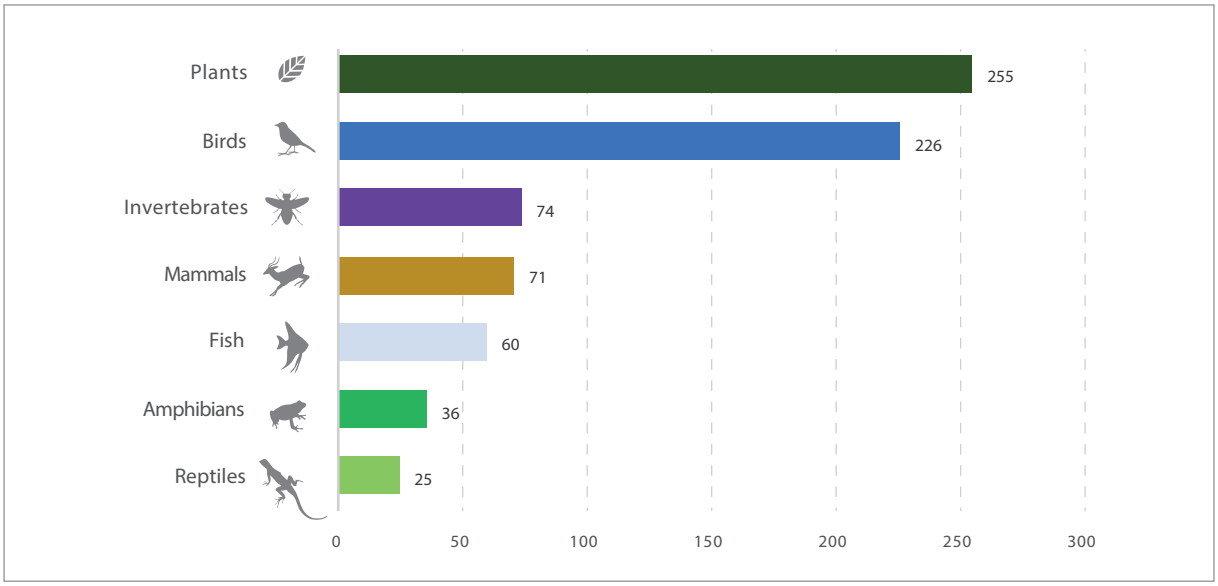
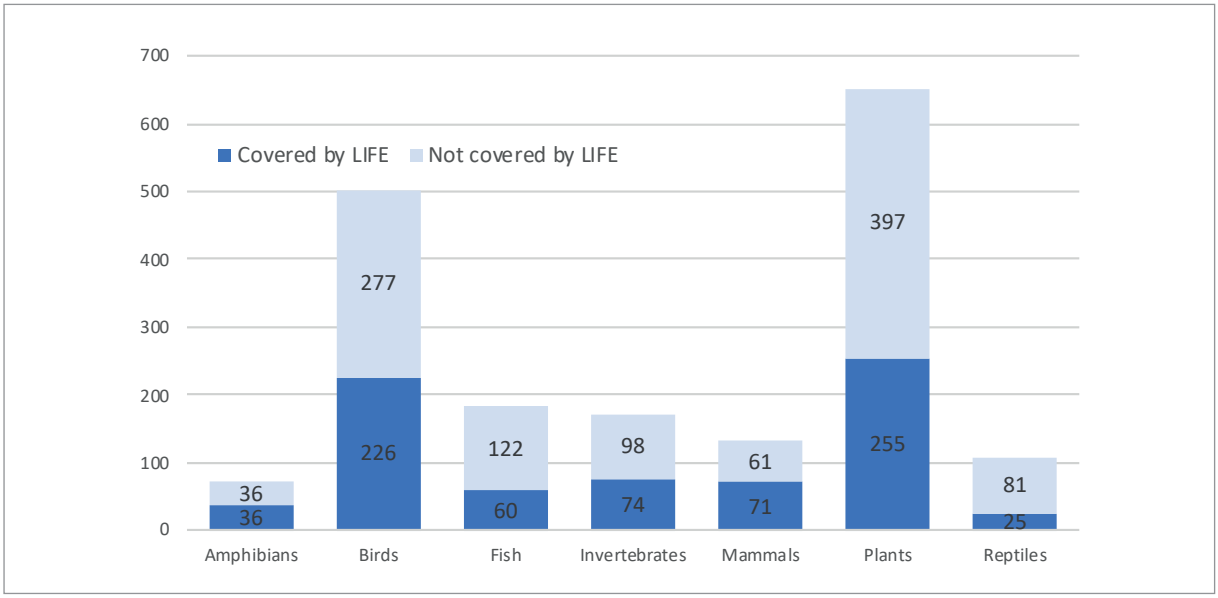


Figure 14: Number of species targeted by the LIFE programme (1992-2017) compared to the total number of species included in Annexes of the Birds Directive and Annexes II and IV of the Habitats Directive



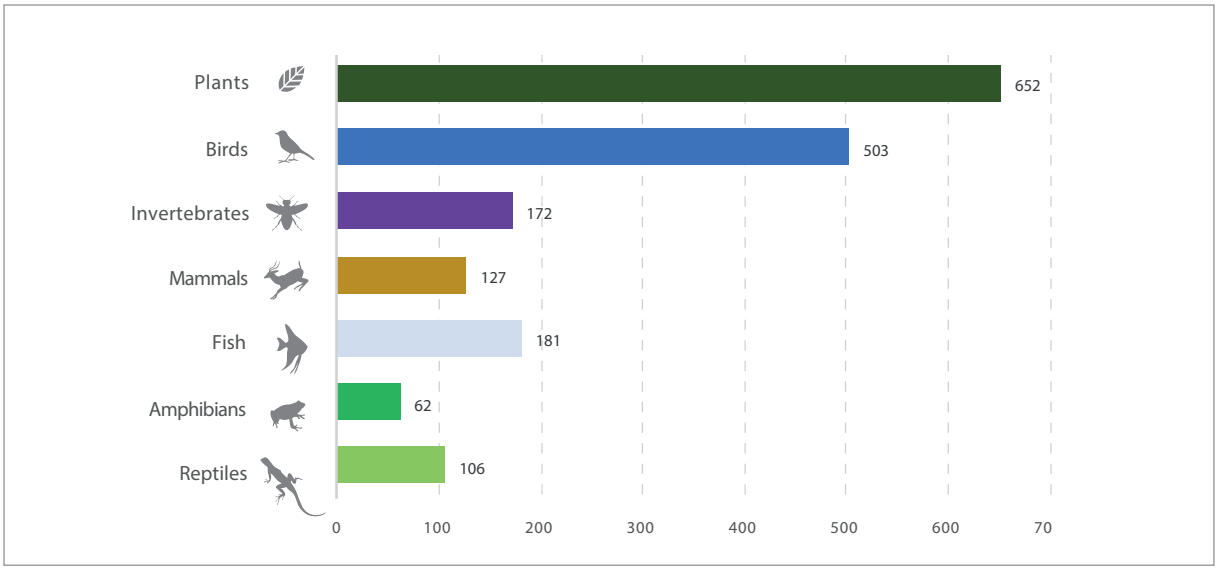


Figure 15: Number of species covered in the Annexes of the Birds Directive and Annexes II and IV of the Habitats Directive (downloaded 14/06/2020)

When comparing Figure 13 and Figure 15, the same spread in terms of species number per taxonomic group with the LIFE programme (1992-2017) versus inclusion in the annexes of both Nature Directives is seen (Figure 14). There are relatively more amphibian, mammal and bird LIFE projects relative to species listed in the annexes, whereas invertebrates, plants, reptiles and fish are still underrepresented in the LIFE portfolio in terms of their relative importance all species.

Table 7 provides an overview of the five most-targeted species per species group by LIFE projects (1992-2017). What becomes obvious, when comparing the total number of LIFE projects for the entire taxonomic group (Figure 12) with the sum of LIFE projects for the top five species in this table, is that 75% and 78% of all amphibian and reptile projects include these top five species. The LIFE projects focusing on the top five fish and mammal species make up 63% and 64% respectively. For invertebrates it is 53%, plants 40% and for birds 33%. This indicates a strong bias within each taxonomic group, with a large part of the LIFE projects focusing on the same species, even if other species might also be included. As mentioned previously for the mammals there is a strong bias towards large charismatic species, whereas within the group of birds there are also clear favourite species that have received substantial LIFE funding over the years. Some of the top five species are geographically widespread species in the EU and are thus, not surprisingly, included in many LIFE projects without being a specific focus of the project. Some caution is therefore needed when interpreting these data.

3.2.2 Fish

This section covers freshwater, marine and anadromous (migrating from sea to freshwater to spawn) species listed mainly in Annex II of the Habitats Directive and which inhabit all the biogeographical regions. According to the European Red List of Freshwater Fishes (Freyhof & Brooks, 2011) there are 391 species of freshwater fishes present in EU waters (excluding Croatia). The most comprehensive list of marine fishes in European waters assessed for the Red List is Whitehead et al. (1984-1986), this checklist reported 1,256 species, although not all are native to Europe. Of these, 77 are listed in Annex II, IV and V and the majority are freshwater, with some euryhaline (able to adapt to a range of salinities) species. Only eight are priority species. While 9% of fish showed an improvement in conservation status since 2012, an alarming 50% are still deteriorating. More worrying still, the World Fish Migration Foundation published a report on the current global status of migratory fish and concluded that 'Populations of migratory river fish around the world have plunged by a "catastrophic" 76% since 1970' and the fall has been even greater in Europe at 93%, with sturgeon and eel populations both down by more than 50%. Habitat degradation, alteration and loss accounted for around half the threats to migratory fish (Deinet et al., 2020). Major threats to freshwater species in-

Common name	Scientific name	No LIFE projects	Common name	Scientific name	No LIFE projects
PLANTS (all)		166	REPTILES (all)		97
PLANTS TOP 5 (number of unique projects)		**60**	**REPTILES TOP 5 (number of unique projects)**		**77**
Yellow twayblade	*Liparis loeselii*	21	European pond turtle	*Emys orbicularis*	38
Lady's slipper orchid	*Cypripedium calceolus*	20	Loggerhead sea tutle	*Caretta caretta*	23
Floating water plantain	*Luronium natans*	17	Hermann´s tortoise	*Testudo hermanni*	11
Creeping marshwort	*Apium repens*	7	Smooth snake	*Coronella austriaca*	8
Slender green feather moss	*Hamatocaulis vernicosus*	7	Sand lizard	*Lacerta agilis*	6
INVERTEBRATES (all)		226	BIRDS (all)		585
INVERTEBRATES TOP 5 (number of unique projects)		**122**	**BIRDS TOP 5 (number of unique projects)**		**195**
Large white-faced darter	*Leucorrhinia pectoralis*	30	Eurasian bittern	*Botaurus stellaris*	83
Freshwater pearl mussel	*Margaritifera margaritifera*	29	Corn crake	*Crex crex*	66
Marsh fritallary	*Euphydryas aurinia*	25	Common kingfisher	*Alcedo atthis*	48
Stag beetle	*Lucanus cervus*	25	Western marsh harrier	*Circus aeruginosus*	46
Hermit beetle	*Osmoderma eremita complex*	25	Red-backed shrike	*Lanius collurio*	43
FISH (all)		161	MAMMALS (all)		328
FISH TOP 5 (number of unique projects)		**103**	**MAMMALS TOP 6 (number of unique projects)**		**206**
European bullhead	*Cottus rondeleti*	54	European brown bear	*Ursus arctos*	86
Spined loach	*Cobitis taenia complex*	33	Wolf	*Canis lupus*	45
Atlantic salmon	*Salmo salar*	30	European otter	*Lutra lutra*	41
European brook lamprey	*Lampetra planeri*	29	Iberian lynx	*Lynx pardinus*	29
European bitterling	*Rhodeus amarus*	22	Horseshow bat	*Rhinolophus hipposideros*	29
AMPHIBIANS (all)		145	Greater mouse-eared bat	*Myotis myotis*	29
AMPHIBIANS (number of unique projects)		**110**			
Northern crested newt	*Triturus cristatus*	47			
Yellow bellied toad	*Bombina variegata*	40			
Red bellied toad	*Bombina bombina*	24			
Italian crested newt	*Triturus carnifex*	24			
Natterjack toad	*Epidalea calamita*	23			

Table 7: Top five species in terms of number of LIFE projects (1992-2017) per taxonomic group (for mammals, there are six listed species which make up the same number of species)

clude over-abstraction of water, pollution, the introduction of alien species, overfishing, the interruption of stream connectivity and the hydromorphological alteration of in-stream habitats (Freyhof & Brooks, 2011). In fact, modification of natural conditions is credited with 69% of the reported pressures on fish populations. The main threats to marine species are overfishing, coastal development, energy production and mining and pollution (Nieto et al., 2015).

LIFE projects mostly target freshwater fish through restoration of their habitats and marine species through optimising fishing practices. The LIFE focus publication 'LIFE and freshwater fish' noted that, between 1992 and 2017, LIFE had targeted 60 species of freshwater fish but with a clear focus on 10 popular species. Clearly, more needs to be done to halt the decreasing decline of fish species, such as targeting more species, finding more innovative interventions, addressing a wider range of threats, supporting initiatives to resolve conflicts with other EU policy initiatives, and increasing our knowledge about threatened marine species.

KEY MESSAGES

LIFE has certainly had an impact on improving the conservation status of many fish species in Europe, such as Atlantic salmon (*Salmo salar*) and Allis shad (*Alosa alosa*). Actions to restore rivers and recreate freshwater habitats have the indirect benefit of improving conditions for threatened fish species and giving them the opportunity to recover. It is also important to recognise the role that LIFE has played in improving connectivity for fish species by establishing green and blue infrastructure in and between Natura 2000 network sites. In this way projects tend to address the main pressures preventing improvement in conservation status of more than one fish species and the cumulative benefits have never really been assessed. Despite the positive impact of LIFE on the conservation status of many fish species in Europe, migratory fish numbers are falling in an alarming way and there is more work to do to remove the main threats. LIFE has yet to make a real impact on the conservation status of any marine fish, and more attention needs to focus on the marine phase of anadromous species where a range of different threats exist.

Status

Almost 80% of the 391 species present in the freshwater bodies of the EU-27 are endemic to Europe (Freyhof & Brooks, 2011). For marine species, the wide latitudinal gradient ranges from sub-tropical through temperate to Arctic. Not all recorded species are native to Europe, for example, the figure of 1,256 for marine species (Whitehead et al, 1984-1986) includes migrants entering the Mediterranean via the Suez Canal. Accordingly, the Red List assessment carried out in 2015 considered 1,220 native marine species in European waters and further noted that 7.5% of these were considered threatened and that 8.4% have declining populations (Nieto et al., 2015).

In the 2015 EU State of nature report (EEA, 2015) 17% of fish species were reported as being in a good condition, which was the lowest proportion of good assessments across all species groups. Furthermore, the proportion of assessments classified poor or bad and declining was particularly high (approaching 40%) in the fish species, mainly associated with freshwater.

However, the latest assessment (EEA, 2020) shows that while fish have a higher improvement trend than other species groups at 9%, they also have one of the highest proportions of deteriorating trends, close to 50%, which continues to be worrying and suggests that improving the habitat is not the whole story. Despite the somewhat gloomy outlook, there are some notable successes where genuine improvements in conservation status have been recorded and there are more cases where the trend is improving but the assessment is based on a change in the method (four cases), improved knowledge (29 cases) or not stated (eight cases). Genuine improvements are highlighted in Table 8.

There are some clear (and some less clear) connections with the LIFE programme in some of these improvements. The Valencian toothcarp (*Valencia hispanica*) is a critically endangered species on the European Red List as well as being in Annex II (as a priority species) and IV of the Habitats Directive. According to the IUCN, it is restricted to six locations on the Mediterranean coastal area of Spain inhabiting marshes, wetlands and springs. Three Spanish projects have all targeted the restoration of priority habitats which support this species and may be responsible for the improvement in the conservation status (U2 to U1) and trend reported in the 2019 Article 17 report for Spain. The first project was in 2000, Dunas Albufera (LIFE00 NAT/E/007339), which removed coastal infrastructure, restored and revegetated the dunes and reintroduced *V. hispanica*. Two further projects in the same location were financed in 2004. Enebro Valencia (LIFE04 NAT/ES/000044) restored a large network of temporary ponds and introduced *V. hispanica* in these new locations. Finally, Ullais Albufera (LIFE04 NAT/ES/000048) recovered a 6 ha area of marshland and restored optimum conditions for the Valencian toothcarp. This series of projects illustrates that sometimes a multiplier effect is necessary to achieve the conservation objectives and that patience is a virtue!

The European bitterling (*Rhodeus amarus*) occurs most abundantly in still or slow-flowing water with dense aquatic vegetation and sand-silt beds in lowland ponds, canals, slow-flowing rivers, backwaters and oxbows, where mussels are present. In fact, the presence of freshwater mussels is of vital importance to the breeding cycle of the fish as the female lays eggs within the valves of the mussel. New LIFE for Dutch Fens (LIFE12 NAT/NL/000372) dredged eutrophic peat lakes and restored habitat on agricultural lands to reduce eutrophication and sedimentation to improve the habitat for this species. Whether the project

Table 8: Examples of genuine positive trends in fish species reported in the 2013-2018 MS reports for which contributing LIFE projects were identified.

Species showing improved status in Article 17 reports	Member State	Bio-geographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
European bitterling *(Rhodeus amarus)*	NL	ATL	U1+ to FV+ (genuine improvement in status)	Highly probable link to **New LIFE for Dutch Fens** (LIFE12 NAT/NL/000372)
Atlantic salmon *(Salmo salar)*	SE	CON	U2+ to U1+ (genuine improvement in status)	Highly probable link to **UC4LIFE** (LIFE10 NAT/SE/000046)
Valencian toothcarp *(Valencia hispanica)*	ES	MED	U2+ to U1+ (genuine improvement in status)	Probable link to three LIFE projects: **Dunas Albufera** (LIFE00 NAT/E/007339); **Enebro Valencia** (LIFE04 NAT/ES/000044); **Ullals Albufera** (LIFE04 NAT/ES/000048)

had a major impact is not really known but there is a positive link.

LIFE programme response

In the latest Article 17 reporting there are several direct links between the LIFE programme and the maintenance or improvement of the conservation status of freshwater species. There are no examples of marine fish conservation status improvements. Interestingly, in the majority of these success stories, there have been a series of projects within a country targeting the same species but whether this is instrumental in the subsequent conservation status of the species is not possible to determine.

Figure 16 shows the top 10 fish species featured in LIFE projects between 1992 and 2018. Up to this point it was estimated that an investment of €150 million had been invested in fish species protection.

Of these 10 species featured in the LIFE programme seven are reported as having some positive trend (as defined by the EEA methodology) in the latest Article 17 reporting analysis (Figure 17). While it is not possible to make direct connections between the number of projects and the reported improvement there are some success stories to share where the LIFE programme has made a difference, at least at the local level.

The Asp (*Aspius aspius*) is classified as Least Concern in the European Red List but is recognised as locally threatened. It is a freshwater fish of the *Cyprinid* family, resembling a carp, inhabiting lakes and lower reaches of rivers and estuaries. In Estonia two projects directly benefitting this fish species have been instrumental in maintaining its conservation status. HAPPYFISH (LIFE07 NAT/EE/000121) restored the spawning habitat at 17 sites (58.5 ha) in one river through the rehabilitation

Figure 16: Top 10 fish species and the respective number of LIFE projects in which they featured

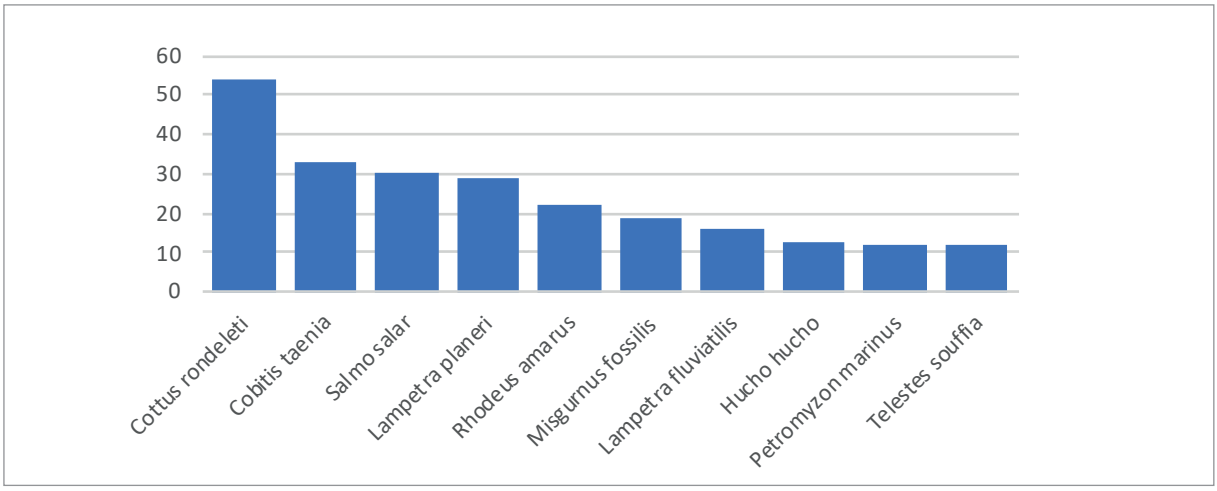
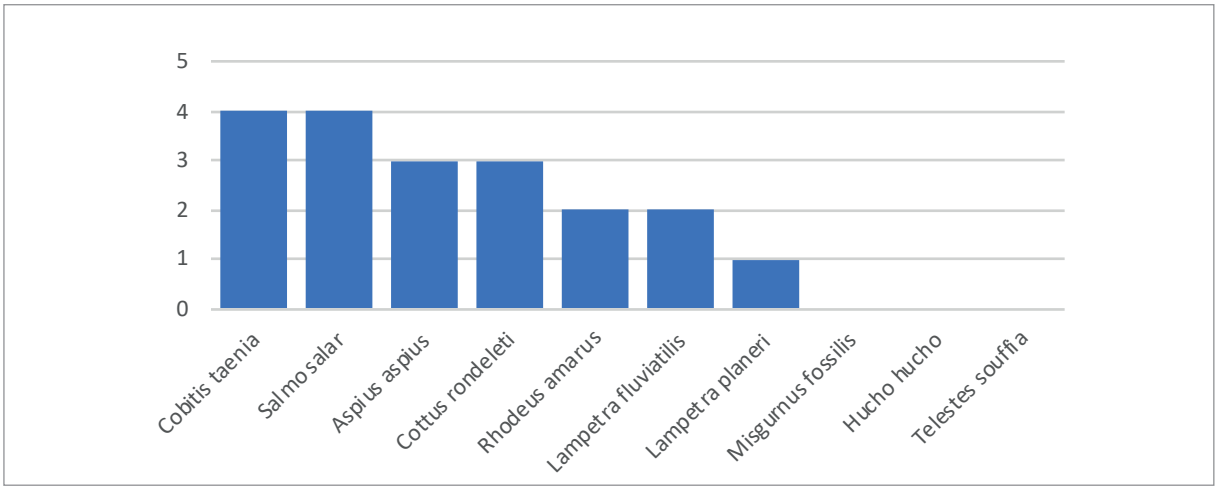


Figure 17: Number of Member States recording an improvement in the 2018 Article 17 reports



of oxbow lakes to improve water circulation and the management of adjacent alluvial meadows. The project also reintroduced over 50,000 one-year old Asps. LIFE HAPPYRIVER (LIFE12 NAT/EE/000871), carried out in the same Natura 2000 site, restored 8 km of riverbed including the provision of two spawning grounds and managed a further 13 ha of alluvial meadows. The project also released 12,000 Asps into the second river course. By the end of both projects, the status of the Asp population in the Emajõgi River system had improved. The latest Article 17 data suggest an improvement for this species in Estonia (and also in Sweden and Austria) which may be as a result of these LIFE projects.

The shad are members of the herring family and were once widespread in Europe from the Atlantic to the Mediterranean. Both the Allis shad (*Alosa alosa*) and the Twaite shad (*A. fallax*) are facing significant population declines and the LIFE programme has successfully addressed the decline of both species. *Alosa fallax* is an anadromous species of fish migrating into fresh water to spawn. Italy recorded a genuine change in both conservation status and trend of *A. fallax* partly due to the actions of **P.A.R.C.** (LIFE07 NAT/IT/000413). The project aimed at improving the conservation status of several other species apart from *A. fallax* (Sea lamprey - *Petromyzon marinus*, Souffia - *Leuciscus souffia*, South-European roach - *Rutilus rubilio* and Italian barbel - *Barbus plebejus*) through the restoration of the fluvial and ecological continuity of the Magra and Vara rivers and the creation of nine fish passes to overcome significant obstructions to their migration. The project achieved an increase of 19 km of shad spawning ground. In the UK, Unlocking the Severn for LIFE (LIFE15 NAT/UK/000214) is removing barriers to fish access over 250 km of the fish's range and thereby directly benefiting 57% of the breeding stock in the UK Atlantic bioregion. The installation of best practice fish passage on all impassable weirs will increase access to spawning habitat by 195%, from 265 km in 2013 to 518 km in 2021. The Twaite shad is a particularly lazy fish, unable to tackle even small rapids, and so the fish passes are being designed to accommodate this trait. The idea behind this approach is that if *A. fallax* can pass the barrier than any other anadromous fish will find it plain sailing. If this project is successful it should bring about a positive change in conservation status across Europe as a whole. Currently the project is on track to meet its objectives and already the signs of fish migration are positive.

The box below presents an equally interesting story from Germany concerning *A. alosa*.

There have been 30 LIFE projects dealing in some way with improving the conservation status of the Atlantic salmon (*Salmo salar*), another anadromous species. Interestingly, this species is only noted in Annex II and

In the spotlight: Recovery of the Allis shad in Germany

The Allis shad (*Alosa alosa*) is an anadromous fish species with a distribution mainly centred in the northeast Atlantic and its tributary rivers. The distribution range has decreased dramatically. For example, only 150 years ago several hundred thousand shad were caught annually in the Rhine system and they were important economically for the local communities. All over the EU its conservation status is bad, mostly still declining. The main reasons for its decline are overfishing, increasing river pollution, destruction of spawning grounds and the construction of river obstacles such as dams and weirs.

The conservation status is also bad in Germany, but with a genuine positive trend. Two projects in Germany have helped to restore this fish species in the Rhine. The first project (LIFE-Projekt Maifisch - LIFE06 NAT/D/000005) introduced 4.8 million Allis shad fry (young fish stage) into the Rhine. This reintroduced a species that had become extinct in the Rhine around 100 years ago – in itself a very significant result. A follow-on project (Alosa alosa - LIFE09 NAT/DE/000008), which reported results in 2015, released a further 6.2 million shad fry into the river. The project reported that 250 adults were observed returning to the Rhine from the North Sea, which suggests that several thousand adult shad are returning annually to the Rhine system. Despite there being no improvement in conservation status the genuine trend improvement is entirely due to the activities of the project. Nevertheless, further improvements may rely on actions related to removal of barriers rather than additional introduction of larvae.

Annex V for the freshwater phase, except in Finland where the marine phase is also listed. At least four LIFE projects have been financed in Sweden to address issues relating to the freshwater phase of this migratory species. It is estimated that Sweden holds around 15% of its total EU population. The first, in 2005 **Moälvsprojektet ReMo** (LIFE05 NAT/S/000109) dealt with the removal of fish barriers, building fish passes, restoring spawning areas and restocking with *S. salar* in a river that had not seen salmon for many years. **Vindel River LIFE** (LIFE08 NAT/S/000266) extended the habitat for fish populations by 4,000 ha through a series of restoration measures. The project achieved increased connectivity and, following the removal of 20 dams, the whole Vindel River catchment gained 288 km of river stretch suitable for salmon spawning.

Two projects in 2010 achieved similar results. The overall aim of **ReMiBar** (LIFE10 NAT/SE/000045) was to minimise migratory barriers in five larger water systems in the northern part of Sweden where road crossings and dams had been some of the causes of decreasing populations of the targeted species, amongst which was Atlantic salmon. In total, 1,700 km of streams with a surface area of 67 km^2 were remediated and reconnected. **ReBorN LIFE** (LIFE15 NAT/SE/000892) is unlikely to have contributed to the current assessment but the project aims to restore 202 km of rivers previously affected by timber operations and create 2,300 spawning grounds for *S. salar* and Brown trout (*Salmo trutta*). The scale of these projects means that, providing other threats are addressed, they have the potential to play a significant role in maintaining and improving the conservation status of the Atlantic salmon in Sweden.

An equally ambitious project attempted to improve the conservation status of Atlantic salmon in Scotland. **CASS** (LIFE04 NAT/GB/000250) targeted 38% of the wild salmon resource in Scotland through stopping commercial fishing on two rivers, removing or bypassing 25 obstacles to improve salmon access to 187 km of habitat and improving 40 km^2 of habitat for spawning. The project achieved this and more in its lifetime and beyond, and because the water quality in Scottish rivers is reasonably good there was no reason to suppose that the wild population on the east coast of Scotland would decline, as the main threats had been removed. Regrettably, this is not the case and annual monitoring has not shown an improvement although salmon do now access the river systems. The problem lies in the marine phase of this species life cycle and is probably linked to climate change and a lack of food resources.

Good news stories sometimes happen around projects that are mainly focused on habitat improvement but bring added benefits for species as well. One such story features the Danube streber (*Zingel streber*), a member of the perch family, found in strong flowing waters of the Danube. This species, together with 12 other Annex II species, has benefited from two Austrian projects, **Mostviertel-Wachau** (LIFE07 NAT/A/00010) followed by **Netzwerk Donau** (LIFE10 NAT/AT/000016). Both projects have attempted large-scale restoration of gravel spawning beds, removal of barriers and construction of power plant bypasses. The latter project aims to restore river connectivity and fish habitat over a length of 300 km, bringing benefits to the entire fish fauna of the Austrian Danube. However, only the 'streber' thus far shows an improvement in both conservation status and trend.

Finally, no discussion on fish in Europe would be complete without mentioning one of the most vulnerable groups – elasmobranchs. While sharks and rays do not feature in Annex II, as apex predators they are amongst some of the most important species in the marine environment. The little known EU Action Plan on Sharks is based on the International Action Plan for the Conservation and Management of Sharks (IPOA Sharks). Within the LIFE programme, Italy leads the way with two important projects targeting these species. **SHARK-LIFE** (LIFE10 NAT/IT/000271) successfully changed the local regulation to ensure that targeted shark species were tagged and released, and also promoted the use of circular hooks in commercial fishing, hereby reducing bycatch. The recently launched **LIFE ELIFE** (LIFE18 NAT/IT/000846) recognises that the first project did not have the impact desired and means to move the agenda forwards in the protection of these extremely important top predators.

There are three times more marine fish species than freshwater fish species in Europe, and yet they are as poorly represented in the reporting as the habitats on which they depend. They are as important to the marine environment as the pollinators are to the terrestrial environment and are equally overlooked. Given that marine biodiversity is now given an equal footing in the targets set out in the EU Biodiversity Strategy for 2030, we need to consider more carefully how Europe reports on these important species in the future.

3.2.3 Reptiles and amphibians

There are some 141 reptile species and 84 amphibian species in the EU-27 (i.e. excluding Croatia). 43% of reptile species and 55% of amphibian species are endemic and about one fifth of reptiles and one quarter of amphibians are threatened according to the European Red Lists (Cox & Temple, 2009; Temple & Cox, 2009). Annex II and IV of the Habitats Directive lists 106 reptile species and 72 amphibian species, accounting for 70% and 85% of the European Red Lists respectively.

For terrestrial reptiles and amphibian species key pressures come from intensive agriculture (e.g. pesticides and fertilisers, filling up of ponds and wetlands, removing landscape features), urban sprawl, infrastructure works, collection in the wild and climate change. The main threats to marine reptiles are accidental losses from fishing (bycatch), destruction of nesting grounds, and water pollution for sea turtles. Furthermore, light pollution is hindering female turtles looking for safe egg-laying sites, and tourism activity is disturbing nests on sandy beaches.

Overall, in the 2019 Article 17 report, 40% of reptile species are in good conservation status and 28% of all amphibians are in good conservation status. However, few of the more endangered species with poor conservation status are showing an improvement and this is a concern. LIFE projects have focused on a subset of these species and have been crucial in several cases in preventing local extinction, in protecting habitats, in stabilising populations and in developing long-term programmes.

KEY MESSAGES

Key conservation success for amphibians and reptiles are through a combination of measures. Site protection is important as most species hibernate in the winter months, making them especially vulnerable. Habitat restoration and improved connectivity is often combined with ex-situ breeding programmes to reintroduce species locally, preventing local extinction. Removing invasive alien species is difficult but proven to be successful regarding the important predators Raccoon dog and American mink. For this species group in particular LIFE projects have improved knowledge, essential for sustained action and especially needed for long-lived reptiles.

Status

Amphibians and reptiles include frogs and toads, newts and salamanders, lizards, terrapins, tortoises, sea turtles and snakes. Reptile diversity increases from northern to southern Europe and is richest in the Balkan Peninsula, whereas amphibian diversity is highest in the intermediate latitudes and in southern Europe with peaks in Germany, Italy, France, Spain, and Greece.

When comparing the 2013-2018 and 2007-2012 periods, it seems that the percentage of amphibians in good condition did not change much (no change at 28%) but that about 10% more reptiles had reached good conservation status by 2018 (from 25% to 36%). In 2018 about 15% of amphibians and 12% of reptile species are grouped into a poor conservation status with their populations deteriorating. A further 18% of amphibian species and 11% of reptile species have a bad conservation status with their population trends unchanging or decreasing.

However, there are several examples of genuine improvements to conservation status and/or trend as shown in Table 9.

LIFE programme response

Since 1992 the LIFE programme has funded 87 reptile and 145 amphibian projects, with most benefiting several species at once. In most traditional LIFE projects the focus has been on addressing threats to the species and protection and improvement of habitats. Site protection is important as most amphibian and reptile species hibernate in the winter months and this period makes them especially vulnerable to development activities such as construction or road works.

The species most commonly targeted by LIFE project funding are the reptiles European pond turtle (*Emys orbicularis*), Loggerhead (*Caretta caretta*), Hermann's tortoise (*Testudo hermanni*), Smooth snake (*Coronella austriaca*) and Sand lizard (*Lacerta agilis*) and the amphibians Great-crested newt (*Triturus cristatus*), Yellow-bellied toad (*Bombina variegata*), Fire-bellied toad (*Bombina bombina*), Italian crested newt (*Triturus carnifex*) and Natterjack (*Epidalea calamita* syn. *Bufo calamita*). There is also a north-south split between mainly amphibian projects in continental and north-west Europe (e.g. Austria, Germany, Estonia and Denmark) and mainly reptile projects in southern Europe (e.g. Spain, Portugal, Greece and France).

Species showing improved status in Article 17 reports	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Reptiles				No LIFE projects identified
Amphibians				
Yellow-bellied toad (*Bombina variegata*)	DE	ATL	U2- to U2= (genuine improvement in trend)	**LIFE BOVAR** (LIFE16 NAT/DE/000660); **LIFE-Amphibienverbund** (LIFE15 NAT/DE/000743)
Bombina variegata	LU	CON	U2= to U2+ (genuine improvement in trend)	**LIFE grassland Luxembourg** (LIFE13 NAT/LU/000068)
European tree frog (*Hyla arborea*)	BE	ATL	U2+ to U1+ (genuine improvement in trend)	**LIFE Green4Grey** (LIFE13 ENV/BE/000212); **Triple E Pond area M-L** (LIFE08 NAT/B/000036)
Hyla arborea	LU	CON	U2- to U2+ (genuine improvement in trend)	**Batraciens** (LIFE96 NAT/L/003195)
Agile frog (*Rana dalmatina*)	SE	CON & BOR	U2= to U1+ (genuine improvement in status and trend)	**SemiAquaticLife** (LIFE14 NAT/SE/000201)

Table 9: Examples of genuine positive trends in reptile and amphibian species reported in the 2013-2018 MS reports for which contributing LIFE projects were identified.

Sea turtles

Five species of sea turtles can be found in Europe's seas. They are primarily found in the Mediterranean Sea, where the Green turtle (*Chelonia mydas*) and the Loggerhead (*Caretta caretta)* nesting populations are considered as indigenous. Another three species of turtle are visitors to the Mediterranean Sea and the North-east Atlantic Ocean.

The endangered *C. caretta* is the most common turtle in the Mediterranean Sea and nests in Cyprus, southern Italy and Greece. The greatest threats to the species are accidental losses from fishing (bycatch), destruction of nesting grounds and water pollution. The status of the species is unknown in the marine Atlantic region with a need for further study of its distribution, home ranges, population ecology and habitat use. Project MIGRATE (LIFE11 NAT/MT/001070) helped to contribute to the improved knowledge of the species and identified three proposed protected areas (pSCIs) which also protected *Chelonia mydas*. Caretta (LIFE02 NAT/GR/008500) improved knowledge on the species through a combination of modelling available oceanographic data and direct boat-based observations. The project helped to see an improving trend in the conservation status of *C. caretta* in Cypriot waters and was given a best LIFE project award. But programmes to protect *C. caretta* must be sustained. It is a long-lived species reaching sexual maturity at about 34 years of age and there are many challenges; light pollution is hindering females looking for safe egg-laying sites and tourism activity is disturbing nests on sandy beaches.

Pond turtles and terrapins

The European pond turtle (*Emys orbicularis*) is widely distributed in Europe but its populations can be highly localised and overall it is listed as vulnerable (IUCN Red List) in the EU. From 1993 to 2017,38 LIFE projects targeted *E. orbicularis* in 14 countries. Between 2012 and 2018 the conservation status of the turtle increased from bad to poor in the Boreal region, likely with help from the Lithuanian and Latvian LIFE projects NELEAP (LIFE05 NAT/LT/000094), ECONAT (LIFE09 NAT/LT/000581), and Life-HerpetoLatvia (LIFE09 NAT/LV/000239). In Latvia the pond turtle is at the northern extent of its range and in a cool summer will fail to breed. The species is slow to mature, reaching sexual maturity at 8-10 years and thereafter being able to lay 5-12 eggs a year. It is localised in Latvia, occurring in only 15 locations including the Silene Natura 2000 site. The project combined in-situ and ex-situ actions to create ideal habitat and, through its Rare Reptile and Amphibian Breeding Centre, to captive-rear turtles. Ideal pond habitat was created in 17 locations with shallow littoral shelves, sunbathing spots and wide open south-facing egg-laying sites with sandy ground. The population was boosted with over 40 adults and semi-adults that had been raised in captivity 4-7 years before their release into the improved habitat. A bonus for the project was finding that the turtle ponds also attracted *B. bombina,* which helped strengthen a southern Latvia/ Belarus population.

Three subspecies of *Emys orbicularis* are found in the Iberian Peninsula. Three projects implemented consecutively in Spain (EmysTer - LIFE04 NAT/ES/000059, PROYECTO ESTANY - LIFE08 NAT/E/000078 and LIFE Potamo Fauna - LIFE12 NAT/ES/001091) increased the population through an ex-situ breeding programme to reintroduce

young pond turtles together with actions to remove invasive alien terrapins (e.g. Red-eared slider - *Trachemys scripta elegans*) and invasive alien fish. The projects led to the successful recovery of an almost extinct *E. orbicularis* population in the River Ter.

The pond turtle subspecies *E. orbicularis orbicularis* occurs in northern European lowlands in the Continental and Boreal regions. The Lithuania-led project **NELEAP** had a regional impact and improved the fragmented habitat situation in Estonia, Lithuania and Germany, including a rigorous effort to save the last German pond turtles. The preconditions for such long-lasting activities were the purchase or lease of land by the LIFE project, the establishment of buffer zones and compensation measures for landowners and the control of the invasive Raccoon dog (*Nyctereutes procyonoides*) and American mink (*Neovison vison*) which were identified as predators on the pond turtles. The support of hunters in trapping Raccoon dogs along with a 20-year reintroduction programme was able to turn the tide in favour of the pond turtles and stablise the last populations in Germany. LIFE funding provided the catalyst for this long-term species survival programme.

Tortoises, snakes and lizards

Terrestrial reptiles, including tortoises, snakes and lizards are particularly threatened by land use change and pressures related to agriculture. Pesticides and fertilisers can get into reptile bodies through their prey (e.g. insects) and intensive agriculture reduces the availability of naturally occurring sandy spots for egg laying. The six European viper species in the Habitats Directive are threatened by intensive agriculture, urban sprawl, collection in the wild and climate change.

There are several sub-species of Meadow viper (*Vipera ursinii*) in Europe. The priority species Hungarian meadow viper (*V. ursinii rakosiensis*) is a small venomous snake that was on the verge of extinction with less than 500 individuals remaining in Hungary. Conservation measures by three successive LIFE projects (HUNVIPURS - LIFE04 NAT/HU/000116, CONVIPURSRAK - LIFE07 NAT/H/000322 and HUTURJAN - LIFE10 NAT/HU/000020) targeted 95% of the global population and this effort has led to a positive conservation trend.

Fourteen years after the first project started, the total population was estimated to have increased to up to 1,000 individuals after releasing more than 500 from a local breeding centre (also see NEEMO, 2018). Other measures included the improvement of 900 ha of grassland habitats for the vipers and establishment of a permanent cattle grazing regime to maintain the habitats in good condition for the viper population. One of the biggest challenges for the projects was to harmonise conservation management interests with military activity in a live shooting range through developing a management plan. The populations of the vipers appear to have stabilised through these efforts and public awareness campaigns, including captive-breeding work with Budapest Zoo, have raised the profile of the species.

It is sometimes the case that one species of reptile is relying on another for its prey. For example, the Smooth snake (*Coronella austriaca*) is quite dependent on the Sand lizard (*Lacerta agilis*), and especially juvenile snakes feed on the offspring of the lizard. The Hungarian meadow viper, however, favours crickets, grasshoppers and locusts, as well as small mammals and small lizards. Thus, there is a clear link between the conservation status of reptiles and amphibians and the conservation status of their habitats in terms of provision of prey.

Frogs, toads and newts

For amphibians the availability of wetland breeding sites is crucial. Thus the greatest threat comes from the intensification of agriculture and the loss of fens, bogs, ponds and other breeding sites through infilling to increase agricultural area. Also, over many years, natural refuges and hibernation sites (hedges, stone piles, dead trees etc.) have been removed as part of an overall move to improve agricultural efficiency. The associated pesticides and fertilisers are an additional threat as they are easily washed into freshwater habitats and have a negative effect on the development of offspring. The need of many species such as *Bombina bombina* and *B. variegata* for pond networks at landscape scale compounds the problems. Many LIFE projects have addressed these specific threats by creating pond networks, by restoring features in the landscape and by reducing pollution to watercourses.

The European tree frog (*Hyla arborea*) has a poor conservation status in the Boreal, Continental and Atlantic regions. For the Atlantic region in Belgium its conservation status improved from bad in 2012 to poor in 2018 with the projects Life Itter en Oeter (LIFE09 NAT/BE/000416) and Triple E Pond area M-L (LIFE08 NAT/B/000036) contributing to this improvement. **Triple E Pond area M-L** opened up pond habitats for *H. arborea* by removing sludge, restoring feeder ditches and removing overshad-

owing trees and scrub. The triple E-approach, led by the European Landowners' Organisation, combined ecology, education and economy, and the project worked successfully with private landowners (including fish farmers) to improve the habitats for the tree frog and Bittern (*Botaurus stellaris*).

In southern Lithuania **ECONAT** addressed the conservation needs of 10 threatened reptile and amphibian species through developing a landscape-scale ecological network combined with specific habitat restoration actions. Both *Emys orbicularis* and *Hyla arborea* were selected as umbrella species with the idea that if you focus work on these highly endangered species the others will naturally benefit. The project created or restored over 200 ponds, established hibernation sites for amphibians and released into suitable habitat about 3,000 young frogs raised at the Lithuanian Zoo in Kaunas. Although the status of *H. arborea* remains poor in Lithuania the trend is now positive, thanks to this project. **ECONAT** is also considered to have saved *E. orbicularis* from local extinction through its actions to release captive-bred animals and to restore wetlands to provide stepping stones and corridors of benefit to other species including *B. bombina* and *T. cristatus*.

The project SemiAquaticLife (LIFE14 NAT/SE/000201) targets a number of amphibians and reptiles in 39 Natura 2000 sites in southern Sweden, Denmark and northern Germany and demonstrates the dependence of semi-aquatic species on 'both worlds'. Amphibians as semi-aquatic species need water to complete their breeding cycle but may spend most of their time in terrestrial environments where habitats must be suitable for feeding, hibernation and protection from predators. The project appears to have already led to an improvement of the conservation status of the Agile frog (*Rana dalmatina*) in Sweden from bad in 2012 to poor but improving in 2018.

The Common spadefoot toad (*Pelobates fuscus*) is a widespread species with an overall improving conservation status in Europe except for its northern range. Its population status has improved regionally in Estonia, mainly through the work of DRAGONLIFE (LIFE08 NAT/EE/000257) which created and restored over 200 small water bodies in Estonia and Denmark and prepared a national species survival plan for Estonia. Both the aquatic and terrestrial habitat of *P. fuscus* was improved by removing scrub and constructing hibernation sites supplemented by the release of over 10,000 tadpoles and toadlets into restored ponds.

In Germany Schutz der Knoblauchkröte (LIFE11 NAT/DE/000348) worked on the last remaining populations of *P. fuscus* in the Münsterland region of North-Rhine Westphalia. One of the outstanding successes of the project was the establishment of a captive breeding programme for *P. fuscus* and the release of over 50,000 toads. Monitoring confirmed that the population had stabilised, thanks to ongoing management measures to improve both the aquatic and terrestrial habitats of the species. The project contributed to the publication of a comprehensive book on the species and the knowledge gained is being replicated through the Integrated Project Atlantic region DE (LIFE15 IPE/DE/000007).

LIFE projects and reptiles and amphibians

One of the important outputs of many LIFE projects across Europe is an increase in the knowledge on the ecology of species and the most effective conservation measures which include, *inter alia*, ex-situ breeding programmes, provision of hibernating sites, protection of eggs, pond creation, trapping invasive alien species and effective monitoring methods. For example, over the past 20 years the knowledge acquired from pond projects for the conservation of amphibians and reptiles has been shared throughout Sweden, Denmark, Germany, Poland, Latvia, Estonia and Lithuania to the benefit of the target species. Participating projects include Bombina in the Baltic Region (LIFE04 NAT/DE/000028), LIFE Auenamphibien (LIFE14 NAT/DE/000171), LIFE-AMPHI-KULT (LIFE08 NAT/D/000005), PHS in NPR (LIFE04 NAT/LV/000199), **Life-HerpetoLatvia**, Bombina (LIFE99 NAT/DK/006454) and **Schutz der Knoblauchkröte**. The notable achievement of these projects, many of which were transnational, is not only the excellent implementation of habitat measures but also the study of the ecology of the species (habitat use, reproduction, feeding behaviour etc) and the improvement of methods for breeding, reintroduction and monitoring.

Monitoring of amphibian and reptile species and the impact of measures undertaken is not always easy and sometimes requires the fitting of tracking devices (e.g. subcutaneous chips on pond turtles) to allow radio-tracking. Some reptile species, especially snakes, are very difficult to spot in the field and data on population size is hard to get. Obtaining meaningful data in the short span of a LIFE project is a challenge, but longer runs of data can be secured when two or more projects follow each other.

Working with other stakeholder groups is important to many projects addressing the recovery of reptile and am-

phibian populations. This is particularly important given the long life spans of species such as sea turtles and pond turtles. The integration of public stakeholders to raise awareness and acceptance of amphibians and reptiles was very important and extremely successful in some projects such as **Bombina in the Baltic Region** in Denmark, Germany, Sweden and Lithuania. Another example of how good communication can be used as a substantial tool in species conservation was the Belgian project **Triple E Pond area M-L**, which received the Natura 2000 award for communication in 2014. One of the target species was *Hyla arborea* and the project performed pioneer work through its innovative cooperation between private landowners, nature organisations and several government bodies. Furthermore, explaining the necessity of ongoing work to school children is seen as a key to future protection and conservation. Reptiles and amphibians are popular species for citizen science projects, although some care is needed when involving the public with poisonous snakes!

There are many LIFE projects that have contributed to the improvement of conservation status for amphibians and reptiles through a habitat approach, irrespective of whether the species were named project targets. **LIFE Mires Estonia**, for example, whilst improving wetlands, such as *Active raised bogs* (7110*), *Bog woodland* (91D0*), and *Fennoscandian deciduous swamp woods* (9080*) has improved the conditions for the Moor frog (*Rana arvalis*).

Similarly, **LIFE4Delta_PL** (LIFE17 NAT/PL/000018) in the inland delta of the Nida River in Poland is carrying out measures, such as land purchase and re-establishment of cattle grazing, to improve the structure and function of *Alluvial forests* (91E0*) and *Natural eutrophic lakes* (3150) while also benefiting *Emys orbicularis*, *Triturus cristatus* and *Bombina bombina*. The pond turtle will be reintroduced at one site.

As in almost all LIFE projects, a combination of measures is usually necessary to achieve project objectives, and some beneficiaries have run multiple projects for one main species back to back, e.g. for *V. ursinii rakosiensis* in Hungary, *E. orbicularis* in Spain and *B. bombina* in Germany, so that the combined measures ultimately lead, or will lead, to a stabilisation or increase of the local population. In some cases, as in examples for the *E. orbicularis* or *V. ursinii rakosiensis*, land purchase is the best or only way to protect populations from unfavourable land management over the long term.

3.2.4 Invertebrates

Invertebrates represent the largest share of species on earth. They include groups as diverse as molluscs, crabs and butterflies. Of the roughly 150,000 species in Europe, 172 are listed in the Habitats Directive Annexes II and IV. Six of these have shown a genuine improvement in their conservation status compared to 2012. Most others are still in decline, mostly due to unsustainable forest management, agricultural intensification and abandonment, tourism development, climate change, water extraction and pollution, and overall under-protection.

LIFE projects mostly target invertebrates through the restoration of their habitats. A total of 74 invertebrate species have been targeted by LIFE since 1992. This has certainly had an impact on improving the conservation status of many endangered invertebrates in Europe. However, more is needed to make real impact, such as targeting more species, increasing knowledge and monitoring, delivering species and habitat action plans, supporting the EU Pollinators Initiative and the commitment to reverse the decline of pollinators as included in the EU Biodiversity Strategy for 2030, and communicating the vital importance of invertebrates.

KEY MESSAGES

LIFE has certainly had an impact on improving the conservation status of many endangered invertebrates in Europe. The most important successes relate to re-establishing traditional mowing and grazing regimes in grasslands, restoring the natural structure of rivers for molluscs, and creating networks of ponds for dragonflies. The impact of LIFE is strongest in combination with long-term habitat restoration. LIFE did achieve local successes in boosting invertebrate populations, such as the Large white-faced darter dragonfly (*Leucorrhinia pectoralis*) and the Marsh fritillary butterfly (*Euphydryas aurinia*). The EU Pollinators Initiative and the EU Biodiversity Strategy for 2030 offer opportunities for strengthened LIFE efforts for invertebrates.

Status

Including marine species there may be about 150,000 invertebrate species in Europe[14]. Invertebrates are the most abundant and species-rich group of animals. They provide critical ecosystem services such as pest control,

14 https://eunis.eea.europa.eu/species.jsp

Species showing improved status in Article 17 reports	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
White-clawed crayfish (*Austropotamobius pallipes*)	ES	MED	U2+ to U1- (genuine improvement in status and trend)	**LIFE Potamo Fauna** (LIFE12 NAT/ES/001091)
Large white-faced darter (*Leucorrhinia pectoralis*)	BE	CON	U2+ to U1+ (genuine improvement in status)	**HELA** (LIFE06 NAT/B/000085)
Dusky large blue (*Phengaris nausithous syn. Maculinea nausithous*)	NL	ATL	U2- to U2+ (genuine improvement in trend)	**Blues in the Marshes** (LIFE11 NAT/NL/000770)

Table 10: Examples of genuine positive trends in invertebrate species reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

pollination, soil creation, water filtration, etc. Most of these species are declining across Europe in the face of loss of natural habitats, agricultural intensification, pollution, pesticide use, invasive alien species and climate change.

The Habitats Directive includes 136 invertebrate species in Annex II, including 38 species of beetles (*Coleoptera*), 38 species of butterflies and moths (*Lepidoptera*), 11 species of dragonfly and damselfly (*Odonata*) and 33 species of molluscs (Gastropods and bivalves), including several priority species. Additional species in need of strict protection are included in Annex IV and V of the Habitats Directive, bringing the total to 181.

The evaluation of the Article 17 information for the 2007-2012 period showed that arthropods, molluscs and other invertebrates together had fewer than 25% good assessments, and for molluscs there was over 25% of bad assessments. In terms of trends molluscs also had over 25% of assessments unfavourable-declining.

Member States' reports for the 2013-2018 period do show a number of genuine improvements to conservation status and/or trends, although very few of these are associated with LIFE projects (Table 10), in part reflecting the difficulties that LIFE projects face in securing a good conservation status for target species in the short time frame of most projects.

However, where there is an improvement in the reported conservation status as a result of improved knowledge, in several cases this is likely to be a result of monitoring studies carried out by LIFE projects. In the Czech Republic, the conservation status of the Jersey tiger moth (*Euplagia quadripunctaria*) is now good – an assessment probably helped by the work of four LIFE projects which targeted this species. Similarly, the conservation status for a number of saproxylic beetles in Italy, such as the Alpine longhorn beetle (*Rosalia alpina*), Stag beetle (*Lucanus cervus*) and Hermit beetle (*Osmoderma eremita*), is improved due to improved knowledge, some of which is expected to have come from the nine projects between 1998 and 2011 which targeted these species.

The difficultly in addressing the conservation of invertebrates is their sheer number. The Birds and Habitats Directives give protection status to 1,171 animal species, of which 1,090 are vertebrates and 181 invertebrates. These figures represent 65% of the vertebrates but only 0.1% of the invertebrates present in Europe[15].

The threats to invertebrates are summarised in the European Red Lists, some of them produced with LIFE funding, which now cover saproxylic beetles, dragonflies, butterflies, non-marine molluscs, bees, and grasshoppers and crickets. Further reviews are planned, such as a Red List for hoverflies.

The Red Lists highlight the need for conservation measures such as protection and management of habitats, species action plans, monitoring, improved land management policies and revising legislation – adding species as necessary. The most pressing actions are to establish a good baseline, to identify areas to be conserved, to identify threats and to strengthen the network of experts. Long-term studies such as the European Butterfly Monitoring Scheme confirm the decline in grassland butterflies.

15 *Preface to 'Spineless'* https://portals.iucn.org/library/sites/library/files/documents/2012-064.pdf

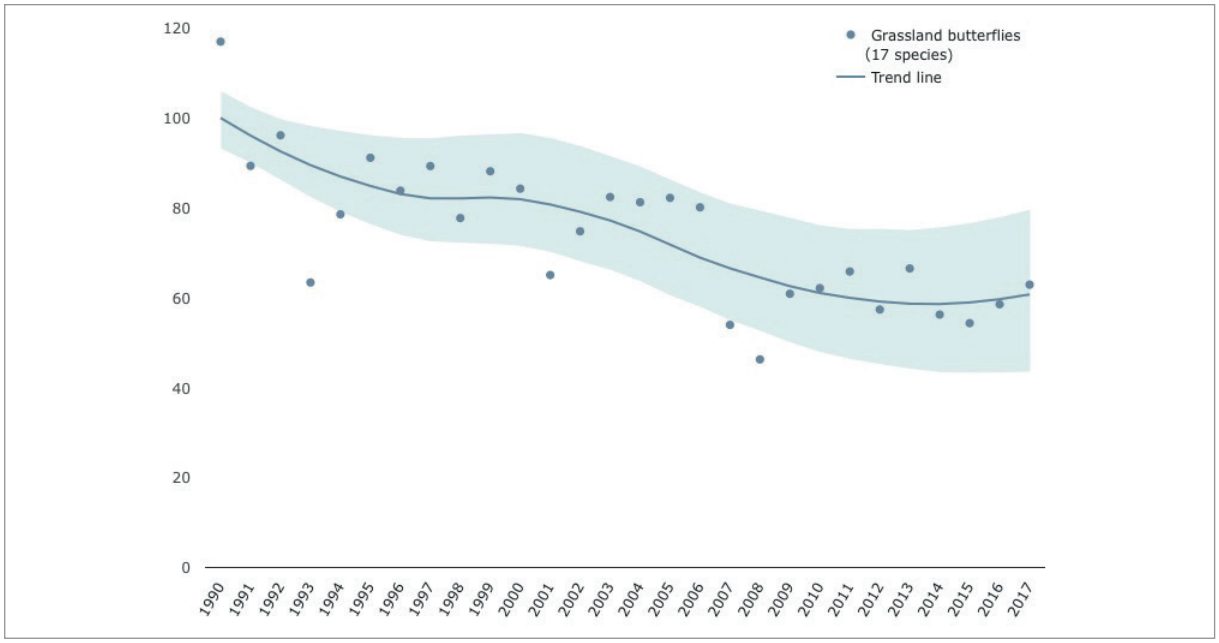


Figure 18: Trend in population index of grassland butterflies in EU-28, 1990-2017 (Source: European Environment Agency[11])

LIFE programme response

Since 1992 the LIFE programme has helped address the conservation needs of many of Europe's rare and endangered invertebrate species listed in the Habitats Directive, mainly through traditional habitat and species projects. In 2011, the first LIFE platform meeting on terrestrial invertebrates was held in the UK (hosted by the project **Cornwall Moors** - LIFE03 NAT/UK/000042). A review was published in 'LIFE and invertebrate conservation' and the LIFE programme was opened up to any species listed as endangered in the European Red Lists for invertebrates. A second LIFE platform meeting on invertebrates was held in the UK in 2018[17] (hosted by **EcoCo LIFE Scotland** - LIFE13 BIO/UK/000428) and this was followed by ex-post missions to 20 closed projects targeting invertebrates and habitats for invertebrates. This exercise highlighted the need for more sustained programmes of management and monitoring to take account of the way invertebrate numbers can fluctuate from year to year in response to weather events, thus making it difficult to see short-term trends.

LIFE projects have targeted 21 species of mollusc, 19 species of beetle, 15 species of butterfly and moth and 10 species of dragonfly and damselfly. The most frequently targeted species have been the Large white-face darter or Yellow-spotted whiteface (*Leucorrhinia pectoralis*), the saproxylic beetle *Osmoderma eremita* and the Marsh fritillary butterfly (*Euphydryas aurinia*).

LIFE projects directly or indirectly targeting invertebrates are mainly grouped into projects in open habitats such as natural and semi-natural grasslands (butterflies and moths), forests and wooded meadows (saproxylic beetles and butterflies), ponds and streams (dragonflies, pearl mussels and crayfish), and bogs and mires (dragonflies). The most common actions have been open habitat restoration such as reintroducing grazing and mowing and establishing agri-environment schemes, wetland restoration, forest management and species reintroduction. Although most projects are LIFE Nature projects there are also LIFE project examples which address pollination services, invertebrates as indicators of sustainable agriculture and forest management, earthworms as soil health indicators and how urban areas can support wild bees.

Dragonflies and damselflies

Dragonflies and damselflies are found in both flowing- and still-water habitats. The main threats addressed by LIFE projects are the loss of wetlands from alteration to river dynamics, over-abstraction of water, filling in of ponds and pollution.

The case in the box presents an excellent example of how a series of LIFE projects has boosted the population of *Leucorrhinia pectoralis* in Belgium. There are indications also of improved status locally in France through the pro-

16 *www.eea.europa.eu/data-and-maps/indicators/abundance-and-distribution-of-selected-species-8/assessment*
17 *A background note for this platform meeting gives an update on LIFE and invertebrates.*

In the spotlight: Dragonflies returning to the Belgian Ardennes

Leucorrhinia pectoralis is a small dragonfly which occurs throughout Europe and is typically found in the stagnant water bodies associated with fens and mires. At the EU level it shows a poor or bad status in all biogeographical regions except the Boreal, where it is good. No genuine improvements at the biogeographical level are observed in the 2019 report. The main reasons for this precarious situation are desiccation and associated loss of pools, eutrophication and acidification of stagnant waters, sometimes leading to overgrowth.

Since the start of the LIFE programme over 30 projects have helped to create and maintain pools and raise the ground water table by closing ditches. The Belgian LIFE meta-project Ardenne Plateaux (see also 3.3.6), comprising six consecutive projects* over 17 years, is likely to have had a major influence in improving the status of the species in the Continental region. In Belgium it has improved from bad in 2012 to poor in 2018. This represents one out of two genuine status improvements in Europe, the other being in the Netherlands.

An ex-post evaluation of four of the Ardenne Plateaux projects showed that the species, which was listed as critically endangered or even regionally extinct in the Red List for Wallonia, is now listed as vulnerable. The creation of over 10,000 small ponds across this large region is likely to have helped the recovery of this species by also providing new habitat for a spread of the species from the east. A key success factor here is the long-term vision that was implemented in a series of successive projects that jointly were able to have a large impact on the peat habitats and their associated species.

* Saint Hubert (LIFE03 NAT/B/000019); PLTTAILLES (LIFE05 NAT/B/000089); Cx SCAILLE (LIFE05 NAT/B/000087); PLTHautes-Fagnes (LIFE06 NAT/B/000091); LOMME (LIFE08 NAT/B/000033); Ardenne liégeoise (LIFE10 NAT/BE/000706)

ject LIFE Jura peatlands (LIFE13 NAT/FR/000762) and in Estonia through the project LIFE Mires Estonia where it was a target species in both projects.

Butterflies and moths

Butterfly and moth species are particularly threatened by the loss of habitat or habitat connectivity due to either intensification or abandonment of agriculture. Actions for protecting habitat, improving habitat and connecting habitat are included in many successful LIFE projects.

The Dusky large blue butterfly (*Phengaris nausithous* syn. *Maculinea nausithous*) occurs on damp, moderately nutrient-rich grassland and rough vegetation and requires an association with the ants of the *Myrmica* genus. Its conservation status is bad in the Atlantic region, and at the European level its IUCN category is 'near threatened'. In the Netherlands it is restricted to just one site with a maximum total population of 400 individuals in 2017. Its situation is precarious but work carried out by Blues in the Marshes (LIFE11 NAT/NL/000770) focused on creating new habitat for the future along roadside margins, taking measures to adapt mowing regimes, to reduce air pollution and to consider climate change adaptation. A unique feature of the project that showed great results was the transposition of intact vegetation (including topsoil with all its soil biodiversity) to grasslands under restoration. Moving a complete micro-ecosystem ensured speedy reproduction of the butterfly locally. This gives hope for the future and the conservation trend is now upwards (from U2- to U2+). Time will tell, however, if the work of the project is enough to secure a sustainable population in the Netherlands at the very western edge of the European distribution of this species. In 2019, 125 important plant species were found at the project site (including 44 species from the Red List), which now has the Dutch record for the most species-rich square kilometre and which no doubt benefits the invertebrate fauna.

Many insect populations operate under so-called metapopulation systems where colonies establish themselves, thrive for some years and then naturally go extinct. A 'patches and corridor' approach is essential to provide robust habitat matrixes for such invertebrates. One example is *Euphydryas aurinia,* which had undergone rapid decline in Denmark due to fragmentation of its habitats.

At the start of ASPEA (LIFE05 NAT/DK/000151), only eight small subpopulations remained. The project was able to establish four new subpopulations and increase overall numbers from 1,200 to 3,600 adult butterflies. The project established best practice for the management of the species and included this in State and local level management plans. Although the project did not reach the objective 'to bring the population of Marsh fritillary in Denmark into a favourable conservation status' it succeeded in improving the conservation status in the Continental region, which is now poor but showing a positive trend since 2012. The population in the Atlantic region has also increased, both in numbers of individuals and number of subpopulations, although the conservation status is still assessed as bad unchanged since 2006 but now with a positive trend.

By the 1990s, the Marsh fritillary was extinct in northern Germany as a result of the intensification of farmland, drainage of bogs and spread of coarse grass and scrub. The ambitious project LIFE-Aurinia (LIFE09 NAT/DE/000010) set out to reintroduce *E. aurinia* by improving habitats through mowing and grazing to reduce nutrients and coarse vegetation, reintroducing butterfly food plants, collecting caterpillars from northern Denmark to develop an ex situ breeding population, and releasing 1,300 adults and 100,000 caterpillars into the restored habitats. As *E. aurinia* is considered to be an umbrella species, the project could show that by restoring its natural habitats there was a benefit to at least 30 butterfly species.

Several projects in the Czech Republic and Slovakia have re-established traditional mosaic management of flower-rich meadows in place of modern, more intensive management for the conservation of rare butterfly species, and have developed agri-environment schemes focused on areas previously excluded from agricultural subsidies. The project Butterflies CZ-SK (LIFE09 NAT/CZ/000364) introduced, tested and promoted patchwork management and developed new agri-environment measures for 10 threatened species, including the Danube clouded yellow (*Colias myrmidone*) and the Large blue butterfly (*Maculinea arion*). The main measures were clearing long-abandoned meadows and pastures of invading scrub, pruning hedges and opening up forest fringes to allow in more light, and introducing mosaic mowing to replace a single annual cut of a large area with a patchwork of two or three cuts a year and in smaller areas. Instead of intensive livestock grazing, more extensive systems were introduced using with cattle, sheep and goats to alternate the land between periods of grazing and non-grazing and to graze poorly accessible areas. Taken together, all these measures helped to increase the populations and range of several species. LIFE for insects (LIFE16 NAT/CZ/000731) expands this work by re-establishing traditional management of wet meadows, conserving open-canopy mixed forests and creating stepping stones between areas of suitable habitat. LIFE Beskydy (LIFE12 NAT/CZ/000629) focuses on the management of *Nardus grasslands* (6230*) and its associated invertebrates threatened by the abandonment of traditional land management practices such as grazing and mowing.

Freshwater molluscs

It is difficult to report on significant improvements to freshwater mollusc species given the scale of the pressures and threats affecting water catchments, including water pollution and over-abstraction. Freshwater molluscs are the most at risk of all groups of invertebrates with the IUCN estimating that 55% of all species are threatened. However, locally, improvements probably linked to LIFE projects are reported for the Thick-shelled river mussel (*Unio crassus*) in Luxembourg through Resto-unio (LIFE11 NAT/LU/000857) and for Freshwater pearl mussel (*Margaritifera margaritifera*) in France through LIFE Continuité écologique (LIFE10 NAT/FR/000192).

In many cases the lack of knowledge on the taxonomy, distribution and habitat requirements of invertebrates is a constraint, but LIFE projects can address these barriers whilst also developing conservation measures. An example would be for the bivalve mollusc *Unio ravoisieri,* recently differentiated from Annex II *Unio elongatulus* and found only in two river basins in Spain. The national Article 17 report for Spain (2013-2018) reports a recovery trend for the species from bad and declining to bad and improving thanks to the work of PROYECTO ESTANY (LIFE08 NAT/E/000078) and LIFE Potamo Fauna (LIFE12 NAT/ES/001091). Between 2010 and 2017, species recovery measures were carried out by reintroduction from captive breeding, restoration of rivers, repopulation with native fish and actions against invasive alien species. The captive breeding centre is still operational and the population trend is considered to be upwards.

Saproxylic beetles

Saproxylic (living on decaying wood) beetles help to re-

cycle nutrients in forest ecosystems and are a measure of forest health. Even in semi-natural forest habitats they are threatened by the loss of ancient and veteran trees and a decline in tree age structure. Forestry practice tends to favour young, fast-growing trees at the expense of woodland ecosystem structure and function. Many LIFE projects have helped to raise awareness of the need to retain older trees for biodiversity and forest function.

A problem in the EU is that the outstanding conservation value of semi-open wood pasture systems with veteran trees is currently neither specifically recognised in the common agricultural policy, nor in Annex I of the Habitats Directive. Even within Natura 2000 sites specifically designated for wood pastures or saproxylic beetles, eligibility rules for common agricultural policy (CAP) payments are promoting management practices that are leading to a transformation of wood pastures into either woodland or grassland, thereby destroying the essential vegetation mosaic beetles require. The attention to the protection of old-growth forests in the EU Biodiversity Strategy for 2030 may bring positive impacts for many invertebrates in the future.

Marine invertebrates

Few projects have targeted marine invertebrates. The Spanish project **LIFE REMoPaF** (LIFE15 NAT/ES/000987) focuses on the conservation of the endangered Mediterranean ribbed limpet (*Patella ferruginea*). It is the first invertebrate, and the first marine species, to be targeted with a national conservation strategy: the main action is to collect individuals from a donor site for translocation to other sites where the species is in decline. One of the innovative aspects of the project is trialling the use of 3D printing to create artificial inert mobile substrates to assist with the translocation work.

LIFE and invertebrates

The LIFE programme experience with working with threatened invertebrates reveals the scale of the challenge across Europe. On the one hand individual projects have had successes in developing management measures for a group of species (meadow butterflies, for example), but the replication required across a region, faced with ongoing degradation of habitat, is daunting. For grassland species so much depends on developing sustainable agri-environment measures. The European habitat action plan for semi-natural dry grasslands (Olmeda et al., 2019) addresses 16,700 km^2 of mostly unfavourable habitat across 25 Member States where regular management by mowing or grazing is required. Taking a habitat approach at this scale, and delivering results through the CAP, would undoubtedly be beneficial to a wide range of invertebrates and especially some of Europe's most threatened butterfly species. The important demonstration role of LIFE projects is recognised in this habitat action plan.

The European Red Lists highlight a mismatch between Habitats Directive listed species and IUCN categories. Although some of the well-targeted species in LIFE such as *E. aurinia* are classified 'least concern' in the IUCN lists, experts agree that the LIFE programme, by targeting individual species, has improved important habitats for a wide range of species. Whilst one or two listed species might attract the funding many more will benefit from the habitat restoration work. On the St-Hubert Plateau in the Belgian Ardennes the total number of dragonfly species increased from 20 to 37 as a result of habitat restoration, with improvement to the status of seven IUCN-listed threatened species. As an example of the opening up of the LIFE programme to species listed in the European Red Lists **LIFE BEETLES** (LIFE18 NAT/PT/000864) targets three species endemic to the Azores not on the Habitats Directive but classed as critically endangered on the IUCN list.

There are no **bee species** in the annexes of the Habitats Directive yet there is now increasing recognition of the economic value of bees as wild pollinators. The main threat to European bees is habitat loss as a result of agricultural intensification (e.g. changes in agricultural practices, including the use of pesticides and fertilisers), urban development, increased frequency of fires and climate change. Almost 30% of all the species threatened at the European level are endemic to Europe.

The LIFE programme is also ready to support the priority actions in the EU Pollinators Initiative – particularly actions tackling the causes of pollinator decline by conserving endangered pollinator species and habitats. In Europe, around 84% of crop species and 78% of wild flowering species depend, at least in part, on animal pollination and almost €15 billion of the EU's annual agricultural output is directly attributed to insect pollination[18]. The dramatic decline in the occurrence and diversity of all wild insect pollinators including wild bees,

18 *Natura 2000 newsletter 44, July 2018. Main article on EU Pollinators Initiative: https://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/nat44_en.pdf*

hoverflies, butterflies and moths is of serious concern not only for biodiversity but also for the economy. The EU Biodiversity Strategy for 2030 recognises the urgency and includes a number of actions to support its commitment to reverse pollinator decline.

The LIFE programme has the opportunity to scale up conservation work through LIFE Integrated Projects for nature designed to support regional or national prioritised action frameworks which themselves are a tool for delivering EU biodiversity targets. Thus, for example, the German Atlantic Region DE (LIFE15 IPE/DE/000007) includes actions for *L. pectoralis* in a 10-year project covering much of North Rhine-Westphalia and Lower Saxony. Projects like this may show that saving endangered invertebrate species of the Habitats Directive is best achieved through longer-term projects linked to regional or national strategies.

3.2.5 Mammals

Within the European Union there are 219 terrestrial mammal species, of which 59 are endemic (26.9%), and 41 species of marine mammals. The Habitats Directive lists 55 species of mammals in Annex II, out of which 18 are priority species (17 terrestrial and only one marine mammal).

The main threats to mammals remain habitat loss and degradation, pollution (including global climate change), conflicts with humans, accidental mortality (e.g. vehicle collisions, secondary poisoning), invasive alien species and overharvesting. For marine mammals threats include accidental mortality (e.g. fisheries bycatch and ship strikes), pollution and stranding caused by underwater noise.

Overall, the Article 17 report for the 2013-2018 period calculated that approximately 25% of the mammal species assessed (473 assessments) are in good status, which has not changed since 2012 (EEA, 2015); around 10% have a bad status, which is a significant improvement over the last reporting period where almost 40% were in a bad conservation status. Red Listed mammals seem to be well covered by the Natura 2000 network (Trochet & Schmeller, 2013) and 18 species show positive population trends (Deinet et al., 2013). It was difficult to link LIFE projects directly with these improvements, but the transboundary nature of many of the larger species means that project actions taking place in one country may also benefit others.

KEY MESSAGES

The significant improvement of a wide range of species from a bad to a good conservation status during this last reporting period is a LIFE conservation success. In the case of large carnivores, the measures adopted by LIFE projects are believed to contribute to the improvement of the conservation status in some countries where it is bad and to the maintenance of the actual status in other countries where it is good. This is especially true for the Wolf (Canis lupus). Multiple LIFE projects addressing the same species and working across national boundaries undoubtedly have benefits for these large migratory species. Smaller terrestrial mammals are also on the increase. Bat populations have benefited the most and the conservation status of 11 species has shown a genuine positive trend, mostly in northern Europe. The Eurasian beaver (*Castor fiber*) is a standout success with genuine improvements in conservation status in four Member States and reaching good status in three of the four. On the other hand, LIFE successes with marine mammals are scarce due to the low number of projects addressing this category.

Status

The mountainous regions of temperate and Mediterranean Europe (including the Cantabrians, Pyrenees, Massif Central, Alps, Apennines, Carpathians, and mountains of the Balkan peninsula) clearly stand out as areas of high species richness. There is a marked latitudinal gradient in species richness, with southern Europe (and especially southeastern Europe) containing a greater diversity of mammal species than the north. In the marine realm, mammal species richness is higher in the open Atlantic Ocean than it is in the enclosed Baltic, Mediterranean and Black seas.

The diversity of endemic mammal species is particularly high in diverse mountainous regions including the Pyrenees, Cantabrians, Alps and Apennines. The Italian and Iberian peninsulas also hold important concentrations of endemic mammal species.

Mammals have the lowest proportion of species reported in bad conservation status, and the group shows more increasing than decreasing population trends at just over 20% increasing. Bat populations, the Eurasian beaver (*Castor fiber*) and large mammals like the Wolf (*Canis lupus*) are among the main beneficiaries from strict protection regimes and targeted conservation actions across the EU, as is evidenced in Table 11. Apart from these genuine improvements in con-

Terrestrial Species showing improved status in Article 17 reports	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Western barbastelle (*Barbastella barbastellus*)	SE	BOR & CON	U2- to FV=	**Bush LIFE** (LIFE13 NAT/SE/000105)
Wolf (*Canis lupus*)	SI	ALP & CON	U1= to FV+	**LIFE WOLFALPS** (LIFE12 NAT/IT/000807); **SloWolf** LIFE08 NAT/SLO/000244
Eurasian beaver (*Castor fiber*)	BE	ATL	U2+ to U1+	**LIFE+SCALLUVIA** (LIFE12 NAT/BE/000596)
Iberian lynx (*Lynx pardinus*)	ES	MED	U2+ to U1+	**Lince Andalucía** (LIFE02 NAT/E/008609); **Reintroducción Lince Andalucia** (LIFE06 NAT/E/000209) **Iberlince** (LIFE10 NAT/ES/000570)
Finnish forest reindeer (*Rangifer tarandus fennicus*)	FI	BOR	U1+ to FV+	**Wild forest reindeer** (LIFE98 NAT/FIN/006325)
Mediterranean horseshoe bat (*Rhinolophus euryale*)	FR	ATL	U2- to U1=	**CHIROFRSUD** (LIFE04 NAT/F/000080)

Table 11: Examples of genuine positive trends in terrestrial mammal species reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

servation status there were many more cases where the trend is improving but the assessment is based on a change in the assessment methodology (15 cases), improved knowledge (74 cases) or not stated (29 cases).

Marine mammals are poorly represented in comparison to their terrestrial counterparts: they are also amongst the species groups with the highest proportion of unknown assessments (over 78%). No LIFE projects were identified that may have contributed to a change in species status or trend. Generally, the lack of appropriate monitoring is an important factor especially for cetaceans.

LIFE programme response

The LIFE programme has targeted 71 mammal species. Around 328 projects have benefited mammal species as a result of direct or indirect conservation actions. The measures adopted range from changing behaviours and attitudes to securing predators' food supplies and restoring the connectivity of habitats to allow migration.

The species most commonly targeted by the LIFE projects are Brown bear (*Ursus arctos*), Wolf (*Canis lupus*) and Iberian lynx (*Lynx pardinus*), although bats and two cetaceans also feature in the profile. Spain and Italy have the most projects but there are many endangered mammals which have never featured in the LIFE programme. Some of the success stories are presented here and more information can be found in various LIFE publications. For example, there have been 29 LIFE projects featuring *Lynx pardinus* since 1994. This well-documented success story has been fully reported in LIFE improving the conservation status of species and habitats, LIFE and European Mammals, LIFE and human coexistence with large carnivores, and LIFE improves NATURE.

Large carnivores (terrestrial)

Historically, large carnivores had seen their numbers and distribution decline dramatically throughout Europe, mainly as a consequence of the interactions with human activities (livestock farming, hunting etc.). However, in the last few decades, a relevant recovery has been recorded and numbers have reached around 40,000, with most of the populations stable or increasing across Europe.

As many as 21 EU Member States are home to at least one of these species, and the LIFE programme has undoubtedly contributed to improving their conservation status. This effort has resulted in large carnivores returning to many areas from which they had been absent for decades and reinforcement of their presence where they already occurred. Although this could be considered a great conservation success, such increases in species numbers and distribution have revived some controversies and conflicts with local people, notably farmers and hunters. While very early projects may have focused on reintroduction only, the potential conflict between humans and carnivores has been recognised by many LIFE projects since 2002, and LIFE's contribution to improved human coexistence with large carnivores (notably Brown bear, Wolf, Iberian lynx and Eurasian lynx (*Lynx lynx*)) has been detailed in LIFE and human coexistence with large carnivores. More recent

LIFE projects, such as the **LIFE EUROLARGECARNIVORES** (LIFE16 GIE/DE/000661), are carrying forward the lessons learnt in previous projects by implementing suitable approaches to reconcile the conservation of large carnivores and the legitimate interests of the concerned people. No matter how complex and politically sensitive the situation is, efforts to improve coexistence, transboundary cooperation and population management of large carnivores need, however, to be sustained to avoid setbacks and to stabilise current populations.

There are believed to be 17,000 Brown bears (*Ursus arctos*) in Europe (excluding Russia), with the largest single population of around 5,000 to 6,000 in the Carpathian Mountains of Romania. The remaining distribution is scattered and disconnected, with small populations in the Spanish and French Pyrenees, the Cantabrians in Spain and an Alpine population. Some of these populations may already be too small to be sustainable. The population in the Balkans, mainly in Croatia and Slovenia, is relatively large but disconnected from the major population of Europe.

The main threats to Brown bear are hunting, habitat loss and conflict with humans (particularly due to clear-cutting forests) and increasingly poaching on a commercial scale to obtain gall bladders and other body parts for use in medicine[19]. *Ursus arcto*s is listed as endangered by the IUCN throughout much of its European range.

In terms of genuine Article 17 changes recorded in *Ursus arctos* populations, success stories involving LIFE can be found in Spain and Italy. There are two isolated subpopulations in the Cantabrians of north Spain, distributed across an area bordering the Atlantic and Mediterranean biogeographical regions. In the 1990s, the situation of the species was extremely worrying, counting 50-70 individuals in the western population and only 20 in the eastern one. Since 1992, the implementation of consecutive LIFE projects[20] has brought a genuine improvement to the conservation status of both populations, from bad before 2007 to poor in 2018. A number of actions such as the purchase of land, habitat reforestation and planting chestnut and cherry trees to increase food availability, placing electric fences to protect beehives, developing cooperative actions with hunters, improving compensation payments for bear damages, and training rangers to halt illegal trapping and poaching, have altogether contributed to reverse the declining situation, increasing the total bear population to around 300 individuals in 2017. Other measures recently taken (e.g. placing eight crossing points over a highway by **LIFE BEAR DEFRAGMENTATION** (LIFE12 NAT/ES/000192) have contributed to improving connectivity between both populations. Furthermore, the rise of tourism is contributing to change the perception of local populations about the presence of *U. arctos* in the area. Today the Cantabrian population is further threatened by warming temperatures brought about by climate change which are thought to affect the foraging behaviour of the bears[21].

In the Alps, after a long history of habitat degradation and persecution, the Adamello massif/Brenta group of mountains in the Trentino region of Italy had become the last refuge for *U. arctos* in the entire region by 1950; by the late 1990s, however, the remaining population was almost extinct. However, thanks to the LIFE programme, the Italian bear population in the Alpine biogeographical region showed a genuine change in trend in the 2018 Article 17 report, building on successes in the previous period. **URSUS** (LIFE96 NAT/IT/003152) is recognised as being instrumental in reviving the population through the translocation of 10 bears from Slovenia to reinforce the Alpine bear population. As noted previously, the simple act of reintroduction led to conflicts. Significant efforts were made during the 2002-2013 period to reduce these conflicts and bear mortalities with the support of LIFE projects. However, as the results from projects like **ARCTOS** (LIFE09 NAT/IT/000160) and **EX-TRA** (LIFE07 NAT/IT/000502) suggest, conflict resolution can be problematic, and it requires a lot of coordinated effort to achieve long-lasting results.

The Wolf (*Canis lupus*) is the most controversial predator in Europe, as it occupies conflicting places in people's imaginations, being either loved or hated. Historically, wolves have been heavily persecuted and were almost exterminated from most of western Europe, probably falling to their minimum in the 1940s to 1960s. Nowadays, the estimated total number of wolves in Europe is larger than 10,000 individuals (excluding Russia and Belarus).

The most relevant threats for wolves in Europe are low acceptance of the wolf in rural communities, persecution (trapping and poisoning) and poaching, habitat loss and

19 http://www.bearconservation.org.uk/eurasian-brown-bear/

20 Oso/Asturias - LIFE92 NAT/E/014500, Oso en Asturias - LIFE98 NAT/E/005305, Oso Cantabria - LIFE00 NAT/E/007352, Corredores oso - LIFE07 NAT/E/000735, LIFE Bear Defragmentation - LIFE12 NAT/ES/000192, LIFE Oso Courel - LIFE16 ES/NAT/000573, LIFENatura 2000 + BEAR - LIFE16 ES/GIE/000621

21 https://ec.europa.eu/environment/integration/research/newsalert/pdf/cantabrian_brown_bear_climate_change_may_endanger_long_term_conservation_spain_528na4_en.pdf

fragmentation due to infrastructure development, poor management structures, accidental mortality and hybridisation with dogs.

The conservation status of the Wolf varies a lot among the 18 countries with regular presence of wolves (2013-2018 Member State reports), but in Estonia, France, Italy, Latvia, Romania, Slovenia and Lithuania the species currently has a good conservation status. In Finland, Greece, Croatia and Hungary, the conservation status of wolves remains poor, while in Bulgaria and Spain the situation of the species has worsened from good to poor. The status is bad only in Germany, and the situation has not improved since the previous reporting round.

LIFE has largely contributed to the conservation of wolves throughout Europe by developing around 50 projects in several EU countries since 1995. Early projects were carried out in the 1990s fully or partly targeting wolves (or large carnivores), mainly in Portugal, Italy, France and Greece. Main actions were aimed at improving the knowledge on the species (distribution, population size, conservation status, availability of prey species) and main threats, and measures to minimise the human-versus-wolf conflict (improving livestock pens, setting and adopting compensation payment schemes for farmers after livestock loss, and awareness programmes for local populations and key stakeholders such as farmers and hunters).

Numerous projects have been developed since 2000, with Italy still at the forefront, but also in other countries such as Portugal – even a project to change stakeholders attitude in Spain. LIFE projects addressing this species also started to be developed in Eastern European countries, mainly in Romania but also in Hungary, Croatia and Slovenia. Likewise, the first project targeting a boreal Wolf population is currently under development in Finland: **LIFE BOREALWOLF** (LIFE18 NAT/FI/000394).

By way of example, the project **WOLFLIFE** (LIFE13 NAT/RO/000205) was designed to apply best practices for in situ conservation of the Wolf, and to maintain a viable population of wolves in the Carpathian Mountains by strengthening the management and promotion of human-wolf coexistence. The targeted area covered 18 Natura 2000 sites in the Eastern Carpathian Mountains of Romania, where the Wolf is protected. The project collected valuable information on the ecology of the Wolf, protected farms against Wolf predation through a dog training programme, raised awareness amongst stakeholders, tackled Wolf diseases, identified fragmented habitats and developed a National Wolf Action Plan.

LIFE WOLFALPS (LIFE12 NAT/IT/000807) is another example of success. The project was implemented in the Alps of Italy and Slovenia. Wolf populations in these countries are expanding into areas where they have been absent for decades, which is often generating conflicts with livestock breeders and hunters. The main threats for wolves in the area are poaching, but also habitat fragmentation and road killing because of the increase in development of infrastructures. Main achievements of the project were to establish anti-poaching teams and put in place preventative measures to decrease Wolf attacks on livestock. The Wolf ecotourism initiative was an innovative approach that was launched to enhance local economies and increase the perception of profit activities linked to the Wolf. The project created a brand for the first wolf-friendly pilot products of the Italian Alps ('Terre di Lupi'- 'Land of Wolves'), which involved six local cheese producers who actively participated in the development of a brand message that succeeded in showing the pride of creating quality products in coexistence with the presence of a predator. To promote networking with similar initiatives, this measure was coordinated with the bear-friendly line promoted by **LIFE DINALP BEAR** (LIFE13 NAT/SI/000550).

Small carnivores

The Eurasian otter (*Lutra lutra*) is mainly affected by developments and changes in river uses (e.g. canalisation of rivers, removal of river bank vegetation, draining of wetlands, poor water quality in rivers) which have caused habitat fragmentation and reduced otter populations throughout Europe. Diverse initiatives put in place to protect *L. lutra* have increased its populations and range in several regions across Europe. However, if conservation actions for the species were stopped or reduced, the species would very quickly move back into a threatened category (IUCN Red List).

Lutra lutra is listed in Annexes II and IV of the Habitats Directive and there have been 41 LIFE projects targeting *L. lutra* in several countries with different situations. In Sweden, the huge exploitation of timber since the 19th century has led to significant changes in riverine ecosystems. These have been damaged by the construction of wooden dams to ease the movement of logs downstream, by cutting off meanders, by clearing vegetation in river banks, and by deviation of tributaries. These changes have significantly affected the entire riverine

ecosystem, destroying riparian habitats and negatively impacting the populations of fish, otters and other aquatic species.

According to Article 17 reporting for the 2012-2018 period, although *L. lutra* in Sweden still has a bad status in the Boreal and Continental regions and a poor status in the Alpine region, the population trend is increasing and this improvement is considered genuine. Since 2005, several LIFE projects in northern Sweden (**Moälvsprojektet ReMo** - LIFE05 NAT/S/000109, **Vindel River LIFE** - LIFE08 NAT/S/000266, **ReMiBar** - LIFE10 NAT/SE/000045, LIFE-TripleLakes - LIFE13 NAT/SE/000116) have undoubtedly contributed to this improvement. Main actions were aimed at restoring water connectivity (e.g. eliminating timber infrastructures and installing fish passes for migrating species like Brown trout (*Salmo trutta*), an Otter prey species), as well as restoring the natural state of streams to provide spawning grounds for fish, and revegetation of river banks to increase shelter for aquatic species.

Measures to reduce the impact of linear infrastructures were also implemented, since road kill was one of the major threats detected (89% of all reported *L. lutra* deaths in project areas in 2000-2005). This was mainly achieved by building passages under roads and erecting fences to guide the otters to safe crossing points.

The Pyrenean desman (*Galemys pyrenaicus*) is a small semi-aquatic mammal endemic to the Iberian Peninsula (some areas of northern and central Spain and northern Portugal) and the Pyrenees (Andorra, France and Spain). The population is declining but it is hard to obtain precise estimates of population size and decline rates, given the small size of the animal and its cryptic behaviour. In Portugal it is estimated that there are less than 10,000 adult individuals divided into small and isolated subpopulations due to physical (e.g. dams) and ecological barriers. In Spain, the species has undergone marked declines in the central system and it has disappeared from some sites where it was previously known.

This species is confined to vulnerable habitats in restricted areas (mainly fast-flowing mountain streams but occasionally found in slow-moving water bodies). Major threats for *Galemys pyrenaicus* are water pollution and habitat fragmentation caused by the construction of hydroelectric plants, water extraction, and dam and water reservoir construction. Other threats are direct persecution from fishermen who incorrectly believe this species to be a threat to fish stocks, especially trout, or from over-eager collectors. In Portugal, fishing methods fatal to the desman include the use of poison and explosives. The expansion of the American mink, an invasive alien species targeted by the EU IAS Regulation, might also be negatively impacting desman populations in Spain.

A few LIFE projects have addressed this species. DESMANIA (LIFE11 NAT/ES/000691) and **LIFE+ DESMAN** (LIFE13 NAT/FR/000092) have given a boost for the knowledge and conservation of the species an, have given greater visibility to *G. pyrenaicus,* which has been overlooked.

DESMANIA was implemented between 2012 and 2018. It is unlikely that its results would have had time to influence the conservation status, which remains bad in all biogeographical regions. The main achievements of the project were to map the distribution, improve the hydrological connectivity of the river basins, protect and restore riparian habitats, influence the impact of the invasive species the American mink, and undertake a range of awareness-raising activities. A model for habitat management in areas with presence of *G. pyrenaicus* and the Recovery Plan for the Pyrenean Desman in Extremadura region were approved in August 2018.

LIFE+ DESMAN targets 11 Natura 2000 sites in the French Pyrenees, covering the whole Pyrenean chain and the whole distribution area of *G. pyrenaicus* in France. The project team have adopted similar methods for habitat improvements and have developed a decision-support tool, with guidance and training, to ensure a better consideration of the species in the evaluation of local projects that could have an environmental impact on the species or its habitat. As a result of this action, the desman is systematically taken into account for any development in areas where its presence is confirmed. For instance, a recent project to build a hydropower plant in Hautes-Pyrénées has used this tool to take into account *G. pyrenaicus* requirements: the minimum water has thus increased to 25% of the average flow rate, whereas the regulatory requirement was only 10%; likewise, two more projects to build micro-hydropower plants have been rejected because of their potential impact on desman populations. This is a major output of the project, which may be replicated for *G. pyrenaicus* in other areas or applied to other species.

In the spotlight: Reigning reindeer in Finland

The Finnish forest reindeer (*Rangifer tarandus fennicus*) is a subspecies of the large and widespread reindeer (*Rangifer tarandus*) population. The (sub)speciation took place during the last ice age, and since then, there have been major changes in the Finnish forest reindeer's range. Once commonplace in Fennoscandia and North-western Russia, by the early 1900s, the subspecies had become extinct in Finland. Today, the Finnish forest reindeer population is a result of migration from Karelia in Russia and the release of captive-bred stock. The current world population in Finland and Russia together is approximately 4,500, of which the Finnish population is around 2,300.
The conservation status of the Finnish forest reindeer is assessed as good in the most recent Article 17 reporting, a genuine status improvement compared to the previously reported poor status.
The major threats to the subspecies are excessive mortality caused by large carnivores and traffic, and the potential genetic dangers of in-breeding. Habitat change is exacerbating large carnivore predation.
The main objective of WildForestReindeerLIFE (LIFE15 NAT/FI/000881) is to achieve a good conservation status for the Finnish forest reindeer by 2023, which was already achieved by 2018 according to the Member State report. This has been accomplished by extending and defragmenting its range, reducing mortality rates and improving genetic diversity in wild and captive bred populations in Finland and Sweden. Some of the project's specific objectives are to reintroduce 30 Finnish forest reindeer in the Seitseminen and Lauhanvuori Natura 2000 network sites, tag 121 individuals with GPS collars to study their migration patterns, and stimulate multi-use forestry to improve its habitat. It is too early to present results on these objectives but the upgrade of the conservation status to good can already be considered a major success of the project.

Large herbivores

The European bison (*Bison bonasus*) is the largest terrestrial mammal native to this continent. It once ranged throughout the lowlands of Europe, with the last wild population (54 individuals) remaining in the primeval forests of Białowieża (Poland), and the northern Caucasus. They have been reintroduced from captivity into several European countries.

The species is located in small restricted areas, where the concentration of individuals is high compared to food resources availability. These areas are fragmented and isolated, resulting in low genetic diversity and high susceptibility to diseases. These threats are compounded by the reluctance of local populations to accept the presence of the species in the area, mainly because of damages to crops.

The species is listed as priority in the Habitats Directive and classified as vulnerable in the IUCN Red List. According to the data from the last Article 17 reporting period, the conservation status of the species remains poor but the population trend is improving. Two LIFE projects have been developed in the Białowieża Forest. BISON-LAND (LIFE06 NAT/PL/000105) provided the grounds for a sustainable conservation of *Bison bonasus* in the Natura 2000 site Białowieża Forest. By the end of the project, the bison population increased by 13.6%. The number of mixed herds of *B. bonasus* increased from seven to 12, while the total area covered by the population increased by 32%. This was followed by LIFE_BISON_NW_PL (LIFE13 NAT/PL/000010) which consolidated the good results obtained by the previous one. By the project end the Bison population in the Białowieża Forest reached 305 individuals (132 at the project start). A new *B. bonasus* herd was created in between the existing ones to increase the genetic diversity of the population and facilitate genetic exchange

An additional LIFE project is ongoing (LIFE_RE-Bison - LIFE14 NAT/NL/000987) to reinforce the *B. bonasus* population in south-western Romania. It is expected to increase the population up to 185 individuals by the project end (63 individuals in the wild at the project start).

Bats

There are 45 bat species in the European Union, of which 14 are included in Annex II of the Habitats Directive; all European bat species are included in Annex IV.

Bats occur in a wide range of habitats, including forests and agricultural land, and throughout all biogeographical regions although showing a north-south gradient, with the number of species increasing southward. Populations have been in serious decline throughout Western Europe, particularly in the second half of the 20th century. Overall, bat species remain vulnerable to habitat changes and frag-

mentation (because of agricultural intensification, changes in forestry management, etc.) and roost disturbances in several EU Member States.

Landscape features such as hedges, rivers and cliffs are key elements for bats since they tend to move regularly between roosts and foraging areas (up to 40 km for some species), providing ecological corridors for the species and improving connectivity between ecosystems.

LIFE PODKOWIEC+ (LIFE12 NAT/PL/000060) aimed at boosting the populations of Geoffroy's bat (*Myotis emarginatus*), the Lesser horseshoe bat (*Rhinolophus hipposideros*) and the Greater mouse-eared bat (*Myotis myotis*). Actions focused on habitat restoration, reducing threats in roost areas, and improving corridors between sites of relevance for bats. The project improved wintering sites and summer shelters commonly used for bats and applied infrared and ultrasonic technology for mapping the flight routes of bat colonies, using this information to improve conditions along flyways to foraging areas by means of reforesting and reducing light pollution. Special attention was paid to increase the awareness of populations regarding bats. With this aim, the project created a quality mark - 'Land of the lesser horseshoe bat' – to be awarded to institutions, and the 'Golden Horseshoe Bat' medal for individuals actively supporting bat conservation at local level.

The project contributed to improve the conservation status of all the three bat species and sspecies – especially the Geoffroy's bat, which is now in good condition.

Freshwater Mammals

The Saimaa ringed seal (*Pusa hispida saimensis* syn. *Phoca hispida saimensis*) is a subspecies of the Ringed seal (*Pusa hispida*) currently found only in the Saimaa fragmented freshwater lake complex (Finland). With a small population of about 400 seals, it is probably the world's most endangered seal subspecies and is categorised by the IUCN as critically endangered. It is listed as priority In Annex II and IV of the Habitats Directive.

The most severe threats to the seal population are fishing bycatch and disturbances during the breeding season. Climate change is posing additional pressure on the species, mainly because of the scarcity of snow for building snowdrifts, used as shelter for newborn pups.

LIFE Saimaa Seal (LIFE12 NAT/FI/000367) developed the strategy and action plan for the protection of the Saimaa ringed seal, drawn up in 2011 by the Finnish Ministry of the Environment in cooperation with key stakeholders, and aimed at improving the conservation status of the subspecies. The project ran between 2013 and 2018, in 10 Natura 2000 sites.

This LIFE project significantly contributed to reducing the main threats for the Saimaa ringed seal largely through raising awareness in local stakeholders and tourists. **LIFE Saimaa Seal** reduced the incidence of bycatch and developed methods to increase the seal's breeding success during mild winters. One innovative method was the construction of man-made snowdrifts, dunes of snow used by the seals to raise their pups, before the start of the breeding season if the snow had not formed sufficient drifts naturally. A volunteer network was created, engaging with some 400 people to help build man-made snowdrifts at short notice throughout the Saimaa region. During the project, over 1,000 snowdrifts were built by more than 300 volunteers and the action was a great success: 75% of the man-made snowdrifts were used by a seal and more than 70% of the pups observed were born in man-made snowdrifts.

Although a five-year project is a short time to assess the evolution of the population, as a result of the long-term conservation actions applied by the LIFE project, the Saimaa ringed seal population has begun to grow slowly from an initial estimated population of 310 individuals to around 400 by the end of the project, a great success.

Marine Mammals

The Mediterranean monk seal (*Monachus monachus*) is one of the most endangered seals. The estimated global population is around 650-700, with the largest number located in the Eastern Mediterranean Sea. Mediterranean monk seals were once widely distributed in the Mediterranean and Black seas, and in the North Atlantic waters from Morocco, including the Canary Islands, the islands of Madeira and the Azores. Nowadays, the distribution of the Mediterranean monk seal is highly fragmented and consists of 3–4 isolated subpopulations. Fisheries interactions (bycatch, deliberate killing) have been identified as one of the major threats for *M. monachus* along its distribution range, followed by habitat deterioration, destruction and fragmentation caused by coastal developments and increase in tourism, which has forced the Monk seal to occupy increasingly marginal habitats.

The LIFE programme funded a number of projects partly or fully addressing the Monk seal, mainly in Greece, Portugal,

and in Cabo Blanco, Mauritania. LIFE Madeira Monk Seal (LIFE13 NAT/ES/000974) improved the conservation of the species in the Madeira archipelago (Portugal) in the long term. Monk seal conservation work began in the Desertas Islands in 1998, and only six individuals were counted in 1990. The Desertas Islands Nature Reserve was created with the aim of protecting the species.

Main achievements of the project are: increased knowledge on the status of the species in the Desertas Islands and the use of the habitat using autonomous surveillance and monitoring systems, creation of a fully operational SOS Monk seal network with intervention patrol, a range of awareness-raising activities and development of an Action Plan for the Monk seal conservation in the Madeira archipelago, detailing the conservation and protection actions needed to minimise or eliminate main threats for the species, and a Survey Protocol detailing the methodology to monitor the Monk seal status and its habitat. By the end of the project, there were 20 Monk seals in Madeira, up from six, which is encouraging progress. This indicates that, thanks to the LIFE project, the species is slowly recovering, although it is still being extremely vulnerable and endangered.

3.2.6 Plants

According to the European Red List, Europe's flora comprises 20-25,000 species of vascular plants, and the areas with the highest plant richness are in the Mediterranean region. Half of the continent's 4,700 vascular plant endemics are in danger of extinction and 64 have already become extinct. In several European countries more than two thirds of the existing plant habitat types are endangered.

The European Red List (Bilz et al., 2011) includes in total 1,826 vascular plant species, among which 467 (26%) are listed as threatened with extinction. Species listed in policy instruments have a high number of threatened species, with at least 47.3% at EU-27 level (data from 2011, excluding Croatia). A further 10.9% are classified as near threatened in the EU-27. Looking at the population trend for the selected plant species listed in policy instruments, it is noted that 3.1% of these plants are increasing, 21.8% have a stable population, 38.4% are declining and for 36.7% of these plants the population trend is unknown.

The main pressures to plants include water pollution and eutrophication (for aquatic plants), drainage and desiccation of wetland habitats for wetland and mire species, and habitat changes due to intensification of agriculture and forestry for grassland and forest species.

Protection of endangered and rare plants and strengthening of their populations is inextricably linked with the restoration, ecological improvement and conservation of their habitats, and thus with the implementation of the Natura 2000 network. The LIFE programme plays a prominent role in conserving and strengthening many of Europe's most endangered plant species.

KEY MESSAGES

In most LIFE projects vascular rare and endangered plant species are tackled within the broader context of habitat restoration and habitat improvement. The results of individual interventions on local populations of selected plant species are generally positive, but often remain hidden in internal reports. Even though a relatively small number of projects specifically focused on Annex II plant species, several of them had a significant impact at the national level on improving the conservation status of the species concerned. This positive development concerns mainly rare species that only grow in small and locally delimited areas, and for which LIFE projects have been able to improve a significant part of the area of their entire nation-wide occurrence.

For species with a broad distribution range a series of successive large-scale LIFE projects (mega-projects) combining habitat restoration and targeted measures on selected plants are obviously needed to achieve a significant improvement in their conservation status at regional or national level. To date, there are no projects specifically aimed at improving the conservation status of non-vascular plants (a group of plants including mosses and liverworts).

Status and trends

For the 2001-2006 period, about 22% of annex species were reported in a good status, 17% poor and 34% bad, while the status of the remaining 27% was unknown. Twelve years later, at the end of the 2013-2018 period, the conservation status remains rather unchanged apart from an increase in good status due to increased knowledge: about 38% vascular plants are in good status, while 18% and 38% remain in poor and bad condition, respectively, and about 6% are reported as still unknown. The

further decreasing trend for plant species in bad and poor conditions is five to 10 times higher than the positive development, which makes obvious the urgent need for concerted and efficient conservation actions in the near future.

The highest values regarding the good conservation status of vascular plants are found in the biogeographical regions with the lowest pressure of industrialised land use – the Alpine region with about 54% and the Steppic region with about 64%.

The main pressures and their drivers vary considerably and are in line with those for the habitats in which the endangered plant species occur. The spectrum reaches from water pollution and eutrophication for aquatic plants, drainage and desiccation of wetland habitats for wetland and mire species up to habitat changes due to intensification of agriculture and forestry for grassland and forest species.

One specific and additional threat is the removal of protected plant species from their natural habitats for home gardening, illegal sale or because of their herbal and medicinal value. These illegal practices can decimate entire populations[22]. Destructive harvesting has brought about the depletion and scarcity of numerous rare medicinal plants.

A further threat at the plant species level is that plant populations often exist only in a small area or in isolated locations. Often there is a lack of scientific data and limited experience in managing and monitoring Natura 2000 sites for plants. Habitats are defined on a broader scale by plant groups and communities, while the existence and occurrence of individual and very rare or endangered taxa may not play a decisive role in the conservation status of a given habitat. As a result, endangered but non-indicative species may disappear, although the overall conservation status of habitats is still good.

LIFE programme response

Until 2018,166 LIFE projects implemented conservation actions on vascular plants, most of them within a broader context of habitat restoration or management plans for Natura 2000 sites rather than being the focus of actions, even if they represent by far the largest group in the annexes of the Habitats Directive. Only 30 of these projects aimed specifically for the conservation of vascular plant species. Nevertheless, LIFE projects that aim to improve a particular habitat also play an important role in the protection of plant species dependent on these habitats.

There were 17 vascular plant species for which a genuine improvement in conservation status within the last period was reported (Table 12) and a further 10 species that show a genuine positive trend: *Arnica montana* in Belgium, *Asplenium adulterinum, Carlina onopordifolia* and *Pontechium maculatum* subsp. *maculatum* in Poland, *Eryngium viviparum* in France, *Gladiolus palustris* and *Onosma tornensis* in Hungary, *Himantoglossum adriaticum* in Austria, *Luronium natans* in Germany and *Thesium ebracteatum* in Estonia.

22 *in 2019 in Germany (Baden-Württemberg), unknown actors systematically stole about 3,000 orchid specimens and thus destroyed one of their largest occurrences in Europe. The sales value in online trade is estimated at €300,000.*

Table 12: Examples of genuine positive trends in vascular plant species reported in the 2013-2018 MS reports for which contributing LIFE projects were identified.

Species showing improved status in Art. 17 report	Member State	Biogeographical region	Conservation status 2018 (2012)	LIFE projects that may have contributed to these improvements
Arctophila fulva	FI	BOR	U1 (U2)	**Conservation of Liminganlahti wetland** (LIFE95 NAT/FIN/000156
Armeria helodes	IT	CON	U1 (U2)	**LIFE FRIULI FENS** (LIFE06 NAT/IT/000060)
Ligularia sibirica	PL	ALP	FV (U1)	**AlkFens_S_PLife** (LIFE13 NAT/PL/000024)
Liparis loeselii	FR	ATL	U1 (U2)	**Maintbiodiv** (LIFE06 NAT/F/000146)
	NL	ATL	FV (U1)	**Wetland succession** (LIFE06 NAT/NL/000074), **New LIFE for Dutch Fens** (LIFE12 NAT/NL/000372)
Pontechium macula-tum subsp. *macula-tum* (6948)	CZ	CON	U1 (U2)	**RUPICOLOUS** (LIFE04 NAT/CZ/000015)
Teline rosmarinifolia	ES	MAC	FV (U1)	**Inagua** (LIFE07 NAT/E/000759)

Actions and measures implemented by plant-targeted projects include plant species assessments, population or habitat recovery plans, site management plans, direct conservation measures for the protection and management of targeted species and their habitats, creation or development of designated areas for plant reproduction, and intense protection from elimination of invasive alien species that endanger the local native flora.

The first LIFE plant project, in 1993 in Spain, tested and established a micro-reserve plant conservation model to rescue, conserve and enlarge specific regional populations of rare, endemic and endangered plant species, as well as the different vegetation types in which they occur. Since then, the concept of micro-reserves has been adopted by other Spanish regions and other Member States[23] as a valuable management tool of the Habitats Directive.

Despite the small number of projects specifically targeting the plant species listed in Annex II of the Habitats Directive, several of them had a significant impact at the national level on improving the conservation status of the species concerned. All the 'success plants' regarding the genuine positive change visible in the Article 17 reporting are rare species that only grow in small and locally delimited areas, and for which LIFE projects have been able to improve a significant part of the area of their entire nationwide occurrence.

One of the first was the Finnish **Conservation of Liminganlahti wetland** (LIFE95 NAT/FIN/000156), targeting the rare grass *Arctophila fulva* that can be found only in a few dynamic Baltic seashore meadows in Finland and Sweden. The last small populations of the grass species are naturally rare climatic relicts, for which the early successional environment of the Bothnian Bay has offered a suitable refuge. 80% of the European *A. fulva* population is reported from Finland, where the species is protected in two Natura 2000 sites – Liminganlahti (118 km^2) and Kainuunkylän saaret (10 km^2). The project restored habitat to improve the conservation status of habitats and rare species of the first seashore location. Thanks to the well selected and implemented measures and massive land safeguarding (c. 1,800 ha of ecologically valuable areas were either bought, swapped, leased, or placed under hunting restrictions or management agreements) the project significantly enlarged the population of *A. fulva* and its bad conservation status in 2006 was upgraded to poor with a positive genuine trend in 2018.

The Austrian **Myosotis Bregenz** (LIFE00 NAT/A/007069) restored more than 2.5 km of eroding shore of Lake Constance in order to guarantee the survival of habitats and species living in the erosion zone and to improve their living conditions, with particular focus on the endangered *Myosotis rehsteineri*. Thanks to the successful project implementation, the species reached good conservation status in 2012. However, it had to be downgraded to poor in 2018 due to increasing pressures in the shore habitats in the post-LIFE period, illustrating the need for continued care for species with a limited distribution range.

Inagua (LIFE07 NAT/E/000759) accelerated and supported the natural recovery of burnt areas of *Endemic Macaronesian pine woods* (9950) in the protected area of Ojeda, Inagua y Pajonales in Gran Canaria. The project improved the conservation status of the most threatened endemic plant species occurring only on the island: *Dendriopoterium pulidoi, Teline rosmarinifolia, Helianthemum bystropogophyllum, Limonium sventenii* and *Isoplexis isabelliana*. Obviously, it had a real impact on the species distribution and population size of *T. rosmarinifolia* as it targeted seven out of the 21 sites known in the island. The seven locations targeted recovered significantly as a result of the project and the national Article 17 report mentions the LIFE project. Furthermore, the project allowed detailed monitoring of these populations, which had never been done before, so it brought a lot of knowledge and precise data about the species. Similarly, six years later, **LIFE+ GARAJONAY VIVE** (LIFE13 NAT/ES/000240) supported the natural regeneration of laurel forest habitats on La Gomera affected by the damaging wildfire in 2012. Among other shrub and tree species the project focused also on *Sambucus palmensis*. In early 2018, revitalised forest patches were enriched by 31 specimens of this rare endemic. The census in 2017 confirmed a population of 1,140 specimens that rose to 1,387 in 2018. Thanks to targeted actions the status of *S. palmensis* improved from bad to poor with a still improving trend.

Another example of a LIFE project resulting in an improved conservation status is that for the rare plant species *Pontechium maculatum* subsp. *maculatum* (syn. *Echium russicum*) in Poland. This plant only occurs in Hungary, Slovakia, Poland and the Czech Republic. In the Continental region in Poland the species is exceedingly rare and endangered.

23 Creation of a network of flora microreserves (1st phase LIFE93 NAT/E/011100 and 2nd phase LIFE95 NAT/E/000856); Flora Menorca - LIFE00/NAT/E/007355, Karst Park - LIFE02 NAT/SLO/008587, and CRETAPLANT - LIFE04/NAT/GR/000104

In 2009, only a few specimens could be found in three small Natura 2000 sites. It was estimated that without active conservation these species would become extinct in Poland. XericGrasslandsPL (LIFE08 NAT/PL/000513) carried out a series of well-planned restoration actions in the largest site (Dobużek, 199 ha). Altogether 26 ha of the most valuable xerothermic grasslands were purchased, 20 ha of grasslands were restored, and extensive grazing was reintroduced on more than 67 ha. The targeted LIFE restoration measures led to the first slight improvement of the conservation status of *P. maculatum* at national level (U2- to U2+). Further actions are needed, however, to further stabilise and enlarge the population on the xeric habitats in the region.

Arabis kennedyae, a priority species of the Habitats Directive, is a rare and endangered Mediterranean species, endemic to the Troodos Mountains in Cyprus, with only three known populations in 2009. The plant was included on the IUCN list of 50 of the most threatened plant species growing on Mediterranean islands and noted as critically endangered, as the area and quality of its habitat is in decline. The number of plants fluctuates widely, and the remaining tiny populations are very fragmented. LIFE carried out two projects that aimed to improve the conservation status of the targeted four endemic priority plant species and two priority habitat types in Cyprus. The first one, Comanacy (LIFE04 NAT/CY/000013), elaborated specific management plans and created national management guidelines, which would ensure the effective long-term management of SCIs in Cyprus. It also implemented specific, immediate and one-off actions in five pilot pSCIs to secure the good conservation status for key habitat types and species, among others, the priority species *Chionodoxa lochiae*, *Pinguicula crystallina* and *A. kennedyae*. In PLANT-NET CY (LIFE08 NAT/CY/000453) the chosen approach was to establish and manage a network of five Plant Micro-Reserves (PMRs) in the country to further improve the protection and conservation of rare endemics. Thanks to these concerted efforts, the conservation status of *A. kennedyae* is reported as good since 2006, with a stable conservation trend.

Three Belgian projects, NATURA2MIL (LIFE05 NAT/B/000088), Herbages (LIFE11 NAT/BE/001060) and Ardenne liégeoise (LIFE10 NAT/BE/000706), represent a series of successful efforts that contributed to the regional strengthening of *Arnica montana* populations. **NATURA2MIL** has worked on the restoration and improvement of a large complex of habitats (13 habitats of five habitat groups) in three military camps in Wallonia. The camp Elsenborn houses vast populations of *Arnica*, which were later used as source populations for ex-situ production of plants and reintroduction in the context of the consecutive **Herbages.** This project restored many different but interlinked habitats as well, and several actions were performed on the seed collection, ex situ propagation and planting of cultivated plants. Four species, *Dianthus deltoides*, *Helichrysum arenarium, Campanula glomerata* and *A. montana,* were chosen and particularly good results have been achieved for the first three named. *Arnica*, *Helichrysum* and *Campanula* show in the meantime a good survival rate, are flowering, and have a good reproductive capacity. Individuals from the second generation and in good fitness are already used for additional reintroductions in restored project sites. As regards *Arnica*, first attempts at ex situ propagation initially proved to be difficult for the project team. However, based on experience gained at the workshop held by the international (DE-BE-LU) LIFE project Borstgrasrasen (LIFE06 NAT/D/000008) the methodology was corrected and very good results achieved. This is a good example of the essential importance and the good results of efficient networking and knowledge-sharing. **Ardenne liégeoise** restored *Nardus* grasslands (primarily by transfer of hay) with successful establishment of new *Arnica* populations. Altogether, these three projects significantly contributed to the regional population strengthening of *Arnica* in south-eastern Belgium and to the successive improvement of the conservation status of the species at Member State level from bad and improving in 2006 to poor and improving in 2018.

As already mentioned before for other species groups and habitats, it is often difficult to identify LIFE projects that have made a significant contribution to improving plant populations at local level, as the vast majority of projects deal with the conservation of plant species in a broader context as part of habitat measures. Many successful or less successful measures aiming at plant growth thus remain hidden in the description of the individual actions in technical reports or Layman's reports, and the necessary links for this cannot be found with the current information and filter functions of the databases. The examples below present such cases.

For instance, no projects were initiated and implemented that specifically dealt with *Liparis loeselii*. However, local populations of this orchid have undoubtedly benefited from habitat restoration measures implemented in the context of numerous other projects. For exam-

In the spotlight: LIFE and changing landscapes for the Long-lasting pink

The project HUNDIDI (LIFE06 NAT/H/000104) resulted in a substantial improvement of the population of the Long-lasting pink (*Dianthus diutinus*) in Hungary. The subendemic and extremely rare *D. diutinus* is only found in the interfluvial area between the Danube and Tisza rivers. It is strictly protected under Hungarian law and a priority species of Community interest. To reach the project aims – the strengthening of the population and the improvement of the conservation status – the project applied a well-balanced combination of targeted actions, namely:

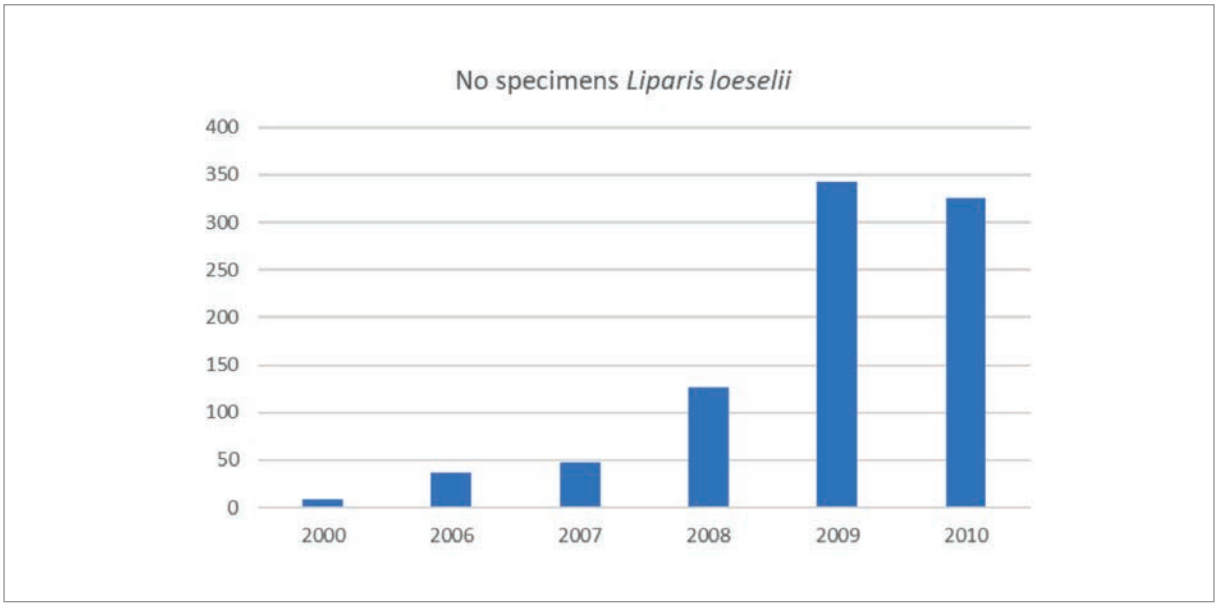
- large-scale restoration of necessary habitats (deforestation of pine plantations on sandy soils and conversion into poor grasslands, elimination of invasive alien plants that suppress the native vegetation, re-establishment of sheep and goat grazing in the restored areas);
- extensive ex situ propagation of young plants in a nursery accompanied by detailed genetic studies;
- planting of cultivated plants on prepared habitats;
- very efficient public relations and awareness-raising activities.

According to precise GPS-based monitoring results, the project succeeded in increasing the number of individuals of *D. diutinus* from 19,000 in 2007 to nearly 98,000 in 2011, not including the specimens that were prepared ex-situ. In total, almost 19,000 of such ex-situ raised plants were reintroduced to three project sites with a success rate of 80%. One of the essential keys to success was the close cooperation between conservationists and plant scientists. The botanical garden of the University of Szeged successfully carried out ex-situ propagation in its plant nursery and carried out all necessary genetic studies.

Thanks to the project, the conservation status of this species changed from 'bad with future prospects poor' in 2006 to poor in 2012, and this status remains stable also in the 2018 Article 17 report.

ple, the wet meadow and sloping mire restoration done by UVOR (LIFE06 NAT/A/000124) was primarily carried out to improve the status of the Marsh fritillary (*Euphydryas aurinia*). The meadow and fen management for the butterfly caused a verifiable improvement of the orchid population in the project area (Figure 19) and an upgrading of the conservation status in the Alpine region in Austria.

Figure 19: Population increase of *Liparis loeselii* (counts of individuals) in the Natura 2000 area 'Untersberg-Vorland' before the start and at the end of the project **UVOR** (LIFE06 NAT/A/000124)



The Spanish project CONSERVASTRATRAGALUS-MU (LIFE11 BIO/ES/000727) targeted a single, exceedingly rare plant species, *Astragalus nitiflorus*, which is endemic to Cartagena in the Region of Murcia. This species is included in the 'Spanish Catalogue of Endangered Species' but not listed in the annexes of the Habitats Directive. Before the project start, *A. nitidiflorus* had a population of just 300 adult specimens. Using best practice methods – increase knowledge about the ecology of the species strengthen existing populations through ex situ propagation and planting, ensuring optimal conditions for the long-term conservation in the region – the project succeeded in saving this species from extinction. More than 57,000 seeds were collected, 24,300 of which were used for the propagation of new specimens (actions in the nursery, sowing and planting) while the remaining seeds were stored in seed banks. In total, 20,716 specimens of *A. nitidiflorus* were planted in suitable interconnected habitats on an area of 13.2 ha, and an efficient stewardship of the sites has been established.

Several projects have addressed the conservation of the Lady's slipper orchid (*Cypripedium calceolus*). While none of these projects had any substantial impact on the status of the species so far, the experience with ex situ propagation and cultivation and the re-establishment in the restored sites can have a big impact in the near future. The German project KTKK HX (LIFE10 NAT/DE/000007) succeeded with ex-situ propagation of the orchid. About 200 plants were planted at five sites but their re-establishment on site was less successful than hoped. The Italian FLORANET LIFE (LIFE15 NAT/IT/000946) is the second LIFE project that invested efforts towards ex-situ propagation of the orchid. As reported in April 2020, over 100 seeds of *C. calceolus* germinated and 100 young plants were grown.

Regarding local and temporary successes of the French project Violette et Biscutelle (LIFE06 NAT/F/000137) in the rescue of *Viola hispida* and *Biscutella neustriaca,* see Section 3.7.4 on rocky habitats.

The **non-vascular plants** (such as mosses and algae) listed in the annexes of the Habitats Directive are, similar to some groups of invertebrates, a 'forgotten' group of species. The status of these plants continues to deteriorate increasingly – and goes widely unobserved, despite their importance and the fact that they are among the best indicators of environmental change and ecosystem fitness.

Among 22 cases of genuine changes of the conservation status and/or trend trend, only two are positive: (for *Sphagnum* ssp. in Continental Poland from poor to good, and for *Hamatocaulis vernicosus* in Atlantic Belgium from U2= to U2+), while all other 20 genuine changes are negative.

The LIFE project database lists only 18 projects that targeted moss and liverwort species. However, even this low number must be considered with care, as the projects mention the lower plants mainly as species that might benefit from the habitat restoration measures, which were the main aim of the projects.

The only moss genus that has been actively used for restoration activities is peat moss (*Sphagnum* ssp.). The restoration method of large-scale spreading of *Sphagnum* fragments on rewetted cut-over peatland fields has been first tested in Canada and further developed in Germany, and even for commercial purposes[24]. The international climate change mitigation project LIFE Peat Restore (LIFE15 CCM/DE/000138) uses the *Sphagnum* transfer to restore degraded raised bogs in Lithuania.

At present, however, there are no other conservation and restoration actions specifically for non-vascular plants. LIFE projects should pay more attention to habitat restoration (especially for lower plants) and targeted monitoring of results in order to reverse the current negative trend.

3.3 LIFE MAKES A DIFFERENCE FOR HABITATS

A second pillar of the EU Habitats Directive, besides species protection, is the extension to protecting habitats. All in all, 233 natural habitat types grouped into nine larger habitat groups, listed in the Directive's Annex I, are protected and require designation of Special Areas of Conservation (SACs). About one in three of the habitat types is considered a priority habitat type on the basis of them being in danger of disappearance (Figure 20).

When looking at habitat groups covered by the LIFE programme, forest habitats are represented in 40% of all LIFE Nature projects, followed closely by grasslands with 35%. One quarter of LIFE Nature projects target freshwater habitats (27%) and bogs, mires and fens (23%). Coastal and halophytic habitats are included in one out of seven LIFE Nature projects (16%). Heathlands, sclerophyllous scrub and dunes are less commonly covered (12-13%). Rocky habitats are included in only 9% of all LIFE Nature projects (Figure 21).

24 www.moorwissen.de/en/paludikultur/imdetail/torfmooskultivierung.php

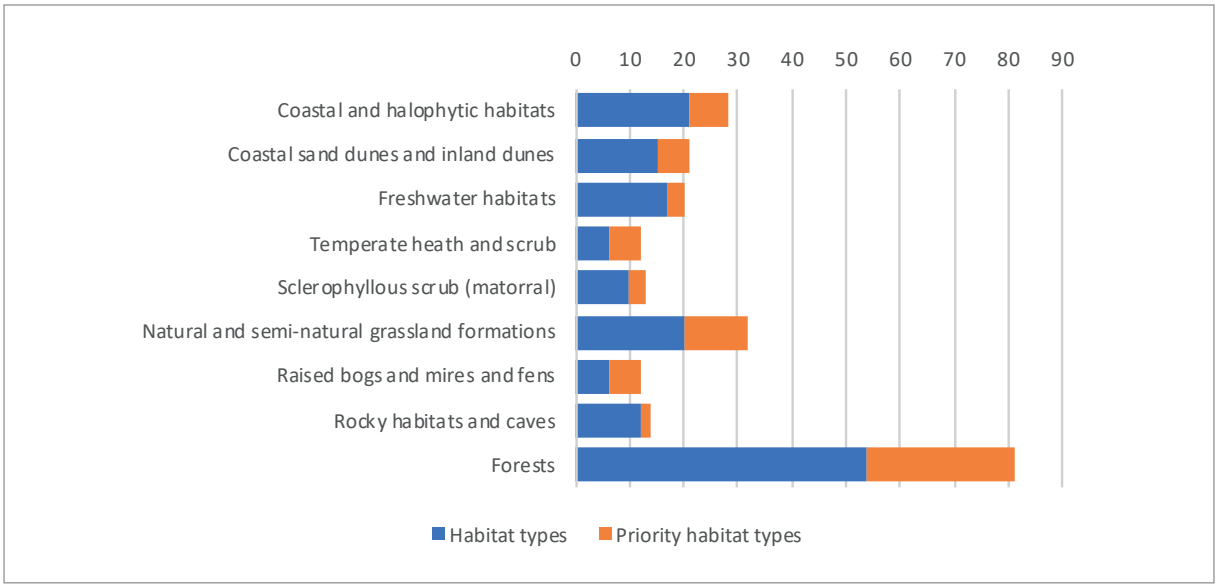
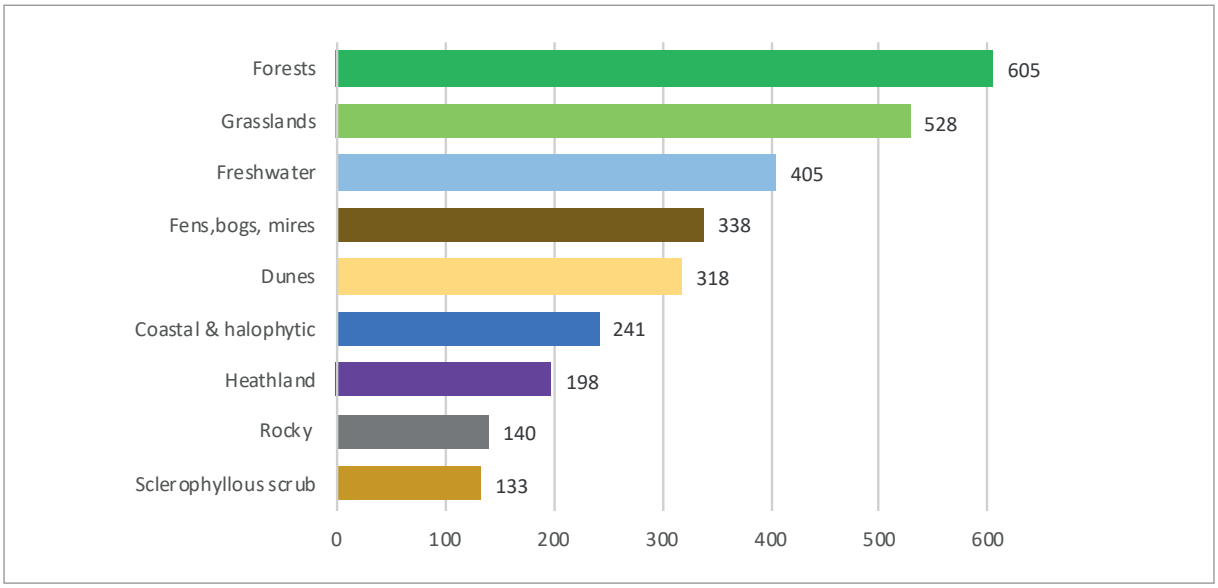


Figure 20: Number of habitat types per habitat group, as included in Annex I of the EU Habitats Directive
Note: habitat types that are partially a priority habitat type are included under 'Habitat types'.

However, caution is needed when interpreting these data. The numbers in Figure 21 represent the number of projects and not the overall coverage in terms of area of a particular habitat group or habitat type by the LIFE programme. There are several reasons for this. Firstly, most LIFE projects focus on a mosaic of habitats as part of a wider landscape approach or as part of restoration within a particular Natura 2000 site, including a variety of habitat types, both within the same habitat group as well as across habitat groups. In the particular example of forests, given that forest habitat types are the climax vegetation as part of the ecological succession and the fact that there is a long list of forest habitats covered by the Habitats Directive, it is as such not surprising that forests are covered by many LIFE projects. Secondly, many LIFE projects include e.g. alluvial forests (91E0*) as priority habitat in their project proposal, as these are widespread habitats that often feature within the scope of a LIFE project but are not specifically targeted. For most LIFE projects this habitat type will only make up a minor percentage of the project area covered/targeted. Unfortunately, the existing databases do not allow calculation of the actual areas of different habitats targeted or restored across the LIFE programme.

Figure 21: Number of LIFE projects addressing different habitat groups (1992-2018, n=1,501)



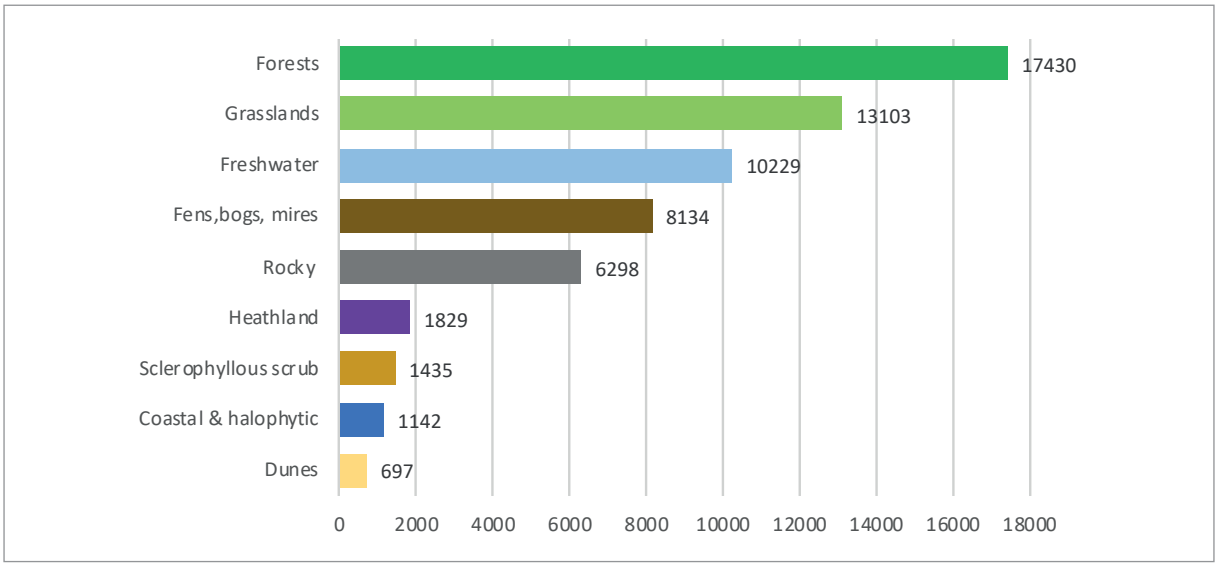


Figure 22: Number of Natura 2000 sites covering the different habitat groups (1992-2018)

When comparing LIFE programme (1992-2018) coverage for the different habitat groups with the overall number of Natura 2000 sites per habitat group, for forests, grasslands, freshwater, bogs, mires and fens the number of LIFE projects corresponds with the relative presence of these habitats within the Natura 2000 network (Figure 22). For coastal and halophytic habitats, heathlands, sclerophyllous scrub and dunes there are relatively more LIFE projects than their overall presence in Natura 2000 sites. Rocky habitats seem to be underrepresented overall in the LIFE programme compared to their overall presence in the Natura 2000 sites. This is not surprising, as rocky habitats are less threatened than other habitat groups and thus not often the focus of LIFE projects.

It is hard to make general conclusions based on these graphs, given that LIFE projects tend to focus on those habitats that require significant efforts to improve their conservation status and overall trend. Also, there might be a bias towards certain habitats, with Member States deciding themselves which habitats require most urgent protection and restoration. Habitats are obviously also not equally distributed across the EU, with some regions and MS having a higher biodiversity than others.

3.3.1 Freshwater habitats

Freshwater habitats are widely spread across Europe and vary in character and distribution according to climatic and geomorphological conditions. Overall, EU-protected freshwater habitats are in a bad to poor status, with only 20% in good condition. The latest trend analysis showed almost 40% were in a poor or bad state with no change, and 25% had a deteriorating trend. However, there have been some encouraging signs in some freshwater habitat types, such as *Rivers with muddy banks* (3270) which showed some of the highest increasing trends between 2012 and 2018 (EEA, 2020).

The most important and significant threats and pressures for freshwater habitats are similar throughout all freshwater habitat types. There is no evidence that there are improvements in any of the pressures listed as significant in either the EU State of nature or the EU Red List of Habitats. Rivers and lakes habitats are still severely affected by three main overarching pressure/threat categories, namely 'modification of natural conditions', 'pollution' and 'agriculture'.

The LIFE programme holds a rich portfolio of freshwater projects, some of which focus on improvements in ecological status of water bodies outside the Natura 2000 network, but which often bring added benefits to neighbouring SACs. The projects frequently target measures to restore hydromorphological functions, improve in-stream habitats, remove barriers, establish riparian zones, control invasive species and address pollution from land-based sources.

KEY MESSAGES

Despite there being few improvements in freshwaters at the biogeographical level, the LIFE projects present numerous local successes, mainly in standing waters, such as through the creation of large networks of ponds. Running waters are more difficult to improve due to the often transnational nature and upstream issues disrupting recovery. LIFE projects present innovative approaches to river restoration and barrier removal, reconnecting river courses to wider catchments. Above all, LIFE has facilitated the increase in knowledge about freshwater systems and how to restore them.

Status and trends

There are several million kilometres of running water and thousands of freshwater lakes within EU Member State boundaries, some of which connect with neighbouring countries in Europe, adding an important transboundary aspect to this habitat type. The area of Annex I freshwater habitat is estimated to be 127,000 km^2, of which 10.5% (or c. 13,500 km^2) needs to be restored (EEA, 2020). Europe's freshwater bodies are diverse and there are marked north-south differences. Permanent water bodies are mainly concentrated in the northern and Atlantic regions, while the temporary ones are more typical in areas with a Mediterranean climate. Some of these habitats can be part of very broad ecosystems (like long rivers or large lakes), while others occur as small and localised patches (like springs or ponds). Natural or anthropogenic supplies of nutrients and minerals are important factors determining the species composition of the biotic part of most freshwater habitats, and they can be grouped according to their trophic level, whether they are oligotrophic (nutrient poor), mesotrophic, eutrophic, or dystrophic (excessive nutrients). Freshwater bodies are classified into two main groups in the Habitats Directive, **standing water** and **running water**. There are 10 different standing water habitat types which include oligotrophic water with a variety of nutrient concentrations, eutrophic lakes, temporary ponds, and turloughs (seasonally flooded lakes in limestone areas). There are 10 different running water habitat types, ranging from Alpine streams to constantly flowing Mediterranean rivers and rivers with muddy banks. Most classifications can be found in a number of different biogeographical regions: for example, *Natural eutrophic lakes* (3150) were reported by 23 Member States across eight biogeographical regions. On the other hand, *Oligotrophic waters containing very few minerals* (3120) are generally found on sandy soils of the Western Mediterranean.

In the 2020 EU State of nature report the conclusion is that rivers and lakes ecosystems had the highest share of unfavourable declining assessments and species conservation status assessments among terrestrial and freshwater ecosystems. Of the 20 Annex I freshwater habitat types in the Habitats Directive, the conservation status assessments for rivers and lakes habitats were 20% assessed as good, 38% assessed as poor and 30% as bad. As for trends in conservation status, both stable/unknown (43%) and declining (26%) make up the majority with only 3% rated poor/bad improving. Only 6% were classified as unknown.

The Article 17 reports for the 2013-2018 period show some encouraging signs with a 4% increase in good status across all classifications since the previous reporting period, and a reduced decline from 31% down to 26%. However, the trend in improving habitat fell by 2% from 5% to 3%, which is of concern as the base was very low to start with. There is still some way to go as the headline data of 68% still in poor or bad condition suggests.

Table 13 illustrates some of the national success stories reported in the data for overall trends to which a link with LIFE projects was identified. These two have been reported as genuine improvements, although there are many more where the trend is improving but the assessment is based either on a change in method (four cases), improved knowledge (11 cases) or not stated (five cases).

Table 13: Examples of genuine positive trends in freshwater habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

Habitat type showing improved status	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Turloughs (3180*)	SI	CON	U1= to FV= (genuine improvement in status)	No LIFE projects identified but see the section below
Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270)	NL	ATL	U1= to FV+ (genuine improvement in status)	Connection with **Floodplain Development** (LIFE11 NAT/NL/000771)

Given the lack of genuine improvement reported for freshwater habitats at the biogeographical level, it is difficult to draw any viable conclusions concerning the possible contribution of the LIFE programme to these results. Only the genuine improvement from poor to good condition of *Rivers with muddy* banks (3270), reported by the Netherlands for its Atlantic region, is possibly supported through the activities of Floodplain development (LIFE11 NAT/NL/000771). However, as only a small area of habitat was restored by the project, it is unlikely that it has had a major impact on the improvement in the overall conservation status of this habitat type in the Netherlands.

However, it must be said that there are numerous examples where LIFE projects have made a contribution to maintaining the conservation status of a habitat. For example, Estonia reported a genuine stability in a poor conservation status of *Water courses of plain to montane levels* (3260) since 2012. This is partly due to the contribution of two consecutive LIFE projects, HAPPYFISH (LIFE07 NAT/EE/000120) and LIFE HAPPYRIVER (LIFE12 NAT/EE/000871), which both restored habitats impacted by hydrological changes through physical removal of sediments in the water and riparian vegetation management. **HAPPYFISH** was given a 'Best LIFE Nature' award in 2013.

Despite these small advances it should also be stated that there are many more instances where a deterioration in conservation status has been recorded, some of which are genuine changes – such as the deterioration of *Natural eutrophic lakes* (3150) in the Netherlands from poor in 2012 to bad in 2018, despite the presence of LIFE going up a level (LIFE13 NAT/NL/000162) which aimed to reduce the impact of agricultural pollution. This simply illustrates the fact that upstream issues can have a disrupting effect on sites lower down a catchment, and that a holistic approach is essential to bring about real improvements.

LIFE programme response

LIFE traditional projects have focused effort on conservation actions in specific locations, which brings about benefits at a local scale. In general, project actions fall into three categories and many have elements of more than one set of actions, such as:

- alleviating hydromorphological pressures by removal of barriers, re-meandering rivers or reconnecting water courses to their floodplains. Some of the most innovative actions can be found in this type of project;
- in-stream restoration works to improve habitat and water quality using techniques such as sediment removal, construction of boulder fields, shingle and gravel beds and widening or deepening water courses;
- riparian works to improve water quality and reduce pollution from diffuse sources through improved agricultural and forestry practices, riparian planting and the removal of invasive species.

In more recent years there has been an acknowledgement that a more holistic approach is needed and that the only way to really improve the conservation status of rivers and lakes is to adopt a catchment-based approach. This approach is adopted by the LIFE Integrated Projects, which operate both inside and outside SACs and can also:

- take targeted action to reduce impacts outside the main conservation areas but which may have a significant impact downstream;
- deal with cross-border and transnational issues.

However, LIFE Integrated Projects typically are of a 10-year duration and only commenced in 2014, so there are few real results to share at this time.

Many of the examples taken from successful LIFE projects are from northern Europe and in many cases a degree of success is only possible when a series of projects focus on the same habitat types. While not all the freshwater habitat types have been covered by LIFE projects the selection below highlights some of the most effective and successful examples.

Standing water

Arguably, it should be easier to restore ecological functionality to these types of water body as they are often discrete and many are relatively small in area so the impact of any intervention might be expected to be more effective than in faster-flowing waters. While there have been successes in improving the conservation status of small and relatively isolated standing water bodies, there are still challenges to face when dealing with larger water bodies where land-based influences are many and various.

Oligotrophic to mesotrophic standing waters (3130): This type of waterbody occurs in most EU Member

States and is relatively abundant in the more mountainous parts of Europe where the habitat can form deep and extensive lacustrine systems. By contrast, it can also occur as shallow temporary pools in lowland regions. The clear soft water which characterises this habitat type contains low to moderate levels of plant nutrients and supports a characteristic assemblage of plant species with *Littorella uniflora,* considered to be the defining component. Out of the 22 Member States that reported on this habitat type in 2019, Bulgaria, Germany, Hungary, Portugal, Romania and Sweden reported good conservation status.

In Belgium, where the habitat is reported as bad, a series of successive projects, going back as far as 1997[25], have improved the local conservation status. Of particular interest is **Dommeldal** (LIFE05 NAT/B/000091) – the fifth project in the series – which also had a transboundary component to promote this habitat's connectivity between Belgium and the Netherlands (where the habitat is also reported as bad). Historically, large parts of the system have been drained by a network of ditches. The project restored almost 50 ha of mesotrophic ponds (mostly in the Netherlands) through extensive restoration of the natural bank profile and the installation of water control devices. Monitoring at the end of the project revealed the presence of the characteristic *L. uniflora* and demonstrated that recovery could be quite rapid in these localised, relatively small mesotrophic ponds provided the right conditions are established. Somewhat worrying though was the presence of the invasive alien species *Crassula helmsii* (a popular aquarium and water garden plant) alongside the desired vegetation. Although removed by the project team it was recognised as a potential ongoing threat. The last project in the series, **Triple E Pond area M-L** (LIFE08 NAT/B/000036), again focused on restoring the hydromorphology of the ponds (this time on breeding and feeding areas for Bittern (*Botaurus stellaris*) but also carried out some riparian improvements by removing scrub and trees from dried-up areas. Some successes were recorded and over 80 ha of mesotrophic ponds were restored. Overall, this project was less successful than anticipated due in part to land ownership issues relating to private land owners who were not so keen to take part in the project.

25 Midden-Limburg - LIFE97 NAT/B/004208; Dijlevallei - LIFE98 NAT/B/005171; Haine - LIFE00 NAT/B/007148; Life Grote Nete - LIFE05 NAT/B/000090; Dommeldal - LIFE05 NAT/B/000091; Triple E Pond area M-L - LIFE08 NAT/B/000036

A different approach has been adopted by the ongoing project **LIFE going up a level**, which also addressed *Natural dystrophic lakes and ponds* (3160). The main measures to improve this habitat type have been restoring hydrology (closing the ditches), reducing the nutrient level of the agricultural enclave by phosphorous mining, excavation, cutting trees and re-opening the ponds and grazing of surroundings to open up the habitat, improve flow and reduce agricultural pollution. Although the overall conservation status for the Netherlands in the 2018 Article 17 report remains bad, a genuine trend improvement is reported, and it seems that the LIFE project has been a contributing factor.

New LIFE for Dutch Fens (LIFE12 NAT/NL/000372) in the Netherlands addressed a range of habitat types including *Hard oligo-mesotrophic waters* (3140) and *Natural eutrophic lakes* (3150), both of which are widely distributed throughout Europe. In the 2013-2018 Article 17 report, the Netherlands reported a decline from poor to bad in habitat 3150 for the Atlantic region, which is noted as a genuine change, while habitat 3140 remained in poor condition overall. **New LIFE for Dutch Fens** took place between the reporting periods and met the expected result of improving a total of 140 ha of these two habitat types as part of a wider restoration of the fenlands. This was achieved mainly by dredging the lakes, removing scrub vegetation, and creating some new habitat. While this improvement may not be reflected in the national reporting it is nevertheless a significant improvement at the local level.

In Belgium, habitat 3150 is reported in 2018 as bad in the Atlantic region and poor in the Continental region. However, **LIFE+SCALLUVIA** (LIFE12 NAT/BE/000596) created a surface area of 11 ha of habitat, previously not present in the project site due to the high levels of nutrients reported for the area. In 2016, monitoring showed the presence of the water plant *Hydrocharis morsus-ranae*, a species included in the habitat description of habitat 3150. This newly created habitat is unlikely to feature in the Article 17 reporting, but it does represent a very positive input into the overall conservation status of this habitat.

Although *Natural dystrophic lakes* and ponds (3160) are common and widespread in Europe, in some countries there is a lack of monitoring data as many of the lakes are small. Fifteen out of 19 Member States reported good status, most stable in the short term and predicted to re-

main. Perhaps most notable in the LIFE portfolio is the suite of five Belgian projects[26] carried out between 2003 and 2006. Interestingly, while Belgium reports this habitat with an overall poor status in the Continental region, they also note that this is based on genuine data. Over the course of these five projects, Belgium has seen an increase in this habitat type of 81 ha – some of which is new habitat and some of which is improved through hydrological restoration.

Mediterranean temporary ponds (3170*): Seven Member States reported on this habitat type. The UK, Cyprus and Greece reported good, stable conditions and in the case of the UK this is a genuine change. Reports are from five biogeographical regions although the majority of records are from the Mediterranean region. In the Mediterranean region, **LIFE Potamo Fauna** (LIFE12 NAT/ES/001091), although targeting a number of species, actually created 37 new temporary ponds in this habitat classification which were already attracting breeding amphibians to the site.

Turloughs (3180*) are seasonally flooded lakes in karstic limestone areas that are principally filled by ephemeral subterranean springs and drain back into the groundwater table – they have no natural surface outlet and the habitat type is not so widespread. The example from the LIFE programme comes from Slovenia, reporting turloughs in both the Alpine and the Continental region. In the Alpine region the overall poor conservation status remains the same, but the data are recorded as genuine. The Cerknica intermittent lake is one such turlough, when full it is the largest lake in the country and therefore of significance in the Slovenian national assessment of this habitat type. **Cerknisko Jezero** (LIFE06 NAT/SI/000069) set out to prolong the drainage time in the lake and hold back the water in the driest summer months. The project improved hydrological conditions on 1,350 m of stream courses, which were successfully restored. A large proportion of abandoned meadows was returned to proper management, which still lasts due to land purchase. **LIFE STRŽEN** (LIFE16 NAT/SI/000708) aims to further improve the status of the Cerknica intermittent lake due to longer water retention times. This will be achieved by restoration of 2.1 km of the Stržen watercourse crossing the intermittent lake through dredging and reprofiling of the riverbed.

Running water

In spite of a large number of river restoration projects (restoration of river flow, river beds/spawning grounds, removal of barriers for migration etc.) that have been implemented all over Europe, there are very few cases where the river habitats have shown genuine improvement in conservation status. This can be due to a number of factors, e.g. the results are 'diluted' in a large number of river habitats with a bad/insufficient conservation status, or the fact that LIFE projects rarely are able to target all factors impacting the river habitats. Eutrophication and catchment processes require a broader approach. Nevertheless, there are some notable examples where LIFE has made a significant difference at the local level.

Alpine rivers and their ligneous vegetation with Myricaria germanica (3230) are reasonably widespread in Europe and are characterised by gravel deposits rich in fine silt of mountain and boreal streams with an alpine summer high-flow regime. In Italy, these watercourses are reported as bad in both the Continental and Alpine regions. Nevertheless, in Italy **Taro** (LIFE98 NAT/IT/005138) improved knowledge about the habitat in the Continental region through implementing restoration measures and raising awareness. Thousands of new *M. germanica* plants, grown in nurseries, were planted, and surveys and studies were carried out on the wild plants found along the river. The project contributed to safeguarding of this important vegetation community locally and could be used as a good example across Europe.

Alpine rivers and their ligneous vegetation with Salix elaeagnos (3240): Not dissimilar in bed type and flow regime from 3230 but distinguished by the characteristic presence of *Salix* rather than *Myricaria* and equally well distributed throughout Europe. Our LIFE examples come again from Italy, where this habitat type can be found in three biogeographical regions (Alpine, Continental, Mediterranean) where it is universally in poor or bad condition with the Mediterranean region reported as bad. Three LIFE projects have made a real change in habitat 3240 at the local level in the Alpine region. **NECTON** (LIFE97 NAT/IT/004089) increased the habitat area by almost 4 ha. This was followed by **NEMOS** (LIFE00 NAT/IT/007281), which succeeded in expanding and reinforcing the Natura 2000 network following the establishment of new Special Protection Areas (SPAs). Finally, **Fiume Toce** (LIFE02 NAT/IT/008572) restored

26 *Saint Hubert - LIFE03 NAT/B/000019; Cx SCAILLE - LIFE05 NAT/B/000087; PLTTAILLES - LIFE05 NAT/B/000089; NATURA2MIL - LIFE05 NAT/B/000088; PLTHautes-Fagnes - LIFE06 NAT/B/000091*

river banks and artificial embankments to reduce erosion; reduced invasive exotic trees and shrubs in thermophilous shrub habitats; created new alluvial forests by planting seedlings of *Alnus glutinosa, Populus alba, Pinus nigra, Quercus robur, Salix alba, Salix fragilis, Salix purpurea* and others.

All water types

There are some LIFE projects that target multiple habitat types and species within a single project or series of projects. A good example of this is LIFE Mires Estonia (LIFE14 NAT/EE/000126). The main objective of this project is to secure the good conservation status for wetlands. In addition, the project affects protection and management of other habitat types as well as species related to them: *Natural dystrophic lakes and ponds* (3160), *Water courses of plain to montane levels* (3260) and others. The main actions concern restoration of the hydrological regime through blocking drains, constructing dams and cutting trees in the riparian habitat. Although the project is still ongoing the results obtained so far are very promising.

Finally, it is worth noting that some projects benefiting priority habitats within and outside the Natura 2000 network can be found in the LIFE Environment portfolio. In such cases the main focus would be the Water Framework Directive but this also brings multiple benefits to the freshwater priority habitats. An example is LIFE REGENERA LIMIA (LIFE13 ENV/ES/000227) where 8.49 ha of floodplains of the old riverbed in the SCI 'Veiga Ponteliñares' were restored and environmentally recovered. The French LIFE Continuité écologique (LIFE10 NAT/FR/000192) addressed continuity issues along 11 km of the Cousin river and restored 3,000 m of river habitats in its valley, as well as 4,200 m of the Cure river. The restoration measures were linked to in-water transformations of weirs to provide optimal water flow and decreases in water temperature that were having an impact on fish spawning.

3.3.2 Marine habitats

Only five of the EU Member States do not possess a coastline and so marine habitats are well represented in the EU. However, it is somewhat difficult to assess trends for marine habitats as in the Habitats Directive they are classified together with coastal habitats and there is no disaggregation of the data. The latest analysis of the Article 17 data suggests that marine biogeographical regions exhibit less good status than terrestrial regions on average, with good conservation status reported for only one marine region (Black Sea). The Marine Baltic and Marine Atlantic regions show a high share of bad status and many marine habitats are still assessed as unknown (EEA, 2020[27]). The latest trend analysis for truly marine habitats shows all but one are in poor or bad condition, and there have been only two improvements in conservation status since the last reporting period.

The most important and significant threats for marine habitats are similar throughout all marine habitat types, and there is no evidence that there are improvements in any of the pressures listed as significant in either the EU State of nature or the EU Red List of Habitats reports. Indeed, the evidence for some pressures such as plastics in the ocean suggests an increasing trend. The main pressures can be broadly grouped into those which are a function of urbanisation (coastal modifications, tourism and leisure, pollution), those related to extractive industries (dredging, mining) and those related to exploitation (mariculture, fishing).

Marine projects focusing on habitat conservation and restoration are not well represented in the LIFE portfolio. This can be accounted for by the low number, until recently, of marine SACs, the low number marine habitat types in Annex I compared to their total number, and the lack of viable and tested restoration methods for most marine habitats. Indeed, the general lack of data makes it difficult to even determine what measures may be necessary and there is no doubt the practical marine conservation measures are well behind terrestrial systems. From the small range of projects available, many deal with spatial planning and the need to change behaviour amongst marine stakeholders, enforcing management measures and trialling limited restoration techniques for specific habitat types. The control of invasive alien species and pollution from land-based sources continue to raise challenges.

27 *Note that the number of assessments upon which these data are based is still very low in comparison with terrestrial biogeographical regions.*

KEY MESSAGES

LIFE has played a vital role in the identification and designation of the marine Natura 2000 network. In the last five years the marine Natura 2000 network expanded by 100% and now covers a more diverse range of habitats under the broad classification of 'reefs' and has significantly expanded the offshore network. LIFE has also been essential in building up the knowledge base to gradually fill the large data gap about marine ecosystems. Key LIFE successes include the recovery of seagrass beds in the Mediterranean and reefs in the North Sea.

Habitat status

Overall, the Natura 2000 network currently covers around 10% of marine waters (c. 0.4 Mio km^2) an area which has almost doubled since the 2015 EU State of nature report (EEA, 2020), and there is a call in the new EU Biodiversity Strategy for 2030 to increase this to 30%. Europe's marine waters vary significantly in character, from the brackish, nutrient-rich conditions found in the Baltic and Black Seas, through the warm, relatively oligotrophic Mediterranean to the exposed western coastlines with cool, well mixed waters of the Atlantic Ocean. There are substantive differences in the physical, chemical and oceanographic characteristics of each separate water body which in turn supports a rich biodiversity. The range of conditions can vary greatly. For example, the western Baltic Sea, influenced by the open water of the North Sea, is fully saline while to the extreme east the Baltic Sea is almost fresh water. There are eight habitats classified under Open Sea and Tidal Areas in Annex I of the Habitats Directive (habitat codes 1110 1180), lagoons (1150) are not included in the aggregated data (EEA, 2020) but Boreal Baltic narrow inlets (1650) and Sea Caves (8330) are. However, for the purposes of this report, habitats 1150 and 1650 are dealt with in the coastal Section (3.7.3) and 8330 in the rocky habitats Section (3.7.4). Most of the remaining six habitat types can be found in almost all biogeographical regions except for *Posidonia* beds, which are exclusive to the Mediterranean[28].

In the 2015 EU State of nature report (EEA, 2015) marine ecosystems were reported in a different way and more closely followed the MAES (Mapping and Assessment of Ecosystems and their Services[29]) classification and although these ecosystems cover around half of the EU's area, they include few Annex I habitat types. The overwhelming conclusion from this snapshot was that marine habitats close to the land were largely in poor or bad conservation status and only 6% were in a good condition. In addition, as habitats become more disconnected from the coastline (shelf and open-ocean ecosystems) there is a lack of data and high levels of uncertainty. There is an acknowledgement that the results in the report should be treated with caution due to a general lack of data.

In the 2020 EU State of nature report (EEA, 2020) only broad conclusions can be made and it is not possible to make direct comparisons with previous reports. Marine regions exhibit less good status than terrestrial regions on average, with good conservation status only reported for one marine region (Marine Black Sea, with 14%). The Marine Baltic and Marine Atlantic regions show a particularly high share of bad status assessments, with 71% and 57% respectively. However, there are many marine habitats where conservation status was assessed as unknown due to the lack of data from Member States, e.g. for the Marine Macaronesian region where 100% of assessments were unknown.

The European Red List of Habitats – Part 1: Marine Habitats (EU, 2016a) presents a more comprehensive assessment and is mentioned here to add context. A Red List assessment was carried out for a total of 257 benthic marine habitats, of which 10 occur only outside the EU-28. In total, 19% of the evaluated habitats were assessed as threatened in the categories Critically Endangered, Endangered, and Vulnerable. An additional 12% are Near Threatened in the EU-28. These figures are approximately doubled if Data Deficient habitats are excluded. The percentage of threatened habitat types differs across the regional seas. Despite having the highest share of marine habitats in a good status, the highest proportion of threatened habitats in the EU-28 was in the Black Sea (78%).

Although the Article 17 reports for the 2013-2018 period are more comprehensive than before, there appears to have been no real improvement in the conservation status of marine habitats since the last reporting period and in fact a decline in some habitat types has been recorded – generally as a result of improved knowledge or changes in methods. The situation is not assisted by the general uncertainty and high proportion of unknown trends and conditions reported. There are no reports of genuine improvements in any habitat type and in any Member State since the last reporting period. Some improvements were

28 *Other seagrass species occur in other biogeographical regions, but they are not considered as separate priority habitats under the Habitats Directive but are duly noted in the Red List of Habitats.*
29 *https://biodiversity.europa.eu/maes*

noted but these were based on a change in the method (two cases) or improved knowledge (three cases). Of particular note are Malta and Estonia (who reported all habitat types in good status) and Cyprus (where three out of four habitats were in good status).

LIFE has invested a lot in marine projects throughout the years, mainly in the identification and designation of the Natura 2000 sites as the network was incomplete. Only recently is there an increasing number of projects dealing with marine habitat conservation. Although there is a lack of genuine improvements in conservation status in the marine habitats across all biogeographical regions, as reported in the most recent Article 17 report, LIFE has definitely played a role in local improvements.

However, there can perhaps be a link drawn between the improvement in Italy in *Posidonia beds* (1120) from poor to good and the series of Italian LIFE projects that have focused on restoration of seagrass beds through implementing a series of measures designed to remove major threats and restore degraded beds using a variety of techniques, from transplanting from donor sites to broadcast seed dispersal (see box).

LIFE programme response

A previous review is presented in 'LIFE and the marine environment'. Recognising the gaps in the data and the lack of progress towards the identification and conservation of critical marine habitats, the LIFE programme has promoted the marine component of the Nature Directives in finalising inventories to set up offshore Natura 2000 network sites, implementing concrete conservation and management measures within existing Natura 2000 sites, conflict resolution amongst marine stakeholders and new approaches to monitor the impact of human activities on critical marine habitats and species as a tool to guide active conservation measures.

It has taken some time for marine habitats to be a focus of the LIFE programme (see Section 4 for overview figures), due in part to the high costs of operating offshore and the general lack of reliable information concerning the scope and distribution of marine habitats and species. In the early days of the LIFE programme there was a focus on 'Integrated Coastal Zone Management' and there were many projects that made positive contributions to coastal environments, often linking coastal and nearshore marine habitats into a single project. It required a change in the LIFE Regulation to allow open sea projects to feature more prominently in the portfolio. This change specifically allowed marine inventories and reduced the emphasis on concrete conservation actions, recognising the lack of data on the one hand and the fact that restoration methods were poorly developed and expensive. The fact that until recently there were very few designated SACs also led to difficulties under the LIFE Nature programme theme as this restricted where, and how many, LIFE marine projects could be featured.

Arguably, ground-breaking projects in the mid-2000s allowed some Member States to move forward and plan their marine protected area (MPA) programme more effectively with a better knowledge of the marine habitats they were trying to protect. In some ways the lack of specificity in the marine habitats allowed countries to determine what they needed to protect and what their specific priorities were.

Many Member States have faced the dilemma of simply not knowing what biodiversity lies within their territorial waters. Collecting this information is expensive and requires coordination, as the following selection of early projects in the Baltic region illustrates. **Baltic MPAs** (LIFE05 NAT/LV/000100) pulled together resources from Latvia, Lithuania and Estonia to carry out a detailed study of important sites for species and habitats of conservation interest. What makes this project stand out from a straightforward inventory project is that it combined data collection with addressing stakeholders' concerns about marine use and the impact of pollution on the environment.

FINMARINET (LIFE07 NAT/FIN/000151) conducted inventories and planned the marine Natura 2000 network in Finland, and also carried out a range of physical and biological surveys of the seabed and water column. The information obtained was of great scientific interest but also of direct practical value in supporting extensions to the Natura 2000 network and providing information necessary to assess the potential impacts of projects and processes on the marine environment. The results of the study therefore form part of the data necessary for Marine Spatial Planning.

A similar project in Lithuanian waters, **DENOFLIT** (LIFE09 NAT/LT/000234), produced an inventory of marine species and habitats for development of the Natura 2000 network in the offshore waters of Lithuania. This included ship-based surveys of seabird distribution, satellite telemetry to obtain information on the movement of birds, and mapping of the abundance and distribution of fish species. The

project results supported the identification of new or enlarged Natura 2000 sites (both SPAs and SCIs).

One of the most ambitious LIFE projects ever to be funded in the marine environment at the time was the Spanish **INDEMARES** (LIFE07 NAT/E/000732), which collected data over a wide expanse of Spanish waters, designated 39 new Important Bird Areas (IBAs) as SPAs, developed the relevant management guidelines for these SPAs and identified 10 new Natura 2000 SACs (see also Section 4.1.1). This laid the foundation for the Integrated Project **LIFE-IP INTEMARES** (LIFE15 IPE/ES/000012), which is now actively implementing the management plans for these protected areas. A second LIFE Integrated Project, this time in France **LIFE IP Marine Habitats** (LIFE16 IPE/FR/000001), deals with the effective and equitable management of marine habitats in France and has adopted some exciting new technologies and methods of monitoring using citizen science approaches to expand the datasets (see also Section 6.4.2).

All of these projects deal with a range of marine habitat types and have added significantly to our understanding of offshore systems.

The study 'Identifying the Drivers of Successful Implementation of the Birds and Habitats Directives' (Tucker et al., 2019) points out that in the UK *Mudflats and sandflats not covered by seawater at low tide* (1140) showed an improved trend between 2006 and 2012 due in part to LIFE projects. The situation appears to be stable even though there have been no further LIFE projects dealing with this habitat type.

Reefs (1170) covers an extremely broad range of habitats, from nearshore rocky reefs exposed at low tide to deep

In the spotlight: Breaking the waves in the Mediterranean

Posidonia beds (*Posidonion oceanicae*) (1120) are endemic to the Mediterranean and there has been a long legacy of LIFE projects focusing on their rehabilitation. In Italy, for example, a series of nine projects dating back as far as 1992 have recognised the importance of *Posidonia* beds as a priority habitat and supported a range of measures designed to improve the conservation status. **POSEIDONE** (LIFE09 NAT/IT/000176) introduced some innovative techniques for introducing anti-trawling devices to remove threats to seabed integrity and so protect the seagrass meadows. The recently completed **LIFE RES MARIS** (LIFE13 NAT/IT/000433) removed the threat of anchoring boats and tackled invasive species, and then transplanted *Posidonia* seedlings to regenerate a small area within the MPA. More recent projects recognise the important contribution that *Posidonia* (and other types of seagrass) make in terms of carbon sinks (see Section 5.1).

In Spain, in 2000, **Posidonia Baleares** (LIFE00 NAT/E/007303) was one of the first projects to recognise the impact of boat anchoring on seagrass beds and formulated an information campaign to reduce the impacts. The project launched a citizen science project that was groundbreaking at the time to collect data using scuba divers and created three new marine reserves. Several marine species also benefited from the measures undertaken.

In 2009, **Life Posidonia Andalucía** (LIFE09 NAT/ES/000534) set out to conserve the seagrass beds in Andalucía. They set up artificial reefs to reduce the impact of illegal trawling, installed monitoring buoys to reduce erosion and the dispersal of invasive alien species (IAS) by free anchoring and set up monitoring protocols that again relied on a citizen science approach. The project represents a cornerstone for the conservation of *Posidonia* meadows in Andalusia, both due to its contribution to improved knowledge of this priority habitat type and because it has substantially contributed to setting up the necessary methodological grounds and tools (including legal tools) for the management and monitoring of this area in the long term. The project has directly contributed to the implementation of relevant EU and national legislation (namely, the Habitats Directive, Marine Strategy Framework Directive, EU Biodiversity Strategy to 2020 and Common Fisheries Policy) and has a high demonstration value. This project featured in the publication on 'LIFE and the Marine Environment'.

One final note concerning seagrass beds in general, there is now a significant catalogue of LIFE projects dealing with other seagrass species which are equally important (although not endemic) in terms of ecosystem services, carbon sequestration, shoreline stability and biodiversity. These projects will contribute to improving or sustaining marine biodiversity in the future even if they never feature in the Article 17 reporting and the conservation status of Posidonia beds (1120) in Spain remains unknown.

water corals that are only just being discovered. The LIFE Integrated Projects in Spain and France previously mentioned have significant elements devoted to improving or maintaining the conservation status of reefs in France or understanding more about their status in Spain. For example, in Spain there are specific actions around restoration of populations of gorgonians and deep-water corals and marine macrophytes through development of innovative transplant techniques. The Spanish projects are also featured in the LIFE and Marine Environment publication (EU, 2018b).

Reefs are particularly difficult habitats to restore, as evidenced by **BLUEREEF** (LIFE06 NAT/DK/000159) which set out to rebuild boulder reefs (originally removed to build sea defences) in the Kattegat. The boulders came from Norway and the restoration costs were significant. The LIFE project increased marine life, including the restoration of 6 tonnes of macroalgal vegetation and 3 tonnes of bottom-living fauna, and a three- to six-fold increase in cod in the reef area. This is a significant input at the local scale but because the categorisation of the habitat type 'reefs' is so broad this type of project is unlikely to have an impact on the overall conservation status. The conservation status of reefs in Denmark's Marine Atlantic region remains bad.

Finally, **LIFE LOPHELIA** (LIFE18 NAT/SE/000959) is a landmark in traditional LIFE projects as it explores the relatively deep-water reefs of the Skagerrak entrance to the Baltic. The project aims to restore 25 ha of deep-water corals to promote fish production and biodiversity using some innovative restoration materials and seeding methods. Although reefs in Sweden in both the Marine Atlantic and Marine Baltic are classified as bad, because of the extent and diversity of the habitat this project might not change the assessment for the next Article 17 reporting, although it could have a tremendous impact locally.

3.3.3 Coastal habitats

Coastal habitats are present in all Member States with a coastline. They range from mobile sand dunes to saline lagoons. Overall, EU-protected coastal habitats are in a bad conservation status, with few signs of improvements at Member State and EU levels in recent years.

High coastal population densities and human activities are the main drivers for the degradation of coastal habitats, sometimes leading to irreversible impacts. Almost half of the EU's population lives less than 50 km from the sea, with the majority concentrated in urban areas along the coast. One in seven EU citizens lives within 500 m of the coast. The main causes of change to coastal ecosystems are erosion, urban sprawl, tourism, and agriculture, directly affecting Natura 2000 sites. Sea level rise linked to climate change is expected to cause half of Europe's coastal wetlands to disappear, an area of some 4,500 km² (EU, 2017).

Since 1992, over 300 LIFE projects have targeted coastal habitats, focusing on measures such as habitat creation, controlling invasive species, or enhancing natural dynamics.

KEY MESSAGES

Key LIFE successes for coastal habitats include the recovery of the entire global area of the rare machair habitats in the British Isles, restoration of coastal lagoons in the Mediterranean and of shifting sand dunes in the Netherlands. Although national or EU improvements are scarce, many successes are observed at the local level. LIFE projects have uniquely facilitated the restoring of natural dynamics in coastal ecosystems. Cooperation between LIFE actors across countries, such as through the Natura 2000 Biogeograhical Process, have facilitated the achievement of larger impacts. For greater impact at the EU level efforts need to be scaled up and conservation measures planned and implemented with cross-border networks.

Status and trends

The EU's coastline is estimated to stretch almost 68,000 km. The terrestrial part of its coastal zones totals some half a million km² spread across 23 Member States. Europe's coasts are highly dynamic, shaped by tides and currents, by sediment deposition and erosion, by weather and by human activity (EU, 2017).

The Habitats Directive makes a distinction between **coastal habitats** (which include coastal lagoons and brackish inlets, drift lines and shingle beaches, sea cliffs, salt marshes and salt meadows, Baltic esker islands and Baltic coastal meadows) and **coastal sand dunes** (which are divided into two geographical groups, dunes of the Atlantic, North Sea and Baltic coasts and dunes of the Mediterranean coast). Altogether in this analysis 33 habitat types are considered, including the priority habitat *Coastal lagoons* (1150*) and *Boreal Baltic narrow inlets* (1650), which can also be considered marine habitats. Coastal habitats occu-

py the European fringe and can be quite similar across biogeographical regions. There is, for example, only one habitat *Annual vegetation of drift lines* (1210) across the whole EU-28, one shingle habitat (1220), three sea cliff habitats and five saltmarsh and salt meadow habitats. There is a set of five specialised habitats in the Baltic Sea (sandy beaches, esker islands, rocky islands, inlets and coastal meadows), 10 dune habitats associated with northern Europe and seven associated with southern Europe.

As numerous bird species breed in coastal habitats many SACs are also designated as SPAs under the Birds Directive. In 2017, some 15% of the EU's coastal zone (landwards and seawards) was included in the Natura 2000 network.

The 2015 EU State of nature report (EEA, 2015) highlighted the critical status of dune habitat in Europe. Consequently, through the Natura 2000 Biogeographical Process, there has been a special focus on coordinated work in the Atlantic region, which holds about half of all Shifting dunes (2120), Fixed dunes (2130*) and Humid dune slacks (2190) in Europe. From discussions at the Atlantic biogeographical seminars in 2012 and 2016 there is now a good understanding across the Member States of the pressures and threats to Atlantic dune habitats and the role that LIFE projects have played in developing and disseminating good practice. A LIFE platform meeting, within the framework of the biogeographical process, was held in 2016 in the Netherlands and the output has been a rolling roadmap for networking and knowledge exchange.

In the Article 17 reports for the 2013-2018 period there are now some encouraging improvements in the conservation status of coastal habitats at Member State level, presented in Table 14.

Table 14: Examples of genuine positive trends in coastal habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

Habitat type showing improved status	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120)	DK	ATL	U2x to U1x (genuine improvement in status)	**REDCOHA-LIFE** (LIFE12 NAT/DK/001073)
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120)	NL	ATL	U1+ to FV (genuine improvement in status)	**Dutch Coastal Dunes** (LIFE05 NAT/NL/000124); **Revitalising Noordduinen** (LIFE09 NAT/NL/000417); **Dutch dune revival** (LIFE09 NAT/NL/000418)
Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130*)	SE	CON	U2- to U2+ (genuine improvement in trend)	**SandLIFE** (LIFE11 NAT/SE/000849)
Humid dune slacks (2190)	BE	ATL	U2+ (genuine improvement maintained)	**FEYDRA** (LIFE02 NAT/B/008591); **ZENO** (LIFE06 NAT/B/000087); **Life FLANDRE** (LIFE12 NAT/BE/000631)
Machairs (21A0) (in Ireland)	UK	ATL	U1+ to FV (genuine improvement)	**Scottish machair** (LIFE08 NAT/UK/000204)
Coastal lagoons (1150*)	FR	MED	U2= to U1+ (genuine change in status and trend)	**LAG'Nature** (LIFE07 NAT/F/000193); **LIFE+ ENVOLL** (LIFE12 NAT/FR/000538)
Coastal lagoons (1150*)	DK	CON	U2= to U2+ (genuine change in conservation status and trend)	**CONNECT HABITATS** (LIFE09 NAT/DK/000371); **Better BirdLIFE** (LIFE17 NAT/DK/000498)
Boreal Baltic coastal meadows (1630*)	EE	BOR	U1= to U1+ (genuine change in conservation status and trend)	**URBANCOWS** (LIFE10 NAT/EE/000107)
Boreal Baltic coastal meadows (1630*)	FI	BOR	U2+ to U1+ (genuine change in conservation status)	**Kokemäenjoki-LIFE** (LIFE06 NAT/FIN/000129); **Vattajan dyyni LIFE** (LIFE05 NAT/FIN/000104); **Species-rich LIFE** (LIFE10 NAT/FI/000048); **Light & Fire -LIFE** (LIFE13 NAT/FI/000099)

Most of these positive trends are underpinned by ongoing measures at national and regional level, including input by the LIFE programme, although the contribution of the LIFE projects is not consistently acknowledged in the Article 17 reports.

Through application of the most effective conservation measures it is possible to focus on improving the structure and functions of habitats. Taking sand dunes in the Netherlands as an example, this has resulted in a generally positive national report indicating that the work over the last decade is paying dividends, thanks in part to a series of LIFE projects.

However, it must be noted that the 2013-2018 reports also show setbacks and continued pressure on several habitats at Member State and EU biogeographical level compared with the previous report. Considering Portugal, for example, there has been a marked deterioration in almost all dune habitats between 2012 and 2018 with no positive trends reported. In Germany in the Continental region the priority habitat *Fixed coastal dunes* (2130*) has declined from poor to bad, in Poland from poor to bad, and in Denmark in a bad and declining status (U2= to U2-).

Coastal dunes

For coastal dunes there are 17 EU habitat types. These are usually found in habitat mosaics so that most 'dune systems' will include components of mobile dunes, fixed dunes, dune wetlands and dune scrub and woodland. In northern and western Europe, interference with natural dynamics (e.g. by artificial stabilisation such as planting Marram grass – *Ammophila arenaria*) is exacerbated by the effects of increased nitrogen deposition (stimulating vegetation growth), leads to a loss of bare sand and more open habitats. This is identified as a key threat not only to mobile habitats but to the whole dune system. In Mediterranean dune systems the key threats are the loss of habitat through urbanisation, damage to habitats from recreation pressure and the spread of invasive alien species. LIFE projects, for example in Spain and Italy, have been at the forefront of responses to these threats by removing infrastructure (roads, car parks and buildings), setting out paths and boardwalks to accommodate visitor pressure and tackling invasive species.

In north-west Europe adoption of a 'dynamic approach' to dune management, first proposed in the 1980s, has been developed largely through the work of several large LIFE projects in Denmark, the Netherlands, the UK and Sweden. This approach takes into account the naturally dynamic nature of dune habitats with cycles, over decades or centuries, of stabilisation, soil formation and scrub development but also of marine and wind erosion, returning habitats to an early pioneer (or embryo) stage. Over-stabilisation of dune systems as a response to historic sand drift has an impact on the specialist plants and animals of open habitats and bare sand. Thus the main measures applied to dune habitats in these countries are re-activation of blowing sand (by removing vegetation and land-forming), restoring humid dune slacks by removing nutrient-rich turf, establishing mowing and grazing regimes to hold back succession, and control of scrub and one-off restoration works such as removal of exotic plantations. The year-on-year reduction in atmospheric nitrogen levels from pollution control measures is helping this work.

There is a particular problem in maintaining dune wetland features. Humid dune slacks (2190) are formed either as a result of coastal accretion (primary slacks) or from aeolian processes reactivating sand movement within dune systems (secondary slacks). With many dune systems fragmented and constrained by urbanisation, there is neither time (decades to centuries) nor space to allow free rein to natural processes. Also, in the Netherlands, and to some extent in Belgium, dunes are used as a source of clean drinking water. This has in the past led to the desiccation of natural humid dune slacks, but a change in policy to better control fluctuations in water levels and to raise water levels along with conservation measures, including mechanical excavation, with the help of LIFE projects, is seeing this habitat begin to recover.

Other coastal habitats

Boreal Baltic coastal meadows (1630*) have evolved as a result of land upheaval and the influence of the brackish waters of the Baltic Sea. This priority habitat is mainly found in the Boreal region, which holds 95% of this habitat, and is only reported from Sweden, Finland, Estonia and Latvia. It is a rare habitat listed by the IUCN as endangered at European level, as more than 50% of the habitat has been lost in the last 50 years (EU, 2016b). The meadows were traditionally managed by grazing, mowing and reed-cutting. However, the main threat to the habitat is the abandonment of traditional agricultural practices, and this is one of the main reasons for its bad conservation status at EU level.

Coastal lagoons (1150*) is a widespread but variable habitat type found in all biogeographical regions with

a coastline and is often found in association with other habitat types. They are expanses of shallow salt water wholly or partially separated from the sea by sand banks or shingle. Salinity may vary from brackish (common in the Baltic) to hypersalinity (common in the Mediterranean) depending on rainfall, evaporation, and inputs of seawater. They are important habitats for specialised species and also for providing invertebrate food for bird species such as the Avocet (*Recurvirostra avosetta*). The habitats are threatened from a combination of changes to water body conditions, pollution, over-harvesting of aquatic resources and urbanisation.

LIFE programme response

Particular efforts of LIFE projects targeting coastal habitats have been made to improve the status of priority habitats across the biogeographical regions, such as fixed dunes in the Atlantic and Continental region, coastal meadows in the Boreal Region, dunes with Juniper in the Mediterranean region and coastal lagoons in several regions.

LIFE projects for coastal and dune habitats have had a strong focus on implementing pilot actions and in disseminating best practice through national and international coastal networks. The main conservation actions include:

- habitat restoration and management, including habitat creation;
- restoration of natural aeolian (wind) dynamics in dune systems;
- restoration of natural hydrology and hydrological function (e.g. in lagoons);
- establishing ex-situ plant nurseries for coastal habitat restoration (especially in the Mediterranean region);
- control of invasive plant species;
- development of integrated coastal management plans;
- cross-border projects;
- sharing of practices with stakeholders and through international networks.

Coastal dunes

In the Netherlands, a series of LIFE projects including Dutch dune revival (LIFE09 NAT/NL/000418) and Amsterdam Dune project (LIFE11 NAT/NL/000776) have demonstrated how active sand-drift can be restored in the mobile dune habitats and in the fixed dune landscape. A strict Dutch coast protection policy dating back to 1950s had turned much of the former mobile dune zone into an engineered sand dyke. The **Dutch dune revival** (see box) project was one of the first to open up breaches in this de-

In the spotlight: Bringing back dynamics in the Dutch dunes

Shifting dunes (2120), also called mobile dunes or white dunes, represent the first succession stage in the development of dune systems along the coastline. Although this habitat type is present in most biogeographical regions the vast majority (60-70%) of its surface area can be found along the Atlantic coasts. This rare habitat, less than 380 km^2 in the EU, shows a gradual improvement in the Atlantic region (from bad in 2006 to poor-stable now). The Netherlands show an even stronger improvement from poor (U1) over U1+ in 2012 to good in 2018.

A key threat to the habitat is human-induced fixation. This includes hard fixation such as the creation of solid dykes, as well as soft fixation by plantation with trees or grasses or encroachment by – often invasive alien – scrubs and trees. The fixation measures are mostly for coastal defence purposes, at the expense of this habitat that depends on natural processes such as wind erosion. It is recognised in recent decades that, where space so allows, allowing natural dynamics to prevail can recover the habitat while at the same time providing a natural buffer against negative effects from climate change.

Several LIFE projects, especially in the Netherlands, have focused on restoring natural dynamics, Dutch dune revival (LIFE09 NAT/NL/000418) being a key example. This project set back succession to an earlier stage. It took ambitious measures by creating openings at five locations in a sand dyke at the Natura 2000 site Kennemerland-Zuid. These wind trenches measured up to 15 m in height and 100 m in width. This extended the surface area of white dunes in the site from 154 ha to 175 ha by the end of the project. Wind patterns now drive mobile dunes, which are gradually 'walking' over the area. This supports many pioneer species that are typical for these habitats but are endangered in the Netherlands. The project created corridors between white and grey dunes, thereby increasing resilience. Succession will now allow vegetation patches to move around, such that all the target habitats, together with their typical species, will profit in the long term.

fence zone to allow sand transport from the beach into the dune system. Restoring such a large-scale dynamic landscape with 21 ha of new mobile dune habitat had never been done before in north-west Europe, and the results of this LIFE project have been widely disseminated.

The sister project **Amsterdam Dune** (the projects held a joint final conference) focused on developing best practice in the reactivation of blowout features in some 250 ha of fixed dune landscape. Blowouts are saucer-shaped wind-driven areas of mobile sand, and the project has shown that they are vital for the long-term health of fixed dune habitat by spreading calcium and nutrient rich sand. Rare plants and invertebrates benefit from the fresh calcareous sand, with the positive effects lasting for decades. Blowouts are reactivated by removing vegetation or are created from new where conditions are suitable. This knowledge too has been disseminated across north-west Europe and is being replicated in the UK.

In Denmark, where there are over 40,000 ha of fixed dunes (habitats 2130* and 2140*), the focus of restoration in several LIFE projects has been on the removal of conifer plantations (planted to control sand drift), control of the spread of self-sown conifers and improving habitat condition through grazing with cattle and sheep, and by controlled burning to maintain open dunes. The project REDCOHA-LIFE (LIFE12 NAT/DK/001073) targeted five habitat types and removed over 100 ha of conifer plantations.

Along the coast of Belgium (Flanders) urbanisation has destroyed many dune areas and left the remaining areas fragmented and at risk of further deterioration. Since 1992, the Flemish Government has implemented its 'dune decree' to protect the remaining dune habitat, purchase land where necessary and implement a long-term programme of habitat restoration. Through a series of LIFE projects, including FEYDRA (LIFE02 NAT/B/008591), ZENO (LIFE06 NAT/B/000087) and the transnational (Belgium/France) Life FLANDRE (LIFE12 NAT/BE/000631), the problems of succession to scrub and woodland have been addressed. Scrub has been cut, stumps removed and organic soil layers removed to restore mobile dunes (2120), fixed dunes (2130*) and dune slacks (2190), with grazing introduced to maintain the restored habitats.

In the spotlight: Restoring fixed dunes in Sweden

Fixed – or grey – dunes (2130*) comprise a secondary succession stage in the dune formation. They are characterised by a perennial open vegetation of grasses, herbs, mosses and lichens, attracting specialised fauna, mostly invertebrates. In all regions, fixed dunes are in a poor or bad conservation state with mostly negative trends.

Fixed dunes are mostly threatened by encroachment of tall herbs and grasses, shrubs and trees, mostly as a consequence of plantations for coastal defence or land abandonment.

In the Continental region of Sweden, fixed dunes show a positive trend in surface area. Here, the project SandLIFE (LIFE11 NAT/SE/000849) addressed the problems of historic over-stabilisation of coastal and inland dunes and was instrumental in stopping the further decline of fixed dune habitat. The project coordinated actions across 23 Natura 2000 sites in the south of the country and cleared 550 ha of scrub and trees, opened up 200 ha of dunes by soil disturbance with tractor-mounted harrows and ploughs, and dug up 40 ha of the invasive Japanese rose (*Rosa rugosa*). The most effective method of removing the rose bushes is to dig up the entire root system. At the same time, light nutrient-poor sand can be dug up and laid on the surface. All root pieces of the roses are sorted in sorting plants and taken to landfill or burnt. The clean sand is then placed at the bottom of the pit. It is easy to miss root pieces, so it is important to go over the areas annually and pull up remaining plants that are coming up. Although complicated and expensive, it is the most effective method: *R. rugosa* grows fast and it becomes more expensive to wait. Furthermore, 79 prescribed burnings were carried out to rejuvenate dune heaths. The project highlighted the importance of patches of bare sand for the specialist invertebrates of dunes and dune heaths.

Similar experiences* were seen in REDCOHA-LIFE (LIFE12 NAT/DK/001073) along the west coast of Denmark. A combination of grazing, excavating, covering with plastic and weed mats, milling, and herbicide treatment cleared some 43 ha of *R. rugosa* to restore fixed dunes.

* https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=LIFE-REDHOCABest-PracticesDAEN.pdf

Machair (21A0) is the Gaelic name for a rare type of coastal dune grassland only found along the exposed western coasts of Scotland and Ireland (it is a priority habitat only in Ireland). The traditional crofting system of land management created a mosaic of arable and grazed farmland which supported large numbers of birds including the Corncrake (*Crex crex*) and Chough (*Pyrrhocorax pyrrhocorax*). With decline in traditional agriculture and a switch to more intensive methods the habitat and its associated species declined as well. **Scottish machair** (LIFE08 NAT/UK/000204) targeted two-thirds of the world's machair and helped improve its conservation status from bad in 2006 to poor by 2012. The project worked closely with farmers to help them maintain traditional practices such as the spreading of seaweed on the sandy soils as a natural fertiliser, shallow cultivation, securing a local seed supply and late harvesting of crops. An ex-post visit to the project confirmed that the improvements had been sustained, and it was an accolade for the LIFE project to see the conservation status in 2018 reported as good. Partly as a result of the project the UK also reported an improved status for both *C. crex* and *P. pyrrhocorax*.

Ireland has a third of the total habitat area of Machair (21A0*) and is targeted by **LIFE Aran** (LIFE12 NAT/IE/000995). Conservation measures include extensive cattle and sheep grazing, application of seaweed as fertiliser, control of rabbit populations and cutting back invasive Bracken (*Pteridium aquilinum*). All this work, as in Scotland, involves a close partnership between conservation priorities and traditional land use. In Ireland, the machair habitat is reported as poor in 2018. This change in status from bad in 2012 is due to the use of a different method.

Other coastal habitats

Conservation efforts, including the work of several LIFE projects such as **CoastNet LIFE** (LIFE17 NAT/FI/000544), **LIFE CoHaBit** (LIFE15 NAT/LV/000900) and **LIFE Coast Benefit** (LIFE12 NAT/SE/000131), aim to reverse the decline of *Boreal Baltic coastal meadows* (1630*) by safeguarding the remaining meadows and in re-establishing traditional land management with mowing and grazing. In doing so the work also helps conserve rare birds and amphibians such as Lesser white-fronted goose (*Anser erythropus*), *Crex crex* and Natterjack (*Epidalea calamita* syn. *Bufo calamita*).

In Estonia, this habitat, whilst still reported as poor, is showing an improving trend. The project **URBANCOWS** (LIFE10 NAT/EE/000107) showed that coastal meadows can co-exist alongside the infrastructure of the City of Pärnu. It worked to raise awareness of the ecological and recreational importance of the city's nature reserve, by establishing visitor trails, observation platforms and information boards to reduce visitor impact. Similarly, in Finland the conservation status of the habitat has improved from bad to poor, partly through the work of several LIFE projects. The long-term management of these meadows is dependent on agri-environment support, and this is being addressed in Estonia at the national level through the **LIFE-IP ForEst&Farmland** (LIFE18 IPE/EE/000007).

More than 20 LIFE projects in Italy since 1992 have helped to maintain favourable conservation status of Coastal lagoon (1150*) habitats. The projects **LIFE LAGOON REFRESH** (LIFE16 NAT/IT/000663), **LIFE AGREE** (LIFE13 NAT/IT/000115), **LIFE-SeResto** (LIFE12 NAT/IT/000331), and **LIFE AUFIDUS** (LIFE11 NAT/IT/000175) are carrying out a range of actions to maintain and enhance lagoon habitats including in the 3,660-ha Venetian Lagoon. The main measures include reducing nutrient inputs and improving circulation to maintain good ecological status under the Water Framework Directive, controlling fishing activity (particularly clam dredging, which impacts on seagrass beds and populations of endangered fish species) and improving integrated management.

Coastal zone management

The conservation of coastal habitats has to work with other uses of the coast such as maintaining flood defences, urban areas, industry and shipping, military use and recreation. These all put pressure on habitats, thus necessitating an integrated approach to coastal and marine use planning. **Living with the sea** (LIFE99 NAT/UK/006081) was the first project to address such challenges for Natura 2000 sites on dynamic coasts. Many of the ideas from this project were incorporated into the UK's approach to Shoreline Management Plans and its influence was wider. In France and in other countries, public authorities are beginning to realise the important role that natural coastal habitats can play in adapting to the effects of rising sea levels. **LIFE Baie de l'Aiguillon** (LIFE14 NAT/FR/000669) aims to protect mudflats, saltmarshes and dunes as part of a climate change adaptation strategy for Aiguillon Bay. The theme of adaptation to sea level rise in France is continued through **LIFE Ad'Apto** (LIFE16 CCA/FR/000131), which aims to demonstrate that ecosystems and natural coastal habitats should be included in flexible coastal management plans to improve climate change adaptation.

Several LIFE projects have addressed habitat restoration and species protection through working with coastal land uses including maintaining traditional agricultural use, salt extraction in lagoons, military use, and tourism. The flexibility of the LIFE programme allows it to approach its objectives in different ways. The Italian led MC-SALT (LIFE10 NAT/IT/000256) had a French commercial salt production company as a partner in actions to improve a vast area of wetlands, saltmarsh and lagoons that supports internationally important numbers of birds, including gulls, terns and avocets. The experience helped establish a sister project, Salt of Life (LIFE11 NAT/BG/000362), on the Black Sea coast. LIFE projects with saltworks have also been funded in Slovenia and Spain. The Slovenian MANSALT (LIFE09 NAT/SI/000376) is a good example of an ecosystem services project which raises awareness about the value of former saltworks for protecting the coast from erosion.

The experience of LIFE projects on the coast shows that the biogeographical approach does work, especially where traditional LIFE projects are set within an integrated approach to coastal zone management linked to national policies for shoreline management. With climate change there will be pressures on coastal habitats but, with no net loss planning at regional or national level, there will be opportunities for habitat creation to offset expected losses. This is particularly important for the estuarine habitats of mudflats, sandbanks and saltmarshes. Several LIFE projects are helping to develop solutions based on managed realignment (i.e. removing dykes and embankments to allow the sea to reclaim the land) such as the Dutch 10GEMETEN (LIFE04 NAT/NL/000202) which restored 700 ha of tidal ecosystem, the Belgian ZTAR (LIFE09 NAT/BE/000143) which improved the tidal habitats of the Zwin estuary. Careful planning and a 'no net loss of habitat' approach is necessary to ensure that valuable freshwater habitats are not lost through the process of creating new intertidal habitat. The UK project TaCTICS (LIFE07 NAT/UK/000938) completed a managed re-alignment on the east coast of England by creating new habitat – first for Avocet (*Recurvirostra avosetta*) and Bittern (*Botaurus stellaris*) – before breaching a sea wall to create new saltmarsh habitat.

3.3.4 Rocky habitats

There are relatively few habitat types covered by 'rocky habitats'. Still they range from marine and wet conditions to the highest and most barren summits of Europe. A common feature is the sparse vegetation cover caused by a hostile substrate and rough environmental conditions. The share of rare species, adapted to these conditions, is high.

Rocky habitats are rarely directly impacted by human activity, partly because of their difficult accessibility. Key pressures, however, relate to indirect impacts such as climate change, with particularly devastating effects on the range of glaciers.

As the habitat types are few and the threats indirect, only few LIFE projects so far addressed the restoration or maintenance of rocky habitats. Typical measures of these projects focus on keeping the vegetation open by removing scrub encroachment. The impacts of such measures in terms of conservation status are mostly very local and rarely visible at the country or EU level.

KEY MESSAGES

As rocky habitats are patchy and often small in size and human pressures mostly indirect, LIFE projects only cover these habitats to a limited extent. The main successes are therefore at the local scale, where - often manual - measures restore open vegetation to make way to rare species. LIFE projects have helped to address the pressures and threats on these predominantly mountain habitats by, where necessary, controlling recreation pressure, managing vegetation succession, and ensuring that livestock grazing is set at appropriate levels.

Status

The group 'rocky habitats and caves' in the Habitats Directive includes 14 habitat types that are generally in good or poor condition, with a few concerns highlighted in the 2013-2018 assessment – especially in the Atlantic and Boreal regions. There is an issue, however, with knowledge as about one third of all assessments are reported 'unknown' for structure and function.

Rocky habitats account for 7.4% of the total area of Annex I habitats (EEA, 2020). As many of these habitats are characteristic of mountain slopes and more remote areas they are the habitat group with the highest number of good assessments and the lowest number of bad assessments. For all habitats assessed as poor or bad, rocky habitats have the lowest percent declining (15%) and the highest percent stable. The area of habitat also remains the most stable with the lowest reported increase in habitat area. The habitat group also has the lowest reported genuine

change in conservation status but also the lowest assessment of habitat area needing improvement (<5%) (EEA, 2020).

Scree (loose stone) habitats are classified on the basis of their geology, exposure and region. Rocky slope habitats include the priority habitat *Limestone pavements* (8240*). Most scree and rocky slope habitats, with the exception of limestone pavements, are little impacted by human activity by their remoteness and inaccessibility. Cliff habitats acted as refugia for plant species during the Ice Ages and as a result harbour many endemic species. Scree and rocky slope habitats are not well studied and there are still many data gaps.

Other 'rocky habitats' include Caves not open to the public (8310), Fields of lava and natural excavations (8320), *Submerged or partially submerged sea caves* (8330) and *Permanent glaciers* (8340). Glacier habitat in Europe is bad and declining and is the only rocky habitat assessed as 'bad' for range. Under current climate projections there will be nothing to reverse the trend. Further declines are given by France and Austria for the Alpine region in the 2018 Article 17 report.

In terms of protecting rocky habitats the most important measures have been establishing Natura 2000 sites and providing legal protection. Protection is especially important where habitats and species are at risk from quarrying activity and infrastructure projects.

LIFE programme response

Rocky habitats, when part of a mosaic of mainly alpine habitats, are frequently included in the scope of LIFE projects but there are few reports of specific measures being undertaken to improve the area or structure and function. Given the total area of rocky habitat types (121,800 km2) it is also most likely that the proportion of the habitat included in any one project is too low to make a difference to the national assessment of habitat quality.

Rocky habitats often have extreme natural conditions that support specialised, often rare species. LIFE projects have helped to address the pressures and threats on these predominantly mountain habitats by, where necessary, controlling recreation pressure, managing vegetation succession, and ensuring that livestock grazing is set at appropriate levels.

Medio-European calcareous scree of hill and montane levels (8160*) is an important priority habitat, especially for rare plants, and several projects have carried out actions to improve local conditions. The objective of the French project **Violette et Biscutelle** (LIFE06 NAT/F/000137) was to ensure the long-term preservation of the endemic priority species *Viola hispida* and *Biscutella neustriaca* on scree and scorched chalk grassland respectively (see also NEEMO, 2018 and Tucker et al., 2019). The species are only found in two Natura 2000 sites in the Seine valley and were threatened with extinction. Actions for the scree-specialist *V. hispida* involved carefully removing vegetation by hand to make the scree mobile, removing larger stones to leave only fine scree, reintroduction of plants and creation of ecological corridors between populations. However, although the number of locations for *V. hispida* increased from 13 to 21 during the project it fell back to 11 locations five years after the project due to overgrowth by woody species. Unfortunately, the improving trend as a result of the project (U2+) could not be sustained and the 2018 Article 17 report shows the species is declining again (U2-). The scree habitat (8160*) was improved locally, but overall the habitat remains bad in the Atlantic region.

The priority habitat *Limestone pavement* (8240*) occurs in five biogeographical regions; its conservation status is generally good in the Alpine, Mediterranean and Continental regions. However, in the Boreal region it occurs only in Sweden and Estonia, and although the situation in Sweden has declined between 2012 and 2018 (from U1- to U2-) it has improved in Estonia (from U1- to U1=). **LIFE to alvars** (LIFE13 NAT/EE/000082), although focusing on alvar meadows (see Section 3.7.5), improved the condition of the limestone pavement habitat (8240*) which, with only 60 ha (compared to the 10,000 ha of alvar habitat), is rather rare in Estonia.

In the Atlantic region the conservation status of 8240* remains poor. *Limestone pavement* is a characteristic habitat of the west coast of Ireland and northern England, with Ireland holding over 32,000 ha and the UK over 2,500 ha. In Ireland, the project **BurrenLIFE** (LIFE04 NAT/IE/000125) controlled scrub invasion and opened up limestone grasslands and limestone pavement. In the UK, the projects **Lowland Limestone** (LIFE99 NAT/UK/006094) and **Limestone Country** (LIFE02 NAT/UK/008539) have helped to maintain from 2012 to 2018 a reported 'bad but improving' trend for the habitat. Actions have included removal of over 100 ha conifer plantations on limestone pavement, introducing coppicing of native woodland and controlling grazing pressure.

3.3.5 Grassland habitats

Grasslands provide important ecosystem services, such as food provision, enjoyment of landscapes, storage of soil carbon, erosion control and flood regulation. They are among the most widespread and species-rich vegetation types in Europe with up to 80 plant species/m^2 and provide habitats for many animal species, especially invertebrates and birds. According to the 2020 EU State of nature report, over 50% of grasslands are deteriorating from an already poor or bad status. Member States reported a 45% decrease in grassland area, the highest of all habitat groups. 13.5% of the grassland area (33,000 km^2) is in need of restoration.

Grasslands, especially in densely populated areas, are increasingly threatened by agricultural intensification and change of land use. On the other hand, the abandonment of traditional grassland management, especially in grasslands areas with borderline yield and profit, leads to negative changes in the species composition and vegetation structure. The decline in the conservation status of Natura 2000 grasslands has now reached alarming levels with a chain of significant consequences for pollinators and other insects as well as for birds.

In total, 528 LIFE projects have addressed the improvement of grassland conservation status through the reintroduction of ecologically sound sustainable management. The best results and impacts are delivered by large-scale projects which include all relevant stakeholders, primarily the farming community, who ideally integrate the conservation of grassland management into their business operation. The communication of the best possible use of agri-environmental schemes for grassland conservation management plays an outstanding role.

KEY MESSAGES

Grasslands are among the most species-rich vegetation types in Europe. Almost all biodiverse grasslands are products of traditional management - mowing and grazing - over centuries. Because they are widespread and threatened, many LIFE projects focus on grassland restoration. LIFE often facilitates going beyond good farming practices and links habitat restoration to species recovery. A key success is the restoration of one quarter of the global area of alvar grassland in Estonia. In particular for this habitat group, LIFE initiates policy changes, such as through the Rural Development Programmes.

Status and trends

Species-rich grasslands are products of traditional management (mowing and grazing) over centuries. Public perception of grasslands has changed significantly, due to industrialisation of agriculture, globalisation and the cultural value attached to traditional management. There are strong gradients and large differences within the EU from east to west, and from south to north, where, especially in north-west Europe, the globalisation process, accompanied by the loss of traditional cultural values, has had the most negative impact. Pastoral systems have changed as well along the 'industrialisation gradients'. Traditional grazing management and the herding profession declined or ceased to exist, and management of High Nature Value (HNV) grassland habitats in Natura 2000 areas and other protected areas are mostly tied to financial support.

Despite ambitious targets, Europe continues to lose grassland biodiversity at an alarming rate. In 2012, more than 80% of Natura 2000 grassland habitats were in a poor to bad status, and about 49% of EU assessments for the 45 grassland habitat types of Community interest were in a bad status. In the 2018 EU State of nature report the ratio of grasslands in poor and bad conservation status slightly decreased to 77%; however, the share of grasslands in bad conservation status remains very high (44%).

The negative trend in conservation status still dominates: while with 180 habitat assessments across the EU in 2018 the negative trend in the conservation status remains very high, the positive trend is reported only in 25 cases.

Out of 530 conservation status records in total (all grassland habitat types broken down by individual Member State and biogeographical region) only four grassland habitat types in three EU countries (UK, the Netherlands and Estonia) show a slight genuine positive development. Only one of these has a clear link to a LIFE project (Table 15).

The decline in the conservation status of Natura 2000 grasslands has now reached alarming levels with a chain of significant consequences for pollinators and other insects, as well as for birds.

Habitat type showing improved status or trend	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Nordic alvar and precambrian calcareous flatrocks (6280*)	EE	BOR	U1- to U1+ (genuine improvement in trend)	**LIFE to alvars** (LIFE13 NAT/EE/000082).

Table 15: Example of genuine positive trend in grassland habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified.

Key pressures and their drivers that have a negative impact on grassland habitats are well known. As already mentioned, main pressures and threats on grasslands are caused by landscape changes related to the modification of land use practices, such as:

- changes in land use and land abandonment;
- abandonment of traditional management activities;
- afforestation;
- changes in livestock densities;
- intensification of grassland management and mowing.

Pressures from intensive agriculture are still supported by the common agricultural policy (CAP) and Rural Development Programmes (RDPs). Existing financing programmes and incentive tools are not sufficient, as the impact is too low. The profitability of (financially supported) biofuels outweighs the incentives for farmers to participate in agri-environment schemes in grasslands. Seed grassland on arable land is converted to produce profitable biofuel crops, while low-productive HNV grassland is intensified to compensate for the high demand for livestock forage.

The present CAP and RDP period ends in 2020, giving way to a new programming period for 2021-2027 and providing an opportunity to coordinate and develop region-specific solutions that could be integrated into the next CAP and rural development policies.

LIFE programme response

Since its beginning, the LIFE programme has contributed to projects with actions targeting grassland ecosystems within the Natura 2000 network. The establishment of a better link between agriculture and the RDP has been important in this regard. Many LIFE projects have focused on agri-environmental measures that go beyond usual good farming practices and that have a direct impact on the conservation of grassland habitats in Natura 2000 sites.

In the first 14 years of LIFE, from 1992-2006, more than 370 projects directly or indirectly targeted grassland habitats or grassland species listed under the annexes of the Habitats and Birds Directives. Of these, more than 45 projects directly targeted grassland habitats. They covered almost all grassland habitat types, with particular attention to calcareous and dry grassland habitats (60%). Over the next 11 years the focus on grasslands intensified. By 2018 the number of projects targeting grassland habitats or species had risen to 528 and more than 100 of them targeted grassland habitats specifically.

LIFE projects on grasslands and their actions vary considerably depending on the characteristics of the grassland habitats and project objectives. In general, the key measures include:

- surveys on habitat characteristics and grassland species (improved knowledge);
- preparation of Natura 2000 site management plans, including the design and adoption of agri-environmental measures with the aim of securing the grassland conservation status after LIFE;
- land acquisition or securing long-term land use rights to be able to implement foreseen restoration measures;
- a broad spectrum of direct conservation actions including reducing nutrient levels, removing woodland encroachment, species enrichment by sowing or planting, establishing or reintroducing suitable management regimes (mowing and/or grazing), fencing of grazed land, and alien species eradication;
- monitoring of impact and networking (improved knowledge), awareness-raising.

The positive trend in the conservation status of *Nordic alvar and precambrian calcareous flatrocks* (6280*) shows an obviously direct link LIFE to alvars (LIFE13 NAT/EE/000082). Nordic alvars have a very limited distribution and in Europe are only found in coastal western Estonia (approx. 100 km^2 in the Boreal region), southern Sweden (approx. 250 km^2 in the Continental and Boreal regions) and Finland (only 0.5 km^2 in Boreal). As for the Boreal region in Sweden, the conservation status of this rare habitat declined from good in 2012 to poor in 2018.

LIFE to alvars restored more than 2,500 ha of alvar grasslands – i.e. one fourth of the total area of this habitat in Estonia – by removing woodland and forests spontaneously developed on former alvars. Traditional sheep grazing has been ensured not only through support from agri-environmental subsidies, but also through additional activities that generate income from the management of Alvar grassland (e.g. sale of meat, wool).

Numerous other LIFE projects have dealt with ***poor dry grasslands*** using similar best-practice measures and management. LIFE to Grasslands (LIFE14 NAT/SI/000005) restored 260 ha of *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (6210) and 257 ha of *Species-rich Nardus grasslands* (6230*) through the removal of overgrowth and the reintroduction of grazing and mowing management. Policy-related activities are crucial for the assurance of the long-term sustainability of achieved results. Important examples include the preparation of expert proposals for agri-environmental measures for integration into the 2021-2027 RDP of Slovenia, the identification of economic interest for continued sustainable use of dry grasslands, or the improvement of a social and economic perspective of agriculture in target areas and beyond.

Similarly, HUGRASSLANDSLIFE (LIFE12 NAT/HU/001028) focused on three priority habitat types: *Sub-Pannonic steppic grasslands* (6240*), *Pannonic loess steppic grasslands* (6250*) and *Pannonic sand steppes* (6260*). Land use related to these types of dry grassland has also changed significantly in recent decades, as extensive livestock farming has declined sharply in Hungary. Consequently, these habitats are now also threatened by spontaneous forest encroachment and the spread of invasive species. Project actions and measures resemble those described above – clearing woodland encroachment and re-establishing pastoral systems. This best practice has been used by many other LIFE projects in various other European countries as well, such as Trockenrasen Deutschland R-Pf (LIFE02 NAT/D/008461) and Wetterauer Hutungen (LIFE08 NAT/D/000004) in Germany, Rodgid (LIFE04 NAT/DK/000020) in Denmark, RICOPRI (LIFE09 NAT/IT/000118) and LIFE Xero-grazing (LIFE12 NAT/IT/000818) in Italy or LIFE České středohoří (LIFE16 NAT/CZ/000639) in the Czech Republic.

In contrast, ***grassland habitats on nutrient-rich soils or on sites suitable for soil improvement*** are increasingly threatened by agricultural land use intensification – conversion to arable land by ploughing, fertilisation, or intensive livestock grazing. Due to this enormous agrarian pressure, the formerly very common habitats of species-rich tall-grass grasslands, such as *Molinia meadows on calcareous, peaty or clayey-silt-laden soils* (6410), *Alluvial meadows of river valleys* (6440), and especially the mesophilic *Lowland hay meadows* (6510) and *Mountain hay meadows* (6520) increasingly disappear from the European cultural landscape. To counteract this negative trend, land purchase with a subsequent re-leasing with nature conservation conditions and/or alternative economically viable use of sustainably produced grassland biomass without site intensification are the decisive LIFE approaches that have a good chance of success. Regrettably, few LIFE projects specifically aim at restoring mesophilic grasslands, as it is increasingly difficult to acquire suitable land due to competition from agricultural interests.

Fortunately, there are good project examples that may encourage further projects on this theme. LIFE Viva Grass (LIFE13 ENV/LT/000189) significantly contributed to the improvement of land use and nature conservation policies in Lithuania, as well as to the legal framework for the long-term maintenance of grassland biodiversity and the ecosystem services they provide. This ambitious goal was achieved by implementing an ecosystem-based approach in planning and by promoting economically viable grassland management. The project identified common policy shortcomings and developed recommendations for national and EU policies and for legal documents on strengthening synergies and eliminating shortcomings, to ensure long-term maintenance of grassland biodiversity. The project also focused on improving the coordination between nature conservation and rural development policies. An integrated planning tool for sustainable grassland management was developed and successfully tested in numerous grassland rich areas.

The Latvian LIFE GRASSSERVICE (LIFE12 BIO/LV/001130) focused on innovation by enhancing economically sustainable alternatives to the use of grassland biomass to maintain biologically valuable grasslands. Cooperation models between farmers, entrepreneurs and local authorities were established to ensure viability of grassland management and proposed technological solutions.

The Latvian GrassLIFE (LIFE16 NAT/LV/000262) focuses on developing, optimising and improving the conservation status of five EU priority grasslands (*Xeric sand calcare-*

In the spotlight: LIFE makes a change through actions on grasslands in Latvia

Targeting 15 floodplain areas in Latvia covering over 14,000 ha, **Meadows** (LIFE04 NAT/LV/000198) made the first step towards large- scale restoration of grassland habitats. These sites harbour the best floodplain meadows in the country, including 50% of the national resource of *Fennoscandian wooded meadows* (6350*), and they also host Latvia's highest breeding densities of the LIFE priority bird species Corncrake (*Crex crex*) and Lesser spotted eagle (*Aquila pomarina*).

In just four years the project initiated a coordinated nationwide programme for the restoration and long-term management of floodplains. Some 2,500 ha of grassland habitats, including such priority types as *Species-rich Nardus grasslands on siliceous substrates* (6230*), *Fennoscandian lowland species-rich dry to mesic grasslands* (6270*) and *Fennoscandian wooded meadows* (6530*), were restored by the project by clearing of woodland overgrowth, initial mowing and re-establishment of grazing. The successfully restored grasslands significantly improved the conservation status for the project main target species: Corncrake (*Crex crex*), Lesser spotted eagle (*Aquila pomarina*), Greater spotted eagle (*Aquila clanga*), Great snipe (*Gallinago media*) and Hermit beetle (*Osmoderma eremita*).

To ensure the continuity of the project management activities, contracts were signed on condition that the land users apply for funding under national and international agri-environmental programmes for at least five years after the end of the LIFE project. More than 400 farmers were trained and assisted to apply for these funds for grassland management. Notably, the project conducted detailed analyses of the relevant national legislation and actively participated in the preparation of the 2007-2013 Rural Development Plan for Latvia.

An ex-post visit carried out in 2017 confirmed the long-term effectiveness of the project's activities. Nine years after the project closed, some 70-80% of the floodplain originally included in the project was still managed in a proper way. The landowners continue to manage the species-rich floodplain grasslands through RDP agri-environmental payments, in accordance with the project's 13 management plans. Agri-environment payments have been prolonged until 2020.

Based on experience gained during the project implementation, and encouraged by the visible results, the same coordinating beneficiary (Latvian Fund for Nature) continues large-scale actions on Latvian grasslands in the follow-up project **GrassLIFE** (see below).

ous grasslands - 6120*, *Semi-natural dry grasslands and scrubland facies on calcareous substrates* - 6210*, *Species-rich Nardus grasslands* - 6230*, *Fennoscandian lowland species-rich dry to mesic grasslands* - 6270* and *Fennoscandian wooded meadows* - 6530*) on more than 1,300 ha by applying best-practice and testing pilot and restoration methods. In this project, the size of the grassland restoration is impressive, and the positive impact on the conservation status of the targeted habitats at the regional scale can be expected. The project also prepared and submitted to the Ministry of Agriculture an expert proposal for agri-environmental measures related to the conservation of the project's target habitats for integration into the 2021-2027 RDP for Latvia. Furthermore, the project produced a report highlighting how the sustainable management of grasslands in the Boreal biogeographical region can also be an opportunity to develop production, entrepreneurship and marketing measures with emphasis on the values inherent to semi-natural grassland products in five categories – meat, dairy, honey, grass, and wild medicinal plants[30].

30 https://grasslife.lv/wp-content/uploads/2020/02/Grasslands-Biodiversity-and-Business_GrassLIFE-report.pdf

Often, projects tackle both conservation problems – abandonment and intensification – in the same grassland area.. An example is the **LIFE MAGREDI GRASSLANDS** (LIFE10 NAT/IT/000243). The high permeability of the subsoil in the project area creates poor and dry soil conditions. Grasslands without proper use are under pressure from the overgrowth of bushes and the colonisation of invasive alien species. At the same time, several dry grassland sites were damaged by ploughing, fertilisation and irrigation for cultivating soybean and maize. By using a large variety of restoration methods, the project managed to regenerate *Eastern sub-Mediterranean dry grasslands* (62A0) on more than 200 ha of former arable land and to restore this grassland type on more than 280 ha of formerly fallow land.

Numerous successful projects have restored a natural mosaic of interlinked habitats – grasslands with salt marshes, fens or dunes. For instance, **PANNONICSK** (LIFE10 NAT/SK/000083) targeted a unique mosaic of 6120*, *Pannonic sand steppes* (6260*), *Pannonic salt steppes and salt marshes* (1530), *Inland salt meadows* (1340) and *Pannonic inland sand dune thicket* (91N0). Numerous best-practice restoration techniques were applied – mulching, elimination of invasive trees

and shrubs, harrowing, surface levelling, top-soil removal and the filling in of drainage channels, followed by the reintroduction of regular management through mowing and grazing on most of the project sites. The project measures helped to raise the conservation status and prospects of all salt marsh habitats and sand dune habitats in Slovakia from 100% bad to 20-23% poor and 46-48% good status, respectively. Similarly, the project Pustynia Bdowska (LIFE09 NAT/PL/000259) managed the largest Polish complex of xeric grasslands and inland dune habitats with the same best-practice restoration and management methods. Scrub and tree removal led to the return of open habitats to a good conservation status on a total area of 335 ha for 6120*, as well as for *inland dunes with open Corynephorus and Agrostis grasslands* (2330).

It should be noted that a very large number of LIFE projects that contribute significantly to the creation, extension or improvement of the ecological status of existing grassland focus primarily on the conservation of certain animal species, for which high-quality grasslands provide the necessary habitats and are thus a precondition for their sustainable protection. This regards especially the numerous LIFE projects for conservation of birds (especially meadow birds) and insects. For instance, the principal aim of the Greek Mikri Prespa (LIFE02 NAT/GR/008494) was to improve the conservation status of the Dalmatian pelican (*Pelecanus crispus*) and the Pygmy cormorant (*Microcarbo pygmaeus* syn. *Phalacrocorax pygmeus*). For this reason, wet grassland was restored on some 100 ha along the lake edge by cutting reeds and grazing buffalo.

3.3.6 Peatlands

Out of a total of 62 assessments on Article 17 reporting for the 2013-2018 period, only seven (11%) of peatland habitats currently show a good status. This concerns primarily peatlands in remote or inaccessible areas, not affected by human pressures, primarily in the Alpine, Boreal and Macaronesian (Azores) biogeographical regions. A further 24 assessed habitats (39%) are in a poor status, and 31 (50%) are in a bad status.

Although the value of mires for biodiversity and other ecosystem services is undisputed, their degradation and habitat loss across Europe is still ongoing. The most damaging and destructive measures and actions in mires are:

- **drainage and water extraction;**
- **afforestation;**
- **conversion to agricultural or horticultural land and fertilisation;**
- **peat extraction;**
- **construction of building and infrastructures;**
- **tourism and uncontrolled recreation demands;**
- **other uses such as waste disposal areas or flooding for hydroelectric power dams, pond creation or water retention basins.**

KEY MESSAGES

Peatlands represent a large share of Annex I habitat types in Europe, with a corresponding high number of LIFE projects targeting their restoration. Successive LIFE projects show massive gains, such as the restoration of 170,000 ha mires in the UK and over 40% of Belgian peatlands. Also in the UK, LIFE projects stopped the degradation of Sphagnum acid bogs. Despite long recovery times, LIFE restoration actions show quick responses in peatland biodiversity.

Status and trends

Natural peatlands (= mires) are considered amongst the most important ecosystems of the world because of their key value for biodiversity, regulation of climate, water filtration and supply, and important support for human welfare. Peat deposits in peatlands across the world store more carbon dioxide than all other vegetation types combined. In Europe alone, peatlands extend to about 515,000 km^2 and lock up about five times more carbon than forests. Almost one-third of the European peatlands can be found in Finland, and more than a quarter in Sweden. Although present in all EU Member States, the majority are to be found in northern Europe.

Mire biodiversity includes a range of rare, threatened, or declining habitats, plants and animals. Besides highly specialised vegetation and flora, animal assemblages on mires can also be relatively species rich, especially for invertebrate families that respond to small-scale structural variation in vegetation and topography. The Habitats Directive distinguishes 12 mire habitats in three groups: *Sphagnum* acid bogs, Calcareous fens, and Boreal mires. In addition, *Bog woodland* (91D0*), grouped under Forests, counts as a naturally forested peatland. In total, some 33,000 km^2 of these 13 habitat types are protected in more than 8,700 Natura 2000 sites. This area represents roughly 24% of all remaining natural peatlands.

Habitats of *Sphagnum* acid bogs and Boreal mires evolved and depend on surplus rainfall and developed mainly in the Boreal, Atlantic, (northern) Continental and Alpine regions. In contrast, Calcareous fens may occur in all regions. The size

of the mapped mire habitats within the Natura 2000 network varies considerably among Member States and habitat types. While *Aapa mires* (7310*) represent the largest complexes in northern Finland and Sweden – up to 48,000 ha of individual habitats – even the largest *Alpine pioneer mire formations* (7240*) or *Fennoscandian springfens* (7160) exceptionally exceed 100 or 200 ha, respectively.

In addition to the natural moor habitats, utilised mires also have important biodiversity value. They should be maintained as long as the hydrological conditions and the low intensity land use are not adversely modified. Several forms of traditional land use have little or no damaging effect on the nature values: hay and litter production on wet meadows and fens, grazing, small-scale peat harvesting, or berry picking. In several instances, low-intensity agricultural practices such as mowing or grazing even increased species richness locally and maintained species-rich peatlands in a particular successional stage (e.g. *Molinia meadows on calcareous, peaty or clayey-silt-laden soils* (6410), and *Alkaline fens* (7230), and thus preventing them from developing into other vegetation types.

However, despite the large-scale restoration of degraded peatland habitats carried out in the last decades, their overall conservation status remains unsatisfactory. Out of a total of 62 Article 17 assessments for 2013-2018, only seven (11%) currently show a good status. This mainly concerns peatlands in remote or inaccessible areas, not affected by human pressures, primarily in the Alpine, Boreal and Macaronesian (Azores) biogeographical regions. A further 24 assessments (39%) are in a poor and 31 (50%) in a bad status. Together with dunes and grasslands, bog, mire, and fen habitats have the highest proportion of deteriorating trends, over 50%.

Although the value of mires for biodiversity and other ecosystem services is undisputed, their degradation and habitat loss across Europe is still ongoing. The most damaging and destructive measures and actions in mires are:

- drainage and water extraction;
- afforestation;
- conversion to agricultural or horticultural land and fertilisation;
- peat extraction;
- construction of building and infrastructures;
- tourism and uncontrolled recreation demands;
- other use as waste disposal areas or flooding for hydroelectric power dams, pond creation or water retention basins.

Drainage resulting in mire desiccation is the key threat in all EU countries, whereby most mires were drained to facilitate agrarian use, afforestation or peat exploitation. The adverse effects include decreased groundwater level and desiccation, fires, complete habitat destruction or significant negative changes in vegetation structure and composition of flora and fauna, pollution, mineralisation, nutrient input and fragmentation.

Considering the increasing biodiversity loss and the effects of climate change observed in recent years, it is of great importance to safeguard mires with effective management and active restoration.

LIFE programme response

Since 1992, the LIFE programme has funded 363 LIFE projects to conserve and restore peatlands to some extent, targeting the 13 habitat types of raised bogs, mires, fens and bog woodland. 28% of these projects focus primarily on peatlands, while others include peatland restoration along with associated habitats as part of a larger landscape approach.

Commonly applied restoration actions focus on rewetting by blocking outflow in drainage ditches, installing bunds, removing dykes and fragmenting infrastructure, halting the pumping in polders, topsoil removal and removal of woodland to reduce competition of trees with peat forming vegetation.

Mire and peatland restoration projects also have proven to be cost-effective compared to other available carbon-reducing technologies. With the launch of the LIFE Climate action sub-programme in 2014 the first LIFE climate change mitigation projects (LIFE CCM) focusing on degraded peatlands were launched. These have the significant added value of re-establishing the multiple benefits arising from peat-forming ecosystems, including enhancement of biodiversity and habitat conditions. For instance, **LIFE Peat Restore** (LIFE15 CCM/DE/000138) aims for a reduction of CO_2 emissions by large scale restoration of degraded peatlands in northern European lowlands (Baltic states, Poland, Germany). In addition to significant carbon sequestration, the restoration of more than 5,270 ha of peatlands will also improve their conservation status in the medium term. With the launch of peatland and mire restoration projects in the LIFE Climate sub-programme, innovative restoration techniques, e.g. *Sphagnum* spreading on cut-over peat bogs, have been implemented also outside of the current Natura 2000

Habitat type showing improved status or trend	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Active raised bogs (7110)	UK	ATL	U2- to U2+ (genuine improvement in trend)	**Scottish raised bogs** (LIFE00 NAT/UK/007078), **Cumbrian BogsLIFE+** (LIFE13 NAT/UK/000443), **Marches Mosses BogLIFE** (LIFE15 NAT/UK/000786), **LIFE Welsh Raised Bogs** (LIFE16 NAT/UK/000646)
Blanket bogs (* if active bog) (7130)	UK	ATL	U2- to U2= (genuine improvement in trend)	**Border Mires** (LIFE98 NAT/UK/005432), **Blanket bog** (LIFE00 NAT/UK/007075), **Active blanket bog in Wales** (LIFE06 NAT/UK/000134), **MoorLIFE** (LIFE08 NAT/UK/000202), **Pennine PeatLIFE** (LIFE16 NAT/UK/000725)
Transition mires and quaking bogs (7140)	UK	ATL	U2- to U2= (genuine improvement in trend)	Refer to 7110 above
Depressions on peat substrates of the Rhynchosporion (7150)	UK	ATL	U2- to U2= (genuine im-provement in trend)	Refer to 7110 and 7130 above
Alkaline fens (7230)	BE	CON	U2- to U2+ (genuine improvement in trend)	**Lorraine belge** (LIFE99 NAT/B/006285), **Herbages** (LIFE11 NAT/BE/001060)

Table 16: Examples of genuine positive trends in peatland habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

network with a long-term objective to return the cut-over areas to functional peat accumulating ecosystems and enlarge the Natura 2000 network.

In the UK, thanks to its humid Atlantic climate, deep peat covers about 11% of the total area of the territory. A series of 24 projects focusing on the large-scale restoration of blanket bogs and raised bogs was carried out since 1992 and led to restoration and improvement of some 170,000 ha of degraded mires. This area represents c. 6.3% of the total peatland area and 17-22% of all peat-accumulating mires in the UK. The most noteworthy projects are: Blanket bog (LIFE00 NAT/UK/007075), that revitalised 16,600 ha of blanket bogs in North Scotland with a significant regional impact; MoorLIFE (LIFE08 NAT/UK/000202), that restored a total of 893 ha of badly damaged bog and has protected 2,500 ha of active blanket bog from becoming eroded; and MoorLIFE2020 (LIFE14 NAT/UK/000070) with 9,500 ha blanket bogs targeted for restoration. Thanks to a massive intervention of nature conservancy agencies and LIFE projects the progressive degradation of Sphagnum acid bogs is stopped in the UK, and is reflected in the improvement of the conservation trends. Active raised bogs (7110*) are still in a poor status but have turned from deteriorating to improving. Similarly, trends of Blanket bogs (7130) improved slightly from deteriorating to stable. It is expected that these peat bog habitats will further improve by the next Article 17 reporting period.

Between 2003 and 2019 a series of successful LIFE Nature mire restoration projects were carried out in south-eastern Belgium, in the Ardennes midlands: Saint Hubert (LIFE03 NAT/B/000019), PLTTAILLES (LIFE05 NAT/B/000089), Cx SCAILLE (LIFE05 NAT/B/000087), PLTHautes-Fagnes (LIFE06 NAT/B/000091), Lomme (LIFE08 NAT/B/000033), and Ardenne liégeoise (LIFE10 NAT/BE/000706). All six projects aimed to improve the hydrological regime of the landscape, restore various open habitats on peat soils (especially habitats with peat-accumulating vegetation), as well as reduce habitat fragmentation and improve the connectivity of similar habitats in the Ardennes plateau chain to enhance species migration. Through these concerted efforts more than 80% of peatlands in Wallonia and about 40% of all peatlands nationally were improved using best practice measures. As a result, an extensive area of more than 2,500 ha of peatlands with improved peat soil hydrology and completed restoration measures (mainly deforestation) was revitalised, corresponding approximately to the total area of *Degraded raised bogs still capable of natural regeneration* (7120) in Continental Belgium. The regeneration of bog habitats takes time. Depending on the hydro-ecological situation prior to restoration and the methods applied, it may take several decades[31] before

31 *Severe droughts like in 2018 and 2019 can significantly prolong the renaturation periods or, in the worst case, negate all efforts completely.*

the desired peat-forming vegetation is sustainably restored. However, it can be assumed that the large scope of the series of LIFE projects in the Ardennes plateau and the advanced development of pioneer mire vegetation will soon lead to the improvement of the conservation status of the targeted mire habitats, even on a national scale.

Denmark's Lille Vildmose – the largest active raised bog in North-western Europe – has been severely degraded by decades of peat-cutting and farming. Of its original 5,500 ha, only about 2,000 are in their natural state today. In a 10 year period, **Lille Vildmose** (LIFE10 NAT/DK/000102) carried out numerous large-scale restoration measures to improve the conservation status of the bog habitats. This includes restoring the bog's 130 ha Lake Birkes, raising the water level on 770 ha of peatland and cutting down 200 ha of woodland encroachment. Beyond **Lille Vildmose**, six more LIFE Nature projects have focused on raised bog restoration in Denmark. In fact, concrete restoration measures have taken place on 56% of all raised bog sites in the Danish Natura 2000 network.

The list of well-implemented projects with good results and a significant impact on peatland habitats is long, with some of the recent examples listed below:

- LIFEraisedbogs (LIFE14 NAT/DK/000012): c. 640 ha of improved raised bog area surrounded by 530 ha of buffer zones;
- LIFE Mires Estonia (LIFE14 NAT/EE/000126): improvement of *Active raised bog* (7110*) on >2,400 ha, *Bog woodland* (91D0*) on >560 ha, *Fennoscandian deciduous swamp woods* (9080*) on >150 ha) and *Western taïga* (9010*) on >270 ha;
- LIFE Jura peatlands (LIFE13 NAT/FR/000762): restoration of 60 bogs covering 625 ha;
- LIFE Irish Raised Bogs (LIFE14 NAT/IE/000032): more than 2,600 ha of raised bog habitat improved by restoration works;
- Peelvenen (LIFE11 NAT/NL/000777): improvement of raised bog habitats on c. 1,300 ha and improvement of the wetland hydrology and water quality on c. 2,400 ha;
- AlkFens_PL (LIFE11 NAT/PL/000423) and AlkFens_S_PLife (LIFE13 NAT/PL/000024): a combined restoration of c. 6,450 ha fen habitats;
- Hannoversche Moorgeest (LIFE11 NAT/DE/000344): purchase of 1,400 ha of privately owned land to improve peatland hydrology and enhance the conservation status on 1,500 ha.

At first glance, it might be surprising how little the conservation status of the monitored mire habitats has improved so far. However, it must be kept in mind that degraded mire ecosystems, especially raised bogs and blanket bogs, react very slowly to renaturation measures. Two factors play a key role here: firstly, the setting of a long-term optimum groundwater or peatland water level, and secondly, the setting of a corresponding nutrient status in the peat profile of the renatured sites. Even if both conditions are fulfilled, it can still take several decades or even centuries for the vegetation to respond enough to report the change from *Degraded raised bogs still capable of natural regeneration* (7120) to *Active raised bogs* (7110*). The more degraded, the longer the development of the target habitat takes.

The comparison of satellite images from 2002 and 2015 of the degraded raised bog Kendlmuehlfilze in Bavaria, Germany, revealed this slow restoration process. The raised bog, degraded by manual peat cutting and machinery peat excavation, was the focus of two successive LIFE projects: Südlicher Chiemgau (LIFE94 NAT/D/000432) and Chiemgau (LIFE97 NAT/D/004224). Massive rewetting measures using cascades of large peat dams were necessary to adjust the peatland water table to close-to-natural conditions again. After deep peat cutting up to mineral subsoil, strong artesian springs had changed the water chemistry in large parts of the restored area. Despite the irreversibly damaged morphology of the peatland, 20 years after the projects ended the vegetation structure and composition in large parts was successively developing towards close to natural raised bogs plant cover and providing suitable habitats for the typical bog fauna and flora today, which is a hopeful sign and clear indication that restoration efforts pay off in the end.

This slow succession on LIFE-restored project sites does not mean that there are no conservation benefits in the initial phases after restoration. In general, restored peatlands respond very quickly with a significant increase in biodiversity, often with rare and endangered species. As many of them occupy the habitats only temporarily during the successional development, their occurrence and abundance can vary considerably over time. At each stage of development, the well-restored peatlands are of remarkably high conservation value.

In general, bog restoration is usually conducted using well-proven best-practice techniques and methods that partially vary depending on the targeted hydrogenetic mire types. Future LIFE projects should therefore involve experi-

In the spotlight: LIFE and mire restoration in peatland-rich Lithuania

Like the creation of forests, the restoration of peatlands is usually an investment for future generations. Since they depend on precipitation and groundwater, entire sections of landscape or catchment areas must function hydrologically well. Often, several consecutive LIFE projects are needed to achieve the large-scale conservation effects. In Lithuania, first WETLIFE (LIFE07 NAT/LT/000530) stopped the peatland degradation in Amalvas and Žuvintas mires on over 1,150 ha. In LIFEAukstumala (LIFE12 NAT/LT/000965) extensive mire restoration continues in Aukštumala raised bog, where the rewetting and removal of vegetation led to the regeneration of 91 ha of degraded bog into active raised bog and the good conservation status of active raised bog was enlarged by 600 ha. WETLIFE 2 (LIFE13 NAT/LT/000084) achieved good conditions for the long-term regeneration of active raised bog and bog woodland over 700 ha.

The main objective of Tyruliai - Life (LIFE12 NAT/LT/001186) was to ensure the favourable conservation status of Bittern (*Botaurus stellaris*), Spotted crake (*Porzana porzana*) and migratory Common crane (*Grus grus*) in the Tyruliai bog. The goals were largely achieved by rewetting of more than 600 ha degraded bog habitats. Also the projects LIFEMagniDucatusAcrola (LIFE15 NAT/LT/001024) and NELEAP (LIFE05 NAT/LT/000094) have contributed to restoration of Lithuanian mires by habitat improvement for Aquatic warbler (*Acrocephalus paludicola*), European pond turtle (*Emys orbicularis*) and several amphibians.

The large-scale raised bog restoration in the country continues with **LIFE Peat Restore** (see above) on five sites totalling about 450 ha.

In spite of the extensive efforts the conservation status of Lithuanian peatlands has not yet improved. The status of *Active raised bogs* (7110*) and *Transition mires* (7140) was even lowered from poor to bad after improved knowledge. This is due not only to the slow response of the mire habitats to the restoration measures, but also due to vast areas of peatlands still in a poor or bad status after decades of degradation. Peatlands in Lithuania occupy about 640,000 ha, almost 10% of the land area. Only some 178,000 ha are in natural or near-natural condition, and out of these some 47,000 ha peatlands and bog forests are included in the Natura 2000 network. In other words, despite their large extent and intensified efforts, LIFE projects have targeted only about 5-7% of peatland habitats in the country.

enced peat experts in the preparation of project proposals, as insufficient knowledge of peatland restoration ecology and ecological restoration can lead to failure or insufficient results of the measures carried out. Often, the hydrology of the site and the real chances for its improvement are not properly taken into account, resulting in insufficient rewetting, which prevents the establishment or development of target habitats and species. Instead of desired open *Sphagnum*-rich habitats a massive woodland rejuvenation from seedbank or seed rain is the consequence. Networking to share best practice and avoid poor projects, such as through specialised networks like the International Mire Conservation Group, is therefore essential.

3.3.7 Forest habitats

Over a third (81) of the Annex I habitat types are forests, covering an area of half a million km². About a quarter of the EU-28 forest area is included in the Natura 2000 network. According to the latest data, approximately 14% of forests habitat assessments report a good status, while over half of the assessments are poor (54%) and close to a third are in a bad conservation status (31%). The only reported genuine conservation status improvement is for *Luzulo-Fagetum beech forest* (9110) in Austria, improving from bad to poor in both the Alpine and Continental biogeographical regions. The lack of more pronounced status improvements is partly due to the long recovery time that is typical for restoring healthy forest habitat types. Forest habitats have the highest share of improving trends (13%). Visible successes are mostly at the local scale.

Commercial forestry is the major pressure and threat to forest habitats. This is followed by the spreading of invasive alien and pest species, agriculture and infrastructural and urban development. An increasing significant threat to forests is climate change, with near-natural forest stands being more resilient to a changing climate than intensive afforestation.

Since 1992, 605 LIFE Nature projects with links to forest habitats have been implemented. Key success fac-

tors of the forest-focused projects include land purchase to allow strict protection and strict adoption of sustainable forest management.

KEY MESSAGES

Although forests account for the majority of the habitat types and areas covered by the Habitats Directive, and though almost half of all LIFE projects include forest habitats in their portfolio, a relatively small proportion of LIFE projects specifically target forests. Given the scale of forests and the long time needed to reach good status, LIFE impact is mostly at the local scale. Key successes are with rare habitats such as Macaronesian laurel forests (9360) or Western taïga (9010), both rescued through LIFE. LIFE often prevents further damage through the adoption of sustainable forest management or preventing afforestation, combating invasive alien species or planting saplings.

Forests represent a crucial habitat group in the Natura 2000 network. Over a third of the habitat types covered by the Habitats Directive are forests, making up 491,900 km^2 of area. Some 27% of the total forest area in the EU-28 is part of the Natura 2000 network. The overall high percentage of forests in the Natura 2000 network reflects not only the wide distribution of forests across Europe but also the outstanding importance of forest ecosystems for biodiversity. Without human influence most of Europe would be covered by forest. The important role of the Habitats Directive and Natura 2000 network is therefore also to maintain a healthy balance between the natural forest formations and the open habitats of a cultural landscape, such as heathlands, scrub or grasslands.

Annex I of the Habitats Directive lists 81 forest habitat types that occur across all biogeographical regions. The largest territory, some 60% of the total forest area, represents temperate forests and 25% are forest habitats in the Boreal and Mediterranean regions. The area of forests under the Natura 2000 network comes also with significant differences between Member States, ranging from 4% (41,000 ha in total) in Ireland to 68% (751,000 ha in total) in the Czech Republic.

Status and trends

The 2015 EU State of nature report (EEA, 2015) showed that only 15% of the forest habitat assessments were in good conservation status, while 54% were poor, 26% bad and 5% unknown. The 2020 EU State of nature report (EEA, 2020) concludes that approximately 14% of assessments were in a good status, while over half of the assessments are poor (54 %) and close to a third of the European forest assessments had a bad conservation status (31%).

This means that no real progress was made towards reaching visible improvement of the conservation status of forest habitats. Among the forest-rich biogeographical regions, the Atlantic region has, with 51%, the largest portion of forest habitats in a bad conservation status, followed by the Boreal (45%) and Continental (33%) region. The best development shows forest in the Alpine region with 34% of sites with good status and only 15% bad. With 13%, forest habitats exhibit, however, the highest proportion of improving trends among all assessments.

The only significant genuine conservation status improvement was reported for *Luzulo-Fagetum beech forest* (9110) in Austria and for *Macaronesian laurel forests* (*Laurus, Ocotea*) (9360) in the Azores (Portugal, see box). In Austria, the conservation status of beech forests changed from bad to poor in both the Alpine and Continental biogeographical regions. According to the national report the main reasons for this improvement include expansion of area by 6.5%, an improved tree species composition as well as an improved management of deadwood and forest structure.

The low level of the conservation status of forest habitats especially in the Continental, Atlantic and Boreal regions seems to be mostly related to forest management practices. Forested sites are in most cases not necessarily strictly protected or managed and often include other uses such as timber harvesting.

No wonder in this respect that unsustainable commercial forestry represents by far the major pressure and threat to forest habitats. It amounts to 50% of all pressures for mixed forests, broadleaved deciduous and coniferous forests. For broadleaved evergreen forests on the other hand, forestry accounts only for 20% of the pressures. The threat and pressure of forestry is followed by the spreading of invasive alien and problematic species, agriculture and infrastructural and urban sprawl. An increasing significant threat to forests in recent years is climate change, especially droughts and heatwaves, even though near natural forest stands are much more resilient to a changing climate than intensive afforestation.

While the above threats and pressures on forest habitat types vary significantly among the biogeographical

Habitat type showing improved status or trend	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Fennoscandian wooded pastures (9070)	SE	ALP, BOR	U2- to U2= (genuine improvement in trend)	**SEPA: Forests in N-Götaland** (LIFE98 NAT/S/005370), **Här-jedalen** (LIFE03 NAT/S/000070), **ROSORIS** (LIFE05 NAT/S/000108), **GRACE** (LIFE09 NAT/SE/000345), **LIFE Coast Benefit** (LIFE12 NAT/SE/000131), **Bush LIFE** (LIFE13 NAT/SE/000105), **LIFE BTG** (LIFE15 NAT/SE/000772)
Fennoscandian wooded pastures (9070)	SE	CON	U2- to U2+ (genuine improvement in trend)	
Luzulo-Fagetum beech forests (9110)	AT	ALP, CON	U2= to U1+ (genuine improvement in status and trend)	**Donauwaelder** (LIFE04 NAT/AT/000003), **LIFE Ausseer-land** (LIFE12 NAT/AT/000321)
Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae or Ilici-Fagenion*) (9120)	BE	CON	U1= to U1+ (genuine improvement in trend)	**Life Averbode** (LIFE06 NAT/B/000081), **Life – OZON** (LIFE12 NAT/BE/000166)
Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) (9120)	DE AT	ATL CON	U1= to U1+ (genuine improvement in trend)	DE: No LIFE projects identified. AT: **WACHAU** (LIFE03 NAT/A/000009), **Donauwaelder** (LIFE04 NAT/AT/000003),
Tilio-Acerion forests of slopes, screes and ravines (9180)	UK	ATL	U2- to U2= (genuine improvement in trend)	**Core forest sites** (LIFE00 NAT/UK/007074), **Core ravine woodlands** (LIFE03 NAT/UK/000044)
Macaronesian laurel forests (*Laurus, Ocotea*) (9360)	PT	MAC	U1 to FV (genuine improvement in status)	**PRIOLO** (LIFE03 NAT/P/000013), **LIFE Laurissilva sustentável** (LIFE07 NAT/P/000630), **LIFE Terras do Priolo** (LIFE12 NAT/PT/000527),
Caledonian forest (91C0)	UK	ATL	U2- to U2= (genuine improvement in trend)	**Capercaillie** (LIFE02 NAT/UK/008541)
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0*)	DE	CON	U2= to U2+ (genuine improvement in trend)	Some 20 LIFE projects
Endemic forests with *Juniperus* spp. (9560)	CY	MED	FV to FV+ (genu-ine improvement in trend)	**JUNIPERCY** (LIFE10 NAT/CY/000717)

Table 17: Examples of genuine positive trends in forest habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

regions, they often are a combination of the following non-exhaustive list of drivers: forest fires, windstorms, water or air pollution, drought, invasive alien species, pests and diseases, habitat fragmentation or other land use developments. In many cases unsustainable or inappropriate management causes lack of structural and species diversity.

LIFE programme response

According to the LIFE database, since 1992, 605 LIFE Nature projects include forest restoration to a lesser or greater degree. Out of these, 97 projects focus specifically on forest conservation and restoration. This is a quite low project number considering the size, extent and importance of the habitat group.

Forests of temperate Europe

A relatively small number of projects deal with the most extensive zone with forest types on mineral soils in the temperate region (Table 18).

Habitat type	No of LIFE projects*	Total area (ha)
Luzulo-Fagetum beech forests (9110)	9	319,408
Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) (9120)	2	177,217
Asperulo-Fagetum beech forests (9130)	11	652,421
Medio-European limestone beech forests of the *Cephalanthero-Fagion* (9150)	4	148,850
Galio-Carpinetum oak-hornbeam forests (9170)	4	203,854

** Number of projects that deal exclusively or primarily with the respective habitat type*

Table 18: Number of LIFE projects and area coverage of forests of temperate Europe

One possible reason for this may be the difficulty of achieving conservation objectives in areas which are also of major economic interest for intensive forestry. It is therefore important that LIFE projects focus on sustainable forest management (SFM) in the Natura 2000 network. This includes the need for the ecological aspects of SFM to embrace management approaches that promote more uneven-aged forests (EEA, 2019a). SFM has thus been tested for a number of habitat types and several projects exist, which aim to develop best practices of sustainable management or reintroduce traditional extensive forms of forest management, for example coppicing.

LIFE Ausseerland (LIFE12 NAT/AT/000321) worked specifically on the introduction of close-to-nature forest management practices – such as improving structural diversity, significantly increasing dead wood (> 10m³/ha on 2,600 ha) or improving ecological diversity in forest corridors – on a wide variety of forest habitat types. Populations of Capercaillie (*Tetrao urogallus*) and Black grouse (*Tetrao tetrix*) benefit from the ecological transformation of more than 300 ha of forest and of 50 ha of sub-alpine shrub vegetation.

The project Steigerwaldrand Iphofen (LIFE09 NAT/DE/000005) contributed to the enhancement of the conservation status of 63 ha of (partly coppiced) woodland consisting of *Galio-Carpinetum oak-hornbeam forests* (9170) and other semi-natural woodlands by reintroducing of hornbeam coppicing, substantially increasing of forest structure including creation of open patches, and increasing the amount of old and dead wood. Significant conservation effects were achieved by the development of some 14 ha of ecotone areas between forests and open countryside containing hedgerows, wood edges, dry stone walls and orchards. Similarly, the project LIFE FutureForCoppiceS (LIFE14 ENV/IT/000514) demonstrated the sustainability of different management approaches of coppice forests in southern Europe through on-site trail testing. The application of sustainable forest management indicators developed by the project revealed that the coexistence of three different management options – traditional coppicing, natural evolution, active conversion to high forest – is the best way to ensure the sustainability of the natural areas.

Many LIFE projects work on the conversion of stands with non-native tree species towards forests with natural structure and species composition. Eichenwälder bei Wesel (LIFE10 NAT/DE/000009) worked on acidophilous oak woods with bogs and heaths. It created 85 ha of habitat type *Old acidophilous oak woods with Quercus robur on sandy plains* (9190) through underplanting or planting on clearings. LIFE Forests-waterworlds (LIFE13 NAT/DE/000147) established conditions for ecological improvement of 34 ha of *Luzulo-Fagetum beech forests* (9110), 8 ha of *Asperulo-Fagetum beech forests* (9130) and 96 ha of *Galio-Carpinetum oak-hornbeam forests* (9170). This was possible through large-scale optimising of the site's hydrology on more than 530 ha, enabling natural forest succession on some 10 ha, establishing coppice management on 37 ha and improving their connectivity. Also, old growth and deadwood trees (process protection) were secured on 990 ha.

Given the limited number of projects in relation to the large area of most temperate forest areas in the Natura 2000 network, and also given the long time needed for the visible transformation of degraded forest stands into biologically diverse systems under good ecological conditions, it is understandable that the direct impact of LIFE on the changes in their conservation status is not yet visible. Nevertheless, the overall good results of numerous projects have substantial local and regional impact and noteworthy demonstration and public-awareness value.

In the spotlight: Increase of Macaronesian laurel forests

In the east of São Miguel Island (Azores) the survival of the rare endemic Azores bullfinch (*Pyrrhula murina*) depends on the existence and quality of the remnants of the *Macaronesian laurel forest* (9360*). The seeds, flower buds and fleshy fruit of the once-thriving laurel forests provide food for the critically endangered bird, of which just 100 remaining pairs lived in 2003. However, the laurel forest was losing the battle against invading alien plant species which were brought to the archipelago long ago by its colonisers. The shortage of food seems to be the main reason for the gradual reduction of the bird's habitat and population.

Three consecutive LIFE Projects have taken on the main task of saving the forest and the bird for future generations – and it seems that they succeeded.

The first, PRIOLO (LIFE03 NAT/P/000013), succeeded in generating a high level of attention and mobilisation of local and regional stakeholders towards the need of rescue actions on the endangered *P. murina*. The SPA of Pico da Vara/Ribeira do Guilherme was enlarged by almost three times, covering the whole species range. The management plan for the SPA and its vegetation was prepared, as well as guidelines for combating invasive alien species and relevant legislation documents. Exotic *Cryptomeria* and *Hedychium* stands were removed from more than 200 ha, replaced by more than 65,000 saplings of native plants cultivated in local nurseries. At the end of the project, about 775 birds were counted – almost three times higher than in 2005.

Encouraged by the first promising results, LAURISSILVA SUSTENTAVEL (LIFE07 NAT/P/000630) continued the conservation management of native habitats and control of invasive alien species. A special nursery dedicated to the production of native plants for conservation purposes was established and the alien species control programme was carried out by a new qualified team. The above-named SPA was designated as a new SPA site for the laurel forest conservation, covering an area of 2,010 ha. Besides the 9360* habitat, *Endemic forests with Juniperus spp* (9560*), *Endemic Macaronesian heaths* (4050*) and peatland habitats were addressed by numerous conservation and restoration measures. Altogether conditions of degraded natural forest habitats on 52 ha and 81 ha peatland habitats were improved, among others by planting 86,000 cultivated native plants.

The last in the series, Life Terras do Priolo (LIFE12 NAT/PT/000527) continued with capacity building and reinforcing the knowledge on the target area ecosystem. It restored a further 26 ha of 9360* habitat and created a protection ring totalling 56 ha against the entry of new invasive flora in the areas recovered. A total of 277,000 plants of more than 25 native species (half of which cultivated in the project plant nursery) were planted in the intervention areas.

Taken together, these projects are a great success story, demonstrating that a long-lasting and concerted effort leads to expected goals. The conservation status of Macaronesian laurel forests improved from poor in 2012 to a stable good level in 2018. Along with habitat improvement, the Azores bullfinch population* size stabilised between 627 and 1,996 specimens and increased its distribution range to 160 km^2.

* http://datazone.birdlife.org/species/factsheet/22720676

Forests of Boreal Europe

With about 950 km^2, *Western taïga* (9010*) is the largest priority habitat that exists in the Boreal region. Characterised by a complex composition of both young and old trees of deciduous and coniferous species, these western taïga virgin forests are extremely rich in biological terms, providing habitats for many threatened species of animals and plants. Dead wood plays a central role in maintaining this high conservation value. Much of this richness is because the forests have had little or no disturbance over hundreds of years, other than naturally occurring fires. However, today much of the original natural forest has been replaced with monocultures. It is estimated that only some 3-5% remains of the original western taïga.

In the beginning of the LIFE programme, during 1995-1999, a targeted series of 12 LIFE Nature projects with the primary objective to protect natural forest and mire habitats was launched in Sweden, with land purchase and legal protection as the main project actions.

Western Taiga (LIFE96 NAT/S/0031820) targeted the legal protection of four of the most important Natura 2000 sites in south-central Sweden through land purchase and economic compensation to landowners for restrictions on forestry activities. Altogether, more than 5,600 ha were acquired and left to passive management. At the time the project was selected, protection of western taïga became prioritised with reference to the rapid loss of natural forest habitats. In a series

of follow-up projects (SEPA: W-taiga/Bergslagen - LIFE98 NAT/S/005366; SEPA: Norrland - LIFE98 NAT/S/005367; SEPA: WT Svea+Götaland - LIFE98 NAT/S/005369; Protection of Western Taiga - LIFE97 NAT/S/004200). Thanks to these concerted efforts, almost 10,000 ha of western taïga could be secured for the future, representing 10% of its entire coverage.

More than 10 years later, LifeTaiga (LIFE13 NAT/SE/000065) addressed controlled burning as a management method that can support the conservation of many sites of habitat 9010* and, to some extent, *Coniferous forests on, or connected to, glaciofluvial eskers* (9060). The reduction in the frequency of fires is one of the major ecological changes that have taken place in woodlands since the 1800s. Since some 40 specialised insects and some 50 fungi species are dependent on burned wood and burned ground for their survival, the project developed suitable methods for controlled burning, and trained authorities, companies, organisations and contractors. Altogether, 120 controlled burning events were carried out on a total area of 2,060 ha in 89 different Natura 2000 sites that contributed to the improvement of the conservation status of western taïga in Sweden.

Similarly, in Finland, a series of four projects targeting habitat 9010* kicked off in 1999: Pohjois-Savo (LIFE99 NAT/FIN/006247) was successful in improving the conditions of western taïga and herb-rich forests by removing spruce on 220 ha, leaving rotting trees in the forest on 140 ha and burning woodland on a small scale in order to restore former burnt-over areas. Altogether, 273 ha western taïga was acquired. Taiga/Central Finland (LIFE99 NAT/FIN/006251) applied a different approach to the conservation of western taïga habitats. Instead of declaring a site protected under the national Nature Conservation Act, as was usual practice in Finland, Natura 2000 aims were achieved through voluntary arrangements under the Forest Act. In total the project succeeded in making forest management plans for 446 ha, more than foreseen. The project Ylläs-Aakenus (LIFE99 NAT/FIN/006267) focused on improving conservation of western taïga in the Natura 2000 site Ylläs-Aakenus covering more than 37,000 ha located in Lapland north of the Arctic Circle. To protect sustainably the sensitive and vulnerable habitats against damage by visitors, a management plan was drawn up to channel recreational use (mountain biking, horse riding, dog sledding, snowmobiling) which is a significant issue in the project area (some 200,000 visitors per year). In order to wisely combine protection with other forms of land use in the natural boreal forests, Syöte area (LIFE99 NAT/FIN/006268) drew up a management and land use plan of the project area characterised by western taïga, aapa mires and scattered remnants of herb-rich forest and endangered alkaline fen. The plan provided a basis for practical action and guidelines for various types of land use, ensuring the preservation of biodiversity. For example, the living conditions of species thriving in burnt-over areas (such as the *Stephanopachys linearis beetle*) were to be improved by means of controlled forest fires.

A series of LIFE projects in Sweden focused on habitat type *Fennoscandian wooded pastures* (9070). Comparing the conservation status in 2012 and 2018 shows a genuinely improving trend from U2- to U2+ in the Continental biogeographical region and from U2- to U2= in Boreal and Alpine regions. GRACE (LIFE09 NAT/SE/000345), for example, restored 214 ha of habitat 9070 by selective clearance of trees and bushes, controlled burning and establishment of grazing. In addition to habitat 9070, more than 300 ha of open habitats – grasslands, heath and scrubland – were restored. With measures aiming at improving forest structures, enabling disturbance regimes and eliminating invasive species, LIFE Coast Benefit (LIFE12 NAT/SE/000131) improved ecological conditions on about 740 ha of habitat 9070 in both the Boreal and Continental regions. Similar to the projects already named, also BushLIFE (LIFE13 NAT/SE/000105) contains a series of best-practice restoration actions benefiting 263 ha of habitat 9070 – selective clearing of tree and scrub encroachment, prescribed burning and planting of target tree species. The habitat structures are improved by leaving trees to grow to veteran state and allowing for the creation of large stumps. Last but not least, LIFE BTG (LIFE15 NAT/SE/000772) aims to restore 907 ha of habitat 9070, both in the Boreal and Continental biogeographical regions, by using the same restoration measures as aforementioned.

Forests of Mediterranean Europe

LIFE successes in forest habitats with restricted distribution are especially evident in southern Europe.

JUNIPERCY (LIFE10 NAT/CY/000717) in Cyprus provides an excellent example of a direct impact of project activities on the conservation status of a particular forest habitat type. The project especially targeted *Endemic forests with Juniperus spp.* (9560*) which saw a threefold increase compared to previous estimates (from 96 ha to 263 ha). The improvement of the habitat condition was achieved especially through recreating habitat 9560* from farmland by replanting with saplings of four targeted *Juniperus* spp. (*J. oxycedrus* and *J. foetidissima* at Troodos; *J. excelsa* at Madari; and *J. phoenicea* at Akama), protecting (e.g. micro-fencing) and irrigating the saplings, erecting barrier fencing to restrict vehicle access and protect against uncontrolled grazing (e.g. goats),

clearing competitive vegetation and removing dried biomass, constructing fire-breaks to prevent the spread of forest fires and posting fire protection signage. The project reduced the impact of outdoor sports, leisure and recreational activities. Moreover, it halted the afforestation of natural and semi-natural habitats targeted by the Habitats Directive. With its series of actions the project contributed to a positive genuine trend in the good status of this habitat in Cyprus.

In Eastern Crete, Vai (LIFE98 NAT/GR/005264) addressed the rare habitat *Palm groves* (9370*). In **Vai** the palm forest composed by *Phoenix theophrastii* used to occupy almost 300 ha, but in 1957 was reduced to an area of only 15 ha due to extensive land reclamation. The project achieved the improvement of the structure and vigour of the existing forest by limiting existing negative factors and expanded the distribution of the palm trees by planting young trees and fencing on another 26 ha. To assure the sustainability of measures taken, tourist activities were regulated, and competent authorities and local stakeholders were involved in conservation actions.

The distribution of *Tetraclinis articulata forests* (9570*) on mainland continental Europe is restricted to a population in the Region of Murcia, Spain. The population was estimated to consist of only 8,400 individual trees, spread over 557 ha in four sub-populations. Nearly all (96%) of its distribution area was included in Natura 2000 sites. LIFE-TETRACLINIS-EUROPA (LIFE13 NAT/ES/000436) was launched in order to improve the conservation status and long-term sustainability of the priority habitat, and the area of the forest type was enlarged. Almost 50 ha were reforested with 25,420 tree saplings and selective clearing of the competitor species *Pinus halepensis* and other invasive species was carried out on 62 ha: this action combats the genetic erosion of the tree populations and reduces future threats.

In the spotlight: LIFE, forest propagation material and gene banks

Bulgarian priority forests are under pressure. In western Bulgaria, two types of priority forest habitats, *Pannonian woods with Quercus pubescens* (91H0*) and *Alluvial forests* (91E0*), are facing similar threats. In recent decades, vast tracts of these natural forests were cut down and replaced with commercial monocultures of non-native tree species. Biodiversity aspects were neglected or underestimated. In south-west Bulgaria priority forests have been damaged by fires, pest or disease outbreaks and their natural regeneration is affected by disruptive human activities, spread of invasive species and lack of natural reproductive material.

Conservation and restoration actions for habitats 91H0* and 91E0* were implemented in two designated Natura 2000 network sites, Plana and Dragoman, situated in low mountainous areas of western Bulgaria. BGNATURAGENEFUND (LIFE10 NAT/BG/000146) contributed to the improvement of their conservation status by stimulating natural regeneration patterns. First, genetic material of a broad variety of forest species typically found in the target Natura 2000 sites from different regions was collected, and saplings were grown in nurseries. After consultation with all relevant stakeholders the project reforested some 40 ha in the two sites. The growth and development of this newly planted forest enhanced habitat connectivity and contributed to the future improvement in the conservation status of the target habitats. The restoration works also brought indirect benefits to a number of other interconnected priority forest habitats. The results clearly demonstrated to the Bulgarian forestry sector that reforestation and restoration of forest habitats are possible and financially viable and can deliver long-term environmental, economic and social benefits. The project also established a gene bank for the storage of reproductive material collected for 26 species as well as a nursery for seedlings. A clear, direct and positive socio-economic impact was achieved by hiring a number of seasonal workers for the restoration work and activities relating to seed collection and seedling production.

The subsequent LIFEFORHAB (LIFE16 NAT/BG/000817) builds on the experience and knowledge gained from **BGNATURAGENEFUND**. It aims to restore seven forest habitats in six Natura 2000 sites. To improve the forest conditions and their conservation status **LIFEFORHAB** continues extensive work on the gene pool of priority forest species and habitats. It identifies sources of propagating material from forest Natura 2000 areas throughout Bulgaria and establishes a high capacity operational production line for containerised seedlings. By the end of the project in 2021, more than 7 tonnes of seeds will be collected and processed from 50 forest species representative of 14 priority habitats, more than 860,000 containerised seedlings from priority forest species produced, and more than 104 ha of seven priority forest habitats restored in six target Natura 2000 sites. In Bulgaria, LIFE tackles the challenges related to the large-scale restoration of degraded forests with efficient propagation of plant material and massive conservation interventions. The positive response of the target habitats should be visible soon.

Azonal forests

More projects in larger areas were carried out in azonal or extra-zonal forests in naturally wet or regularly flooded areas (e.g. 91D0*, 91E0*) or on steep or rocky slopes (e.g. 9180*) where commercial forestry is less efficient.

The ambitious **LIFE ALNUS** (LIFE16 NAT/ES/000768) aims at a better understanding of conservation issues at the regional level, as well as improvement in management planning and habitat conservation in 24 SACs and 950 linear km of river areas – 485 km within Natura 2000 sites and 465 km along interconnecting water courses in three river basins in Catalonia. A visible improvement of the conservation status should be achieved in the mid-term through the improvement of the legal and physical protection of alluvial forests on more than 2,200 ha, through improvements at existing sites (some 130 ha), a proposed new Natura 2000 site (980 ha), and additional protection by supplementary legal action (about 1,100 ha). Far-eaching direct conservation actions on the target alluvial forest habitat are being implemented on 480 ha, including forestry measures and regulation of river use (280 ha), the creation of more than 300 small core habitat areas from which plants can expand to recover restored habitat areas, and the development of four demonstration sites (total 162 ha) to test possible solutions to the most complex problems threatening this habitat type.

Also, **Core forest sites** (LIFE00 NAT/UK/007074) restored alluvial forests and *Tilio-Acerion forests* (9180*) in a network of 12 sites in Scotland, providing restorative habitat management and removing threats for three priority woodland habitats at 11 SCIs. The project outcomes covered over 4,000 ha, which is a substantial area of woodland habitat in Scotland. Native trees were established over 16.5 ha at three SCIs. Special attention was given to the eradication of invasive species – *Rhododendron ponticum* was eradicated over 377 ha in eight SCIs and controlled over 72.8 ha adjacent to four SCIs. Exotic broadleaves were removed over 577 ha in eight SCIs and 10.6 ha removed adjacent to one SCI. Monitoring indicates that LIFE support resulted in the required improvements to the conservation status of the target habitats in this area, which are now classified as either in good or poor but improving conditions.

The devastating wildfires that burst out in summer 2007 throughout Greece, but mainly in the Peloponnese, destroyed nearly all the areas where the *(Sub-) Mediterranean pine forests with endemic black pines* (9530*) is found on the south of Mount Parnonas (426.5 ha in total). The ambitious project **PINUS** (LIFE07 NAT/GR/000286) succeeded in restoring 290 ha of Black pine forest in the burnt area of Mount Parnonas, by applying and demonstrating the validity of a structured approach for the restoration of such forests, applicable throughout southern Europe. The pioneering structured approach devised by the project followed specific steps: preparatory actions, mainly fire impact assessment on the target habitat type; drafting of the forest restoration steps; carrying out of technical studies; design of the monitoring system; and establishment of monitoring plots. In the long term, the restoration of the burnt forest on Parnon will restore also its economic value as a source of selective conservation logging. The local community will also benefit from the return of apiculture and the area's improved recreational value.

3.3.8 Heath and scrub

In the past, extensive heathland has characterised the landscape of large parts of Europe. Traditionally managed by grazing and burning, heathland was once widespread, especially on sandy soils of northern Europe (e.g. Belgium, Netherlands, Germany, and the UK). However, agricultural intensification during the 20th century caused a rapid loss and fragmentation of heathland mainly through ploughing, fertilisation and urban development. Remaining heathland is vulnerable to scrub encroachment and reforestation due to abandoned traditional management practices.

From the habitat types in Annex I of the Habitats Directive, 12 habitats are listed in 'Temperate heath and scrub' and 13 habitats in 'Sclerophyllous scrub (Matorral)'. Heaths and scrub cover some 88,300 km², while sclerophyllous scrub occupies 35,100 km² representing 5.3% and 2.1% of the total Natura 2000 area within the EU-28, respectively[32].

Heathlands today are often found in unfavourable natural conditions and conservation status.

The aforementioned negative impacts from intensive agriculture, together with adverse natural processes (abandonment of traditional management such as extensive grazing or burning) and forestry, still represent the highest pressures and threats to these habitats. The recognition of heathland and scrubland for its biodiver-

32 https://forum.eionet.europa.eu/nrc-biodiversity/library/consultations/consultation-state-nature-eu-2020

sity and its aesthetic and cultural values was ignored or underestimated for a long time.. Only recently has their appreciation increased. In recent years, significant effort has been devoted to rehabilitation of degraded heaths and scrubland, and LIFE plays a substantial role in this.

KEY MESSAGES

Despite high biodiversity values and great pressures on heaths and scrub, very few LIFE projects targets these habitats. Only a small number of improvements are reported at Member State and EU level. LIFE successes are at the local scale, with sometimes impressive restoration results.

Status and trends

Temperate heathlands and scrubs

According to EEA data of 2008, 50-100% of heathlands were in bad or poor condition in all biogeographical regions except for the Mediterrean. The worst situation was reported in the Pannonian region, though based on three assessments only.

Ten years later, the overall conservation situation is slightly improving. Currently, heathlands in the best conditions are reported in the Macaronesian region (75% good, four assessments), followed by the Alpine region (62.5% good). Even though most degraded heath habitats are reported bad (24%) in the Atlantic region and only 10% good, the current development represents a substantial positive change comparing with 43% bad status in 2008. The assessment of the Pannonian region improved substantially with EU enlargement to 28 Member States.

The 2018 report on Article 17 contains some notifications on the improvement of the conservation status between 2012 and 2018. Except for two cases in Latvia and the UK for the *Northern Atlantic wet heaths with Erica tetralix* (4010) and *Dry Atlantic coastal heaths with Erica vagans* (4040*), for which this positive change is genuine, other changes are due to improved knowledge on habitat conditions or the change of the monitoring method. However, despite the unchanged conservation status, there are more cases of positive genuine trends of two other habitat types in the UK and the Czech Republic (Table 19).

Land use change, and especially the conversion or natural succession into forests, represents the major cause of the loss of heaths and scrubland in Europe. Heaths and scrublands are also severely affected by agriculture. Intensive agriculture together with adverse natural processes after giving up traditional management represents the highest pressure and threat to the habitats. However, as far as full conversion is concerned, the areas of scrubland habitats are more impacted by the continuing afforestation trend in the EU and more heathlands have been converted to forest than to open land.

Due to severe pressure, in contrast to the few positive changes and trends described above, an alarming larger number of genuine negative status changes has been reported. Out of 21 negative assessments, five are genuine deteriorations, with one in Poland (*Sub-Arctic Salix spp. scrub* - 4080 in the Continental region) dropping from good in 2012 to bad in 2018.

This makes it all the more important to highlight the success of numerous LIFE projects which demonstrate the opportunities and possibilities for improvement of degraded or damaged heaths at the local level within a short time.

Table 19: Examples of genuine positive trends in heath and scrub habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

Habitat type showing improved status or trend	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Northern Atlantic wet heaths with *Erica tetralix* (4010)	LV	BOR	U2 to U1 (genuine improvement in status)	**ADAZI** (LIFE06 NAT/LV/000110)
European dry heaths (4030)	UK	ATL	U2= to U2+ (genuine improvement in trend)	**Protection and management of lowland heathland in Dorset** (LIFE92 NAT/UK/013300); **Dorset heaths** (LIFE00 NAT/UK/007079), **Cornwall Moors** (LIFE03 NAT/UK/000042),
European dry heaths (4030)	CZ	PAN	U1- to U1= (genuine improvement in trend)	**Military LIFE for Nature** (LIFE15 NAT/CZ/001028)

Active management of numerous habitats is considered necessary for the conservation of Natura 2000 sites. The EU elaborates successively documents for selected habitats that contain detailed descriptions of practical management techniques. Experience and lessons learned gained from the implementation of the numerous LIFE projects have substantially contributed to the preparation of these publications. So far, two of these management guidelines have been prepared for heathland habitats:

- MANAGEMENT of Natura 2000 habitats - Northern Atlantic wet heaths with *Erica tetralix* 4010;
- MANAGEMENT of Natura 2000 habitats - Alpine and Boreal heaths 4060

In addition, the publication 'MANAGEMENT of Natura 2000 habitats* Macaronesian laurel forests (*Laurus, Ocotea*) 9360' also includes management recommendations for closely associated Endemic Macaronesian heaths (4050*).

Sclerophyllous scrub – Matorral

This habitat group seems to be a forgotten Cinderella from the Habitats Directive. Although consisting of a few widely distributed natural and seminatural scrublands with a remarkably high importance for European biodiversity such as *Stable xerothermophilous formations with Buxus sempervirens on rock slopes* (5110) covering more than 2,000 km^2 in the Natura 2000 network, *Arborescent matorral with Juniperus spp.* (5210) with some 3,000 km^2 or *Thermo-Mediterranean and pre-desert scrub* (5330) covering more than 6,000 km^2 of the network in eight Member States, it seems that disproportionally less attention and targeted conservation efforts have been paid to this group.

Like temperate heathland, the majority of the sclerophyllous scrub habitats developed thanks to extensive human activities in the past, such as goat or sheep grazing or burning and woodland cutting. Often, they represent successional stages from open habitats to woodlands, and their structural and species richness can be preserved only with proper management.

The 2020 EU State of nature report names only a single habitat, namely *West Mediterranean clifftop phryganas* (5410) with a small restricted distribution in five Mediterranean countries, which experienced a genuine improvement of its conservation status in France from bad to poor. However, the same habitat significantly deteriorated after 2012 in Portugal from good to bad. A similar picture can be drawn for the second habitat for which at least the positive trend has been reported, *Juniperus communis formations on heaths or calcareous grasslands* (5130), with indication of a positive trend in Belgium but with a declining status in Poland. For the *Arborescent matorral with Laurus nobilis* (5230*) an assessment of a positive trend is reported from the UK (genuine) and Malta (improved knowledge) but improved knowledge led to a decrease in conservation status from poor to bad in both biogeographical regions in Portugal.

LIFE programme response

Temperate heathlands and scrubs

According to the LIFE database, almost 200 LIFE-Nature projects were carried out between 1992 and 2018, targeting at least to some extent heath habitats. However, only about 15 projects focused exclusively or mainly on heathland and scrubland habitats, while about 10 other projects targeted this habitat group to a greater extent.

From the group of the 25 key projects, half worked on the restoration of the heathland complex of *Northern Atlantic wet heaths with Erica tetralix* (4010) and *European dry heaths* (4030) as for example **Cornwall Moors** (LIFE03 NAT/UK/000042), **"Healthy Heath"** (LIFE08 NAT/NL/000192), **RAHID** (LIFE09 NAT/DK/00037) or **LIFE Avaloirs** (LIFE17 NAT/FR/000007). "**Healthy Heath**" succeeded in restoring two agricultural enclaves and conducted heath habitat restoration over a total area of 285 ha, which led to a defragmentation and enlargement of a vast area of wet and dry heathland in the Dwingelderveld Natura 2000 site in the Netherlands. The improvement of hydrological conditions and a large-scale soil removal

Table 20: Example of genuine positive trend in sclerophyllous scrub habitats reported in the 2013-2018 MS reports for which contributing LIFE projects were identified

Habitat type showing improved status or trend	Member State	Biogeographical region	Conservation status change 2012 to 2018	LIFE projects that may have contributed to these improvements
Juniperus communis formations on heaths or calcareous grasslands (5130)	BE	CON	U2x to U2+ (genuine improvement in trend)	**Lesse Lomme** (LIFE00 NAT/B/007168), **Haute Meuse** (LIFE02 NAT/B/008593), **Ardenne Liégeoise** (LIFE10 NAT/BE/000706)

were applied as main measures that led to the restoration of the formerly intensively used land. In contrast, **Cornwall Moors** was developed as a species-protection project, primarily carried out to improve the Marsh fritillary butterfly (*Euphydryas aurinia*) population. To do so, some 25 ha heathland was burned annually. **LIFE Avaloirs** targets a complex of heathland, bogs and hay meadows. Some 120 ha of heathland will be restored by clearing woody vegetation over the whole area, as well as by mowing and fern control. Local populations of Hen harrier (*Circus cyaneus*) and European nightjar (*Caprimulgus europaeus*) will benefit from these large-scale restoration efforts. The Danish project **RAHID** improved conditions of six interlinked habitats, mainly Northern Atlantic wet heaths and inland dunes on a total area over 2,600 ha. Heathland was repeatedly managed by controlled burning on more than 1,000 ha, and Calluna harvesting took place on more than 390 ha. An important delivery from the project is the publication 'Management of Heaths and Inland Dunes in Denmark – a Manual of Methods', which gives a survey on the background of nature conservation actions in Danish heathlands, summarises the knowledge of the effects of modern methods and opens the door for ideas on how to further develop methods in the future.

A further six projects addressed *European dry heaths* (4030) either specifically, such as **HIGRO – HIGRO** (LIFE09 NAT/PT/000043) or within the scope of a complex restoration together with dry grasslands, *Juniperus* formations or inland dunes **(Lynx/Malcata** - LIFE99 NAT/P/006423, **Habio-Calvana** - LIFE00 NAT/IT/007170, **Zahorie Sands** - LIFE06 NAT/SK/000115, **Military LIFE for Nature** - LIFE15 NAT/CZ/001028 or **LIFE Drylands** - LIFE18 NAT/IT/000803).

Three projects contributed significantly to the conservation of *Alpine and boreal heaths* (4060) (**Alpe Veglia** - LIFE02 NAT/IT/008574, **Arno** - LIFE98 NAT/IT/005075 and **Vipère d'Orsini** - LIFE06 NAT/F/000143). The Romanian project **NORTHWESTGORJ** (LIFE11 NAT/RO/000825) dealt especially with conservation management of the mountain scrubland habitat Bushes with *Pinus mugo* and *Rhododendron hirsutum* (4070*).

LIFE conservation measures are often planned and implemented on heaths in combination with other habitats with which they occur in a natural or semi-natural mosaic. This regards especially the combination of peat bogs and heaths on moist and wet sites, and grassland and heaths on dry locations.

Until now the spatial extent of the LIFE interventions in relation to the total size of the mapped heathland habitats at Member State level has been rather limited. Therefore, despite the high number, these projects did not have a significant genuine impact on the improvement of the conservation status according the Article 17 report for the period 2013-2018[33].

Sclerophyllous scrub

The LIFE database lists 132 LIFE Nature projects that dealt in some way with one or more types of sclerophyllous scrub. However, it must be stressed that no single project deals exclusively with this habitat group. Sclerophyllous scrub habitats have always been mentioned in combination with other (key) habitats with which they are connected as part of a habitat mosaic in a broader holistic project approach, mainly meadows, heaths, forests, or bogs. Very often, in LIFE projects focusing specifically on animals (mainly birds, insects and mammals), scrub habitats are identified as habitats for living, breeding, or nesting, without any specific action being taken other than general site protection and development. As for LIFE projects focusing primarily on vegetation improvement, sclerophyllous scrub habitats and species are mentioned, but the project measures for them are neither further specified nor quantified.

The German project **Osteifel** (LIFE05 NAT/D/000055), for example, succeeded in restoring over 140 ha of *Juniperus communis formations on heaths or calcareous grasslands* (5130) in the Eastern Eifel with sheep and goat grazing. However, the long-term aim is a further transition to *Species-rich Nardus grasslands* (6230*) over time. **LIFE-RIZOELIA** (LIFE12 NAT/CY/000758) specifically focused on the long-term conservation of the priority habitat type *Arborescent matorral with Zyziphus* (5220*) in the Natura 2000 site of Rizoelia National Forest Park. Project efforts quantified and stopped natural and anthropogenic pressures and threats that contributed to the habitat degradation. *Ziziphus* habitat was restored on 1.97 ha and recreated on 1.95 ha on a site that was previously a landfill. **LIFE RELICT** (LIFE16 NAT/PT/000754) tackles the negative conservation status of continental laurisilva relicts, especially *Arborescent matorral with Laurus nobilis* (5230*), which declined from poor to bad in 2018. It is expected that at the end of the project in 2022, the quality of areas currently occupied by the habitat will be improved at least on 11 ha and further increased by 20.5 ha in order to reverse the deterioration process of the habitat in Portugal.

33 For the only significantly positive reported case in habitat improvement (4040 in the Atlantic region of the UK), no single LIFE project focusing on this habitat type is listed in the LIFE database.*

Photo: Alkaline fens in Northern Poland - LIFE11 NAT/PL/000423

4. LIFE protects - contribution to Natura 2000

4. LIFE protects – contribution to Natura 2000

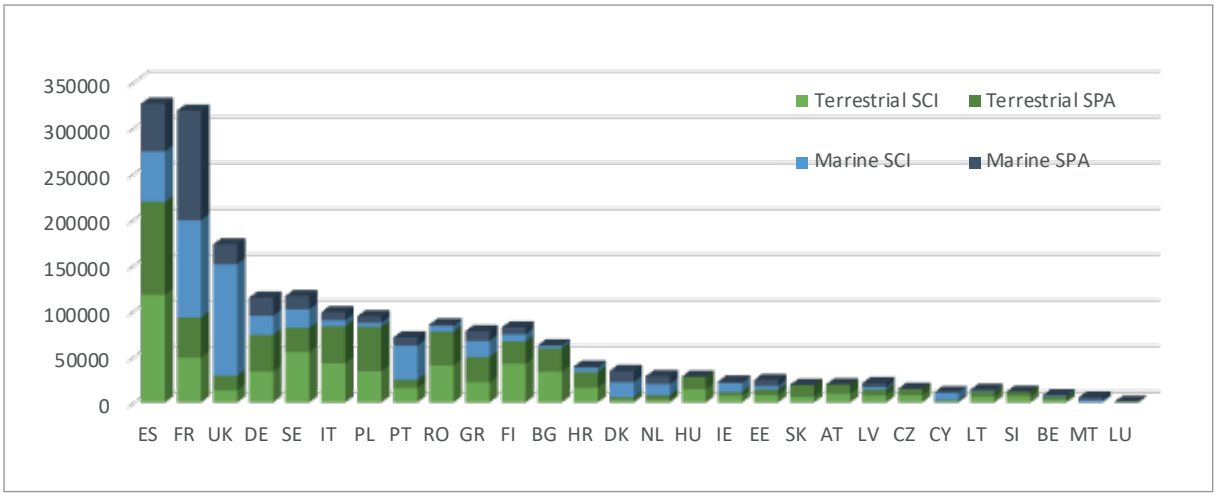


Figure 23: Total area (km²) of Natura 2000 sites per EU Member State (by end 2019), divided per terrestrial and marine Sites of Community Interest (SCIs) and Special Protected Areas (SPAs)
Source: https://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/ENG%20Nat2k47%20WEB.pdf

The Natura 2000 network forms the backbone of EU nature conservation policy, contributing to maintaining or improving the conservation status of targeted habitats and species. Created with the adoption of the Habitats Directive in 1992, the Natura 2000 network today is one of the outstanding achievements of the European Union. Natura 2000 is the largest coordinated network of legally protected areas in the world, extending across all EU Member States, covering 17.9% of EU-28 land area and over 573,000 km² of marine area, corresponding to roughly 10% of EU-28 sea area. At the end of 2019[34], the network included over 27,800 sites, covering some 1,358,000 km². All Natura 2000 sites with their Standard Data Forms are available in the EU Natura 2000 Viewer[35], managed by the EEA.

The LIFE programme (in the 1992-2018 period) has co-financed conservation actions in over 5,700 Natura 2000 sites or 20% of the total Natura 2000 network. There is a high variability in terms of coverage of LIFE actions in Natura 2000 sites between EU Member States, on average 27%, but ranging between 2% and 71% (Figure 24). For some smaller Member States, such as Belgium, Cyprus and Luxemburg, LIFE projects cover a substantial part of their respective Natura 2000 network. Although the coverage by LIFE projects seems relatively low for Germany and Sweden, these two are amongst the countries with the highest number of Natura 2000 sites (5,200 and 4,087 respectively), explaining in part the overall low coverage of LIFE projects on the national network.

The EU Member States need to ensure that the sites included in Natura 2000 form a coherent network in order to guarantee the needs for the habitats and species of Community interest. Member States have different strategies to achieve this goal; some select large areas and others select small areas targeting only one habitat or species covered by the Nature Directives (EEA, 2020). The variability in Natura 2000 coverage is thus very much related to the different Member State approaches for designating and managing Natura 2000 areas as well as in targeting different species and habitat groups.

34 https://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/ENG%20Nat2k47%20WEB.pdf
35 https://ec.europa.eu/environment/nature/natura2000/data/index_en.htm

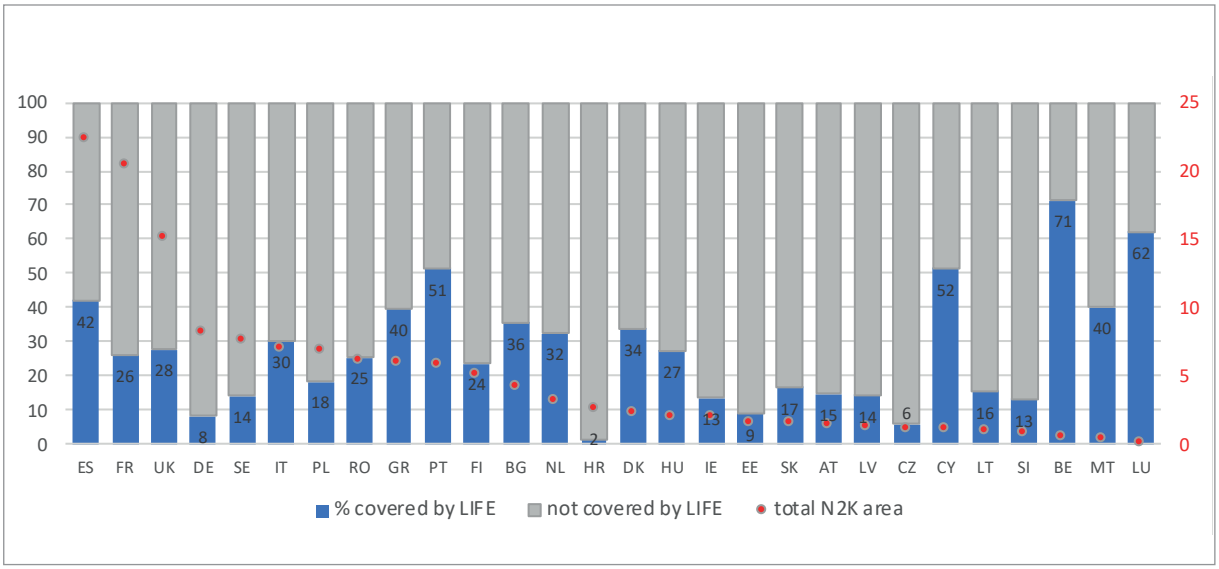


Figure 24: Percentage of Natura 2000 sites covered by LIFE projects (1992-2018) per EU Member State alongside total area of Natura 2000 network for each Member State (in 10,000 km^2) by end 2019

For each Natura 2000 site, Member States have the obligation to establish conservation objectives and appropriate conservation measures, necessary for the species and habitats protected in the respective site. While notably LIFE projects play a crucial role in implementing conservation and restoration actions within the sites, they also play an important role in collecting information about the species and habitats within the sites thus contributing to the setting of conservation objectives and measures.

The vast majority (92%) of the LIFE projects (1992-2018) has focused on conservation of habitats and species on land, with only 125 (8%) nature and biodiversity projects focusing on marine conservation so far (Figure 25a). Of these projects one third focused specifically on the protection of marine species and habitats out at sea, whereas two thirds of these projects combined conservation and restoration actions both at sea as well as on islands or in coastal areas. Since 2012, the marine Natura 2000 network has more than doubled in area[36]. Currently 42.2% of the Natura 2000 network consists of marine sites (Figure 25b), hence underlining that the LIFE programme needs to step up its ambition to promote marine conservation and restoration. Marine habitat types are underrepresented compared to freshwater and terrestrial habitats in the Habitats Directive, with only nine out of 233 habitat types of Annex I being marine, and this is a constraint. A much wider and more representative set of marine habitats is included in the IUCN Red Lists of Habitats, and those with threatened status or worse are now eligible for LIFE funding, which provides relevant opportunities for future LIFE projects.

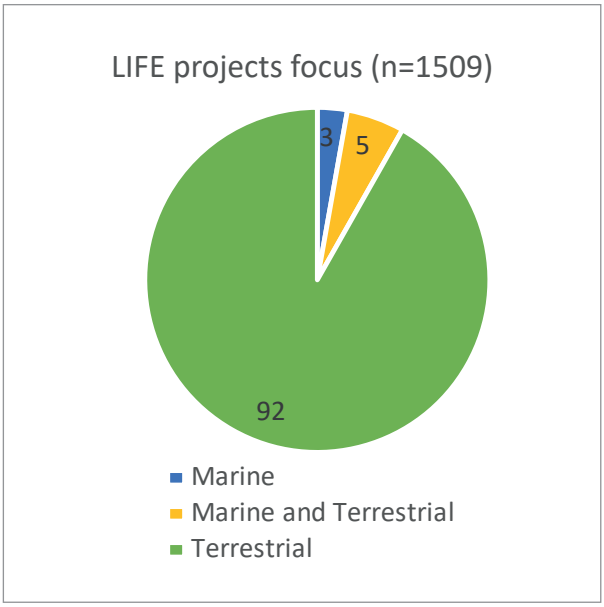
While the EU is steadily advancing with the completion of the marine part of Natura 2000, the vast majority of the EU protected marine habitats and species are still far from achieving a favourable conservation status and implementation of tailored management practices remains a key challenge. Another challenge is the lack of data on species and habitats when it comes to marine conservation. Significant data gaps remain and thus the accurate assessment of conservation status and effectiveness prove to be difficult[37]. While several LIFE marine projects have improved our knowledge of marine habitats, such as reefs and seagrass meadows, and species, especially seabirds, cetaceans, and sea turtles[38], a lot more work remains to be done. This is also confirmed by the 2020 EU State of nature report highlighting that nearly all marine biogeographical regions have high percentages of unknown assessments, reflecting the general lack of marine population data. Data on marine mammals are particularly deficient.

The EU Biodiversity Strategy for 2030 sets ambitious targets to legally protect 30% of EU land areas and 30% of EU seas, of which one third needs to be strictly protected,

36 *EU Biodiversity Strategy for 2030.*

37 *2020 EU State of nature report.*

38 *https://ec.europa.eu/environment/nature/info/pubs/docs/nat-2000newsl/nat45_en.pdf*



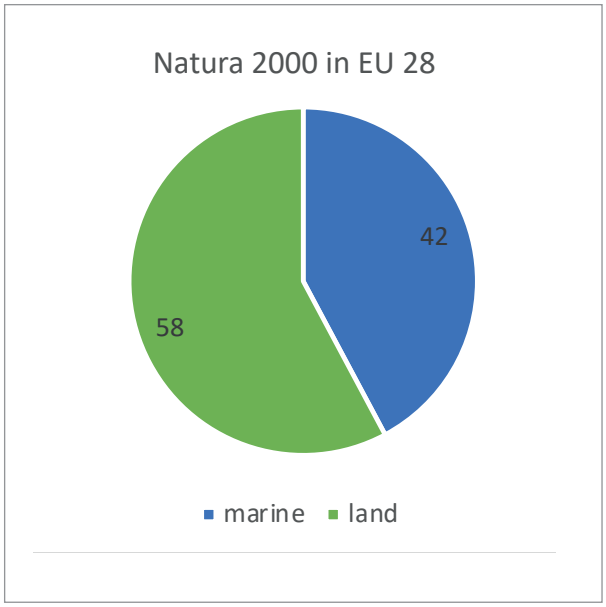


Figure 25a: The percentage of LIFE projects (1992-2018) focusing on terrestrial areas only (n=1384), on both terrestrial and marine areas (n=82) and strictly marine areas (n=43) **Figure 25b**: The representation of marine and land areas in the Natura 2000 network by end 2019. *Source:* https://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/nat45_en.pdf

focusing on areas with a high biodiversity value. Currently about 10% of the EU marine territories are designated as Natura 2000 and only 1% are strictly protected, indicating that in the coming 10 years the current protected marine areas will have to expand. The LIFE programme has a good opportunity to help close the knowledge gaps as well as to step up conservation and restoration actions.

4.1 LIFE AND DESIGNATION OF NATURA 2000 SITES

LIFE projects have been supporting the implementation of the Natura 2000 network by enabling the designation of new Natura 2000 areas or by changing and extending site boundaries. Additional forms of nature protection are national designation of protected areas within the Natura 2000 sites and land purchase through LIFE co-financing that is destined for conservation only and indefinitely. These three ways of ensuring conservation at different levels – EU, national level and at land parcel level – go hand in hand within the LIFE programme and are mutually enforcing.

4.1.1 Natura 2000 expansion

It is the obligation of the Member States to identify Natura 2000 sites. LIFE funding, however, has been used to help with the process of site identification and preparation of conservation objectives and measures and management plans. For example, a series of projects in Ireland from 1992 to 1996 helped the Irish Government to re-evaluate all its protected areas, introduce a new designation of Natural Heritage Areas which identified 1,225 sites covering 750,000 ha. This formed the basis for the Irish submission of lists of candidate SCIs. The whole programme, through a series of projects, included 11,000 ha of strategic land purchase and the preparation of management plans for Natura 2000 sites.

As a rule, LIFE projects must address the needs of Natura 2000 sites or other sites which are expected to be designated as Natura 2000 sites by the end of the project (a condition of co-financing). This 'carrot and stick' approach has been used successfully to extend the network. For example, and again from Ireland, **DBPRBRI** (LIFE09 NAT/IE/000222) addressed the threats to raised bogs on five Natura 2000 sites and 12 Natural Heritage Areas in the Irish midlands. At the end of the project this led to the creation of 12 new Natura 2000 sites.

Projects working on existing Natura 2000 sites are well placed to assess opportunities to extend the site area if needed or to identify new features that qualify to be added to the respective Standard Data Form. For example, based on surveys carried out by **Sefton Coast LIFE** (LIFE95 NAT/UK/000818) the rare bryophyte *Petallophylum* ralfsii was added to the list of the species protected in the site.

More recently, LIFE projects have been helping to identify marine SCIs and SPAs. For example, INDEMARES (LIFE07 NAT/E/000732) greatly contributed to the designation of Important Bird Areas (IBAs) and marine Natura 2000 sites in Spanish waters (see Section 3.7.2).

The French marine Natura 2000 network has significantly expanded, by adding 72,372 km^2 to the network since 2018[39]. Thanks to this expansion, reef habitats (1170) are now sufficiently covered by the network. In addition, inventories are being conducted as part of the LIFE Integrated Project MarHA (LIFE16 IPE/FR/000001) to monitor and assess their conservation status and to understand the causes of their degradation.

The identification and designation of the terrestrial Natura 2000 network is largely complete, allowing attention to turn increasingly to the management of sites, but the door remains open and it is still the case that LIFE projects are well placed to put forward cases for additional sites or extensions to existing sites. A recent example is LIFE Ausseerland (LIFE12 NAT/AT/000321), focusing on forest, bog and river restoration around the Aussee area in Austria, which succeeded in proposing the new 261 ha pSCI 'Mitterndorfer Biotopverbund'. In addition, five existing Natura 2000 sites were expanded by a total of 600 ha. The project also created a 'Grouse habitat network' on 408 ha, as stepping stones between the Natura 2000 areas. The population of Capercaillie (*Tetrao urogallus*), a target species, remained the same, but monitoring showed that the proposed sites were being used by the birds.

Another example is LIFE+ Pinzon (LIFE14 NAT/ES/000077), aiming at creating a sustainable population of the endemic Blue chaffinch (*Fringilla teydea polatzeki*) in the pine forests of the summit of Gran Canaria. The procedure for the designation of the SPA 'Cumbre de Gran Canaria' covering an area of 3,614 ha is currently ongoing.

4.1.2 LIFE and nationally protected areas

In general, most areas targeted by LIFE Nature projects are already part of the Natura 2000 network, or sites identified to be designated as such. The identification of areas to be designated as Natura 2000 sites is underpinned by scientific criteria based on Member States' monitoring methodologies. Often the areas designated as Natura 2000 sites could also be protected partially or entirely under another international or national protection regime such as UNESCO Biosphere Reserve, national or nature park or strictly protected reserve or others. These protection regimes could be stronger or less strong than the regimes provided by Article 6 of the Habitats Directive for Natura 2000 and it is up to the Member State to decide how to manage these areas, but in any event for the territory designated as Natura 2000 Article 6 of the Habitats Direc-tive should be respected. However, such designations could sometimes help to give sites more identity and security of management and funding. It is therefore seen as a positive outcome if LIFE can help strengthen national, regional and local governance and the capacity of NGOs.

For example, the Polish AlkFens_PL (LIFE11 NAT/PL/ 000423), targets the conservation and restoration of al-kaline fens within multiple Natura 2000 sites and is run by the conservation NGO 'Klub Przyrodnikw'. The project carried out restoration of natural hydrology, tree removal and extensive mowing to restore alkaline fens, and has also established five new nature reserves in the respec-tive Natura 2000 sites in the north-western region of the Pomeranian Voivodeship and drafted management plans for each of them. They are replicating their successful ap-proach in the southern part of the country with the project AlkFens_S_PLife (LIFE13 NAT/PL/000024).

Along the Slovenian stretch of the Drava river, LIFEDRAVA (LIFE11 NAT/Sl/000882) restored three river arms of the Drava and implemented restoration actions at two lakes, which are Natura 2000 sites, improving breeding habitat of various fish and bird species. In addition, this LIFE pro-ject was a catalyst for the restoration of the former waste-water basins of the Ormož sugar factory. The first steps of restoration of these basins were taken already in the 1980s, but now finally turned into a wetland of 55 ha with a permanent water influx and several islets. Large flocks of water birds now use the area as a stopover site, declared as a nature reserve in 2017.

In Belgium for example, LIFE Grote Netewoud (LIFE12 NAT/BE/000438) builds on its predecessor Life Grote Nete (LIFE05 NAT/B/000090) to propose one of the best brook valleys with alluvial forests in Flanders located with-in a Natura 2000 site to become a regional park of a few thousand hectares. Also in Belgium, and crossing the bor-der with France, the Flemish and French authorities agreed a Memorandum of Understanding within Life FLANDRE (LIFE12 NAT/BE/000631) to prepare for the establishment of the first cross-border nature park between both coun-

39 www.eea.europa.eu/data-and-maps/dashboards/natura-2000-barometer

tries, including four Natura 2000 sites, securing the protection of a vast area of coastal shifting and fixed dunes.

The Cumbrian BogsLIFE+ (LIFE13 NAT/UK/000443) restored a degraded raised bog. One of the great successes of the project was the declaration of the Natura 2000 site Bolton Fell Moss as a national nature reserve and the production of a combined management plan for the Bolton Fell Mosses and Walton Mosses National Nature Reserve. To go from an industrial milled peat site in 2013 to SAC and then National Nature Reserve by 2019 is a remarkable achievement thanks to LIFE and shows what can be done when policy meets practice.

In 1989, the conservation NGO 'Natuurpunt' launched its conservation programme to restore salt meadows on the Belgian coast. Three successive LIFE projects (Flemish polders – LIFE99 NAT/B/006295, UITKERKSEPOLDER – LIFE03 NAT/B/000023, and LIFE Oostkustpolders – LIFE12 NAT/BE/000252) invested in extensive land purchase to reduce fragmentation, hereby expanding the SCI 'Poldergraslanden' significantly in combination with restoration efforts and the development of management plans. The area was also given an official designation as nature reserve. By 2019, Natuurpunt managed a total of 534 ha at the core area 'Uitkerkse Polder', while updating management plans over the years and designating newly added areas as nature reserves. All together, these projects represent a great restoration success which was only possible through land purchase, expanding the protected area by over 750 ha. It also demonstrates the important role of a conservation NGO managing nature reserves in Belgium.

4.1.3 LIFE and legal protection through land purchase

Wherever possible, European nature conservation objectives are delivered in partnership with landowners, including using tools such as management agreements, covenants and funding support through, e.g. Rural Development Programmes. In some cases, however, control over land is the only feasible way to protect species or restore habitats. A unique feature of the LIFE programme is the co-financing of land purchase, usually by national conservation agencies or NGOs, to secure land in perpetuity for nature conservation. All land purchased with EU LIFE support requires the inclusion of a specific clause in the land register, assigning the land to nature conservation indefinitely. Usually, land purchase is to enable vital conservation measures to be applied but it can also be the case that land purchase is purely to safeguard land at risk.

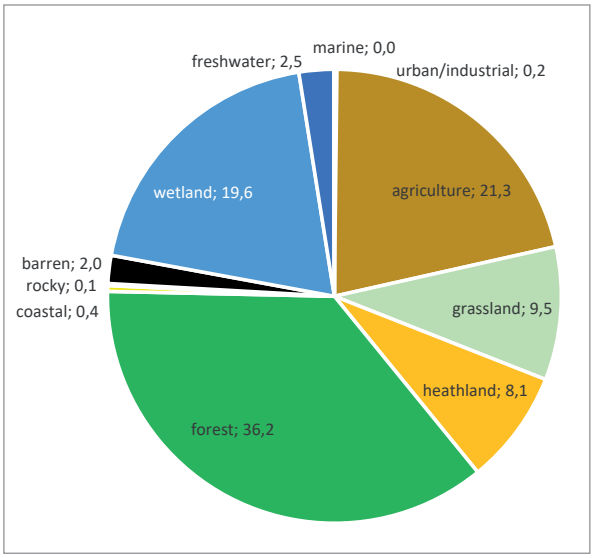


Figure 26: Share (%) of land purchase surface area by LIFE projects (1992-2014) per land use class (based on Corine and the Habitats Directive)

Where habitats and species are under severe risk, as in the case with the Madeira laurel forest or the Western taïga in Sweden, a strategic programme of land purchase can help create core zones of protected habitat to strengthen the Natura 2000 network. According to the available information, the total area of the purchased land parcels within the LIFE programme exceeds 200,000 ha[40] across all EU Member States.

Figure 26 shows as an example the type of land purchased in the LIFE+ programme (2007-2014), based on the CORINE land cover classes that were grouped to better reflect the habitat groups under the Habitats Directive. It shows that more than one third (36%) of the purchased areas is classified as forests and one fifth is classified as agricultural land (21%) and wetlands (20%) each. Grassland (9%) and heathland (8%) represent almost one tenth each, with the remainder (6%) classified as freshwater, barren land, marine, coastal or rocky areas, together with some minor industrial and urban areas. The actual size of purchased land is not of most importance; selecting strategic parcels to connect habitats, such as stepping stones or corridors, is equally relevant.

Land purchase should always be justified and should be used only where alternative arrangements such as management agreements have been ruled out. For example, in the case of the Spanish imperial eagle (*Aquila adalberti*) the preferred solution, e.g. in Extremadura with three

40 *LIFE improves NATURE (EC, 2018a)*

Land purchase is the heart of many successful LIFE projects

Land purchase is used in several ways, for example:

- To secure pristine habitats under threat, such as remaining old growth forests in Finland and Sweden.
- To purchase large areas of, e.g. uneconomic afforestation or degraded peat bogs, to restore the original habitats.
- To acquire full control of a parcel of land, e.g. in a forest or agricultural area, to develop and demonstrate best management practices.
- To purchase a series of essential areas to reconnect landscapes through patches and corridors, both at the small scale (e.g. an individual wetland) or regional scale (to allow species dispersal).
- To purchase a 'strategic spot' such as the natural source of a spring-fed fen to gain control of the hydrology of a site.
- To operate a 'land swap' system by purchasing plots of land in a Natura 2000 site and providing compensation to displaced owners.
- To consolidate an entire area of wetlands and peatlands as a necessary prerequisite to allow for the necessary rewetting.
- To allow an NGO to purchase or extend a nature reserve to increase their capacity to protect habitats.

phases of an action programme for the species (LIFE92 NAT/E/014303, LIFE94 NAT/E/004825 and LIFE95 NAT/E/001150), was to develop land stewardship agreements with private landowners. But in other cases, such as the large expanses of blanket bog in Scotland (see below) or aapa mire in Finland, e.g. in Aapi & Avi (LIFE00 NAT/FIN/007060), land purchase was the only solution which allowed the project beneficiaries to fully deliver their own restoration plans.

The first RSPB project for the Conservation of active blanket bog in Scotland and Northern Ireland (LIFE94 NAT/UK/000802) combined over 8,300 ha of land purchase with management agreements on c. 93,500 ha bringing 62% of the area of high nature conservation value under some form of management. A second follow-up project Blanket bog (LIFE00 NAT/UK/007075) purchased 1,556 ha of afforested blanket bog and removed the plantations. It also acquired 2,275 ha of active blanket bog, and drain blocking, thus benefited the condition of more than 18,000 ha of peatlands. Long-term management plans for the area were also developed.

The project Hang- und Hochmoore (LIFE09 NAT/DE/000009) succeeded in securing the entire catchment area of the kettle mire Mosbrucher Weiher thanks to targeted land acquisition and land consolidation, which has enabled its complete rewetting and development of target habitats (Figure 27).

The same approach but on a much wider scale is applied by Hannoversche Moorgeest (LIFE11 NAT/DE/000344), a project in Lower Saxony aiming for a large-scale restoration of four degraded raised bogs complexes. More than 10 years were necessary to advance the extensive land acquisition and swap involving more than 2,200 individual plots of land. At the end a total of 1,775 ha of bog woodlands (91D0*), raised bogs (7110*, 7120), and transition

Figure 27: LIFE land purchase and consolidation for wetland restoration in LIFE09 NAT/DE/000009 (*left*: hydrology of the depression; *middle*: fragmented private land ownership before LIFE (purchased parcels yellow); *right*: consolidated land in public ownership allowing the total rewetting of the site).

In the spotlight: Conservation of western taïga in Sweden

Although 65% of the land surface of Sweden is covered in forests only about 5% of this is designated and protected as 'natural forest'. In the 1990s there were insufficient national funds for the urgent protection of the western taïga (9010*) (of which only 3% remained in Sweden and Finland) and so the government turned to the LIFE fund for support. Between 1995 and 1998 a series of LIFE projects to protect natural forests and mires from commercial forestry and other activities were launched in Sweden with land purchase and legal protection as the main project actions. The results of these projects were straightforward and sustainable with little management intervention required. For example, Protection of western taïga in Svealand and Götaland (LIFE98 NAT/S/005369) purchased 1,262 ha of forest. The ex-post mission in 2012, 10 years after the end of the project, found that the areas benefited from protection in the Natura 2000 network, that management plans were in place and that a new 600 ha nature reserve was being established. The mission found that today the national funds in Sweden to protect nature areas are much greater and so there would not be the need to apply to the LIFE programme for land purchase. LIFE funding was well used in the 1990s when the threat was higher but the government did not have the full resources to address it. In total the Swedish Environment Protection Agency (SEPA) received €11.8 million for 12 projects in the LIFE II Programme (1996-1999). The added value represented an additional contribution of 14% to the national budget for land acquisition for nature conservation. The conclusion is that LIFE support was requested at a critical period by the Swedish government and was used well to target immediate threats.

mires (7140) free of forests will benefit and these habitats are left to natural ecological succession with little or no human intervention.

Through purchasing important land parcels, LIFE projects can even pave the way for the establishment of large national parks, involving a great deal of stakeholder negotiations and discussions with national authorities. In Spain Cabañeros (LIFE99 NAT/E/006327) managed to purchase the 3,500 ha private estate 'El Caracol' and the neighbouring 4,477 ha estate 'Selladores' which are both of exceptional value for breeding pairs of the Black vulture (*Aegypius monachus*), the main species targeted. This land purchase contributed substantially to the consolidation of Cabañeros as a National Park, designated in 1995.

4.2 LIFE MANAGES NATURE

Beyond designation of a protected area, management is crucial to ensure effective species and habitat protection in the Natura 2000 network. Within six years of their designation as SCI, Member States need to designate these sites as SACs. With the designation of SACs, Member States also need to adopt site conservation objectives and conservation measures that involve, if need be, appropriate management plans and/or other measures which correspond to the ecological requirements of the natural habitat types and the species of Community interest subject of protection. While generic guidance exists, the specifications of these objectives and measures are to be decided at Member State level for each Natura 2000 site. Throughout the years the LIFE programme supported gathering information about species and habitats within the sites, generated knowledge about conservation approaches that helped the formulation of adequate conservation measures and objectives. In the framework of numerous LIFE projects management plans for Natura 2000 sites were elaborated, in consultation with stakeholders and local population and approved by the competent authorities.

Between 2007 and 2013 alone, roughly 20% of all LIFE+ projects produced management plans. There are several excellent examples of approved management plans developed as part of a LIFE project, often for multiple Natura 2000 sites and put into implementation by the competent authorities. For example the management plans developed in the projects Comanacy (LIFE04 NAT/CY/000013) and PANNONICSK (LIFE10 NAT/SK/000083) served as role models for future management plans in Slovakia and Cyprus. These were instrumental in influencing the national guidelines for the elaboration of management plans for Natura 2000 areas in both countries.

The extent of suggested conservation measures and proposed management plans varies greatly across sites. The same is true for the period covered, which can range from five years up to 35 years. Good examples include LIFE projects in Sweden and Finland, producing seven (MIA - LIFE07

NAT/S/000902), 10 (GRACE - LIFE09 NAT/SE/000345) and 35 management plans (NATNET - LIFE10 NAT/FI/000047) respectively. The latter project aimed to improve overall coherence of the Natura 2000 network in Lapland by developing 35 management plans for 24 Natura 2000 sites for a total area of 5,018 ha.

Life Terras do Priolo (LIFE12 NAT/PT/000527) revised the management plan for the SPA Pico da Vara/ Ribeira do Guilherme covering 6,067 ha, including the SCI Serra da Tronqueira/ Planalto dos Graminhais (2,011 ha). This SPA tripled in size with the help of an earlier LIFE project, PRIOLO (LIFE03 NAT/P/000013) and now covers the entire range of the Azores Bullfinch (*Pyrrhula murina*), an endemic species to São Miguel Island, in the Azores archipelago. While developing the management plan, extensive vegetation mapping was done to develop a risk map and strategy to combat invasive plant species, based on citizen science. These tools greatly contributed to the drafting of the management plan for the entire Natural Park of Ilha de São Miguel and to defining conservation measures to be implemented following the project. The management plan of the SPA was recently approved by the Azores Autonomous Region Governing Council. Thanks to the LIFE programme and the developed management plan, the endemic bullfinch now receives effective long-term protection of its habitat (see also Section 3.7.7).

Many LIFE projects (SIMARINE-NATURA - LIFE10 NAT/SI/000141; Resto-unio - LIFE11 NAT/LU/000857; LIFE Eislek - LIFE11 NAT/LU/000858; Herbages - LIFE11 NAT/BE/001060; LIFE Baie de l'Aiguillon - LIFE14 NAT/FR/000669; LIFE OREKA Mendian - LIFE15 NAT/ES/000805) have also fulfilled an important role in taking the important preparatory steps that precede the development of management plans, such as data collection, land use analysis, identifying key actors and starting negotiations with stakeholders. These are often lengthy processes, but essential in securing success in the long run.

The EU State of nature report (EEA, 2020) shows that the number of Natura 2000 sites with comprehensive management plans increased significantly in the 2013-2018 period. The cumulative area of managed Natura 2000 sites (SACs) has increased from about 283,000 km^2 to 358,000 km^2. Without a doubt, the LIFE programme has greatly contributed to this increase, as well as to the implementation of management plans, hereby playing a central role in achieving long-term improvement of Natura 2000 areas. A more in-depth study of the contribution of early LIFE projects (up to 2004) to developing integrated management plans is presented in the thematic publication 'Integrated management of Natura 2000 sites'.

A more recent development, since the LIFE calls in 2014, is the role of LIFE Integrated Projects (IPs) in boosting the development at regional or national scale of management plans to ensure a full coverage of all Natura 2000 sites, thereby implementing the prioritised action frameworks (PAFs). Meanwhile, 19 Nature IPs are contributing to this process.

Photo: The Laurel Forest area - LIFE03 NAT/P/000013 - © Salgado João

5. LIFE and sustainable development

5. LIFE and sustainable development

Nature and biodiversity do not stand in isolation but are closely linked to other environmental aspects as well as economy and society. The UN Sustainable Development Goals (SDGs) reflect this interconnection, with 'biosphere' forming the fundament on which society and economy depend.

These SDGs are embedded in the EU's Environment Action Programmes, which frame EU nature and biodiversity policy and legislation.

The interconnection between nature, society and economy was to a certain extent also visible in the EU Biodiversity Strategy to 2020 and its six mutually supportive targets. It is further reinforced by the overall aim of the recently adopted EU Biodiversity Strategy for 2030 and its 17 commitments for protecting and restoring nature in the EU (see box in Section 2.4).

The EU Biodiversity Strategy for 2030 recognises that nature conservation efforts as still insufficient to halt the loss of species. Although the EU has adequate legal frameworks, strategies and action plans to protect nature and restore habitats and species their implementation on the ground is still insufficient. Conservation and restoration actions have been small-scale, and the implementation and enforcement of legislation far from sufficient. Therefore the EU Biodiversity Strategy for 2030 is urgently calling for stepping up the protection and restoration of nature by improving and widening our network of protected areas and by developing an ambitious EU Nature Restoration Plan, including the deployment of nature-based solutions to contribute more effectively to the Sustainable Development Goals.

So far this report presented the contribution of the LIFE programme to the implementation of the EU Birds and Habitats directives, which is also Target 1 of the EU Biodiversity Strategy to 2020. The following sections demonstrate how LIFE contributed to the implementation of the other five targets of the 2020 strategy, while highlighting links to the 2030 Biodiversity Strategy and future prospects. The selection of projects by the LIFE project monitoring experts yielded over 300 projects in connection to the themes covered by this Chapter 5 and Chapter 6.

5.1 RESTORING ECOSYSTEMS AND THEIR SERVICES THROUGH GREEN INFRASTRUCTURE AND NATURE-BASED SOLUTIONS

KEY MESSAGES

The main impact of considering ecosystem services, green infrastructure and nature-based solutions in LIFE projects is reflected in the added value of conservation investments for wider human well-being. These terms have only recently and still sparsely been used by LIFE projects although the concepts are in the essence of the LIFE programme since its very beginning. Between 2010 and 2017, all LIFE Nature and Biodiversity projects were asked to measure their impact on ecosystem functions and services. This requirement is now maintained mostly for green infrastructure-related projects, but with further guidance provided on how to harmonise monitoring approaches. A number of LIFE projects have implemented and demonstrated the effectiveness of nature-based solutions, a more recent biodiversity conservation agenda, offering a solid basis of knowledge and experience for further implementation of these solutions on a larger scale. For instance, LIFE projects focusing on the restoration of habitats, such as with extensive floodplain development, also support climate change adaptation by reducing flood risks. Communicating about ecosystem services, green infrastructure and nature-based solutions helps reach out to and engage stakeholders from other sectors, links with the international conservation policy language, increases overall support for conservation, and supports uptake by other sectors.

'Biodiversity and nature sustain life on Earth, delivering numerous essential ecosystem services. They are a vital element of our cultural heritage and treasured for their recreational, spiritual and aesthetic values. As a result, bio-

diversity loss has fundamental consequences for our society, economy and for human health and well-being' (EEA, 2019). Restoring healthy ecosystems, for example by developing and managing green infrastructure and deploying nature-based solutions, helps in balancing the provision of all ecosystem services to sustainable levels.

Examples of ecosystem services delivery, green infrastructure development and nature-based solutions deployment can be found across the entire LIFE portfolio. Ecosystem services featured prominently in the EU Biodiversity Strategy to 2020 and even more so in the 2030 strategy, through implementation of nature-based solutions. The integration of these concepts in LIFE projects is following the development of the scientific and policy agendas in these fields. It is therefore not surprising that it is mostly in recent years, as the work on Mapping and Assessing Ecosystems and their Services (MAES) advanced and the nature-based solutions agenda started to gain ground, that they have been addressed more explicitly in LIFE projects. Concerning ecosystem services guidance on how to carry out assessments and mapping was produced in 2018, providing a harmonised framework for LIFE beneficiaries.

The projects that explicitly tackle ecosystem services and nature-based solutions, some of which are presented in this report, provide good examples of the value that the concepts add for communicating nature and biodiversity conservation results. Where projects can demonstrate the benefits of nature restoration to society, other than in terms of species recovery or restoration of habitat quality or quantity, it shows that stakeholder support and involvement increases. Valuation only rarely is in monetary terms but mostly in terms of the appreciation of other sectors or stakeholders of how nature can contribute to society, economy and to human well-being. Multifunctionality of land use can in some cases convince certain actors, that usually would be unwilling, to get engaged in conservation and Natura 2000. This observation supports the findings of an analysis of arguments used for biodiversity conservation in Natura 2000 sites, based on LIFE projects (Müller & Maes, 2015).

It is good to see that quite a few of the projects that deal with ecosystem services produce materials that can help transfer or replicate the methods and results from LIFE projects, such as guides, web tools, simulators, models or otherwise. It is important to encourage the exchange of such materials and to communicate about the importance of LIFE projects to other sectors using the ecosystem services concept. This will also support the EU Biodiversity Strategy for 2030 principle for strengthened mainstreaming of biodiversity concerns into other sectors.

Various LIFE projects have successfully implemented the method and shared their experiences with others. In Belgium, for example, **Ardenne liégoise** (LIFE10 NAT/BE/000706) assessed nine ecosystem services for six habitat types: forest clearcuts, forest plantations, natural forests, heathlands, peatlands, and grasslands. Based on mapping and assigning indicator values to land cover types it was calculated that the ecosystem services produced, once the target habitats are restored, will increase the heritage value by 71%, pollination value by 69% and that of carbon sequestration by 57%. The only value that decreased was that of timber production, which fell by 6%, a logical consequence of a project that focuses on removing conifer forest plantations to make way to open habitats or semi-natural broadleaved forests.

A similar study in Spain by **LIFE "Oeste Ibérico"** (LIFE12 NAT/ES/000595) assessed that the restoration of freshwater habitats, forests of temperate Europe and Mediterranean deciduous forests, and dehesas in Spain increased the values for environmental education and ecotourism each by 40%, biodiversity, water supply and carbon sequestration by 20%, while food production remained stable.

A range of other projects has applied the MAES method to different types of restoration and to different habitat types. Although no overview of the results of these studies has yet been published, a compilation to assess their value would support future activities in this field. The following presents a general picture of LIFE projects that have carried out MAES-based assessments:

- **LIFE Miera** (LIFE13 NAT/ES/000899) assessed the impact of the project actions on ecosystem services using the **TESSA** tool in a range of Natura 2000 sites and habitats along the river Miera in Spain.
- **LIFE IP 4NATURA** (LIFE16 IPE/GR/000002) is supporting MAES implementation in Greece at country level focusing on areas inside and outside Natura 2000.
- **LIFE IP NATUREMAN** (LIFE16 IPE/DK/000006) assesses the value of natural landscape features in farmland in Denmark in providing biomass production, flood protection, pollination, recreational use, and hunting.
- **LIFEFORHAB** (LIFE16 NAT/BG/000817) assesses Bulgarian forests for their value in terms of biodiversity, climate change adaptation, carbon sequestration, water purification and retention, agriculture and forestry,

flood alleviation, provision of aesthetic values, and provision of resources.

- LIFE Andros Park (LIFE16 NAT/GR/000606) looks at the ecosystem services provided by alluvial forests on Andros Island to support its protection.

A number of LIFE projects go beyond assessment and mapping and are designed to restore target habitats in Natura 2000 sites with the specific purpose to also restore selected ecosystem services as an added value. Examples include:

- LIFE Sparc (LIFE16 CCA/BE/000107) in Belgium is an excellent example of building with nature (nature-based solution) to adapt to a changing climate (an ecosystem service) while supporting Natura 2000. 428 ha of tidal mud flats and freshwater tidal marshes (*Estuaries* – 1130; *Hydrophilous tall herb communities* – 6430; and *Alluvial forests* - 91E0*) are created to reduce flood risk as well as nitrogen and phosphorous levels in the river Scheldt.
- Elbauen by Vockerode (LIFE08 NAT/D/000013) did something similar in Germany by relocating dykes to restore over 100 ha of natural dynamic floodplains and associated river and wetland habitats. This reduces flood risk while extending target habitats (habitat type 6430; *Alluvial meadows* – 6440; *Hay meadows* – 6510; 91E0*; and *Riparian mixed forests* - 91F0).
- LIFE Regain (LIFE04 NAT/DK/000022) is another example of a nature-based solution that, while improving the ecological conditions of species and habitats along the Danish river Odense and in its fjord, mainly through the restoration of meanders in a 12.2 km section of the river, it increased also the retention capacity for nutrients and thereby reduced (by 3%) the nutrient load on Odense Fjord. It also provided the basic infrastructure to allow sustainable grazing in the area.
- SEA FOREST LIFE (LIFE17 CCM/IT/000121) aims at restoring Seagrass (*Posidonia*) meadows (1120*) along all Italian shores. Among others it will quantify the capacity of this habitat type to sequester carbon and focus on measures that reduce the loss of the habitat and restore it on 120 sites where old mooring facilities will be dismantled.
- In Finland Hydrology LIFE (LIFE16 NAT/FI/000583) restores over 5,200 ha of peatland and lakes (11 target habitat types), mostly within 95 Natura 2000 sites, to increase water-storage capacity, improve water quality and reduce flood and drought risk. It will do so by filling ditches, removing trees from peatlands, and relocating draining water courses.
- MoorLIFE 2020 (LIFE14 NAT/UK/000070) restores upland bog habitats in the UK because of their fundamental role in flood mitigation while improving water quality, water flows, water tables and carbon accumulation and reducing wildfire risk. It will stop the erosion of the peat body by revegetating 837 ha of bare peat and ensuring the positive trajectory of a further 2,030 ha and it will raise water tables to reduce chemical peat erosion by blocking 50,402 m of grips and 57,582 m of erosion gullies (see Section 3.7.6).
- In France LIFE Baie de l'Aiguillon (LIFE14 NAT/FR/000669) and LIFE Ad'Apto (LIFE16 CCA/FR/000131) restore more than 110 ha coastal ecosystems (target habitat types 1130, *Mudflats* - 1140, *Salt meadows* - 1330, *Grey dunes* - 2130, *Eutrophic lakes* - 3150) on the Atlantic coast that provide a passive natural protection against natural hazards and mitigate effects of sea level rise (see Section 3.7.3).
- In England Pennine PeatLIFE (LIFE16 NAT/UK/000725) looks at a payment for ecosystem services (PES) mechanism under the UK Peatland Code to determine what provides the most cost-effective and widely applicable solution to blanket bog restoration.
- LIFE Blue Natura (LIFE14 CCM/ES/000957) aims to quantify the carbon deposits and the sequestration rates of seagrass meadow habitats in Andalusia. This information will enable evaluation of the ecosystem services created by this habitat. It should also encourage existing initiatives to finance conservation and restoration projects of blue carbon sink-habitats and the development of key policies for mitigating and adapting to climate change, with special attention to carbon emissions trading or carbon markets. It will thereby create a monetary value for the habitat that can be used to finance its protection in the future.

The LIFE programme also finances projects across various strands that contribute to biodiversity protection by developing green infrastructure and nature-based solutions in the wider countryside, beyond Natura 2000. Examples include:

- LIFE IGIC (LIFE16 NAT/GR/000575) implements green infrastructure in agro-ecosystems in 10 areas in the Western Messara plain, southern Crete, to reduce synthetic and technical measures by deploying functional agro-biodiversity through in field

measures, such as stone walls, field margins, etc. This will enhance ecosystem services such as pest control, pollination, and nutrient provision while boosting local agro-biodiversity and improving connectivity between the surrounding Natura 2000 sites.

- LIFE-IP RBMP-NWRBD UK (Natural Course LIFE14 IPE/UK/000027) in the North West (England) River Basin District reduces flood risk and river bank erosion and improves water quality and biodiversity by developing green infrastructure, such as planting trees and woodland to reduce water runoff, in an integrated river management approach, contributing to the Nature Directives as well as the Water Framework Directive.
- LIFE GREENCHANGE (LIFE17 NAT/IT/000619) combines nature protection, green infrastructure development and ecosystem services provision in agro-ecosystems in Malta and in six Natura 2000 sites in the Pontine Marshes (Agro Pontino) in Italy. The restoration of 690 ha of ecosystems and the creation of at least 8 km of wind breaks and reclamation canals in the Agro Pontino, and at least 10 km of rubble walls and buffer strips in Malta is expected to reduce wind erosion and increase water storage.
- In Rotterdam (the Netherlands) LIFE URBAN ADAPT (LIFE14 CCA/NL/000302) creates over 5 ha of urban green infrastructure as a nature-based solution to increase water buffering and quality, reduce NO_2 air pollution, reduce sewage overflow events, reduce heat island effects and flood risk, increase urban biodiversity and human well-being and participation.
- Also in Belgium LIFE Green4Grey (LIFE13 ENV/BE/000212) developed various green and blue infrastructure elements in seven sites in the peri-urban areas of Brussels and Hasselt-Genk to increase water retention, water infiltration, recreation, attractive business and living environment and health. Biodiversity gains included the population increase of the European tree frog (*Hyla arborea*) and greater connectivity between adjacent Natura 2000 sites.

A final group of projects, relating to ecosystem services and green infrastructure, concerns those projects that raise awareness through models, training and publications. The following examples give a flavour on what LIFE has to offer:

- iLIFE-TROODOS (LIFE16 GIE/CY/000709) works on increasing public awareness of Cyprus' Troodos National Forest Park's natural values and the ecosystem services it provides. This site is one of the most visited Natura 2000 sites in Cyprus and one of the most important natural ecosystem and biodiversity hotspots of the island. A suite of awareness-raising actions about ecosystem services values offered by the Park, such as media broadcasting, TV presentations, ads in newspapers/magazines, buses, billboards, training workshops and a mobile exhibition is expected to strengthen support by local authorities and inhabitants and the tourism sector for Natura 2000.
- A similar approach is followed by Natura2000ValueCrete (LIFE13 INF/GR/000188) in Greece, which assesses and communicates about the ecosystem services of the Natura 2000 sites in Crete to increase support and reduce the negative attitudes of stakeholders, target audiences and the local public, who view Natura 2000 as an inhibitive factor for economic development. It produces booklets, maps, a TV broadcast and a guide on ecosystem services provided by the Natura 2000 sites.
- Also LIFE Viva Grass (LIFE13 ENV/LT/000189) in Lithuania produced training and teaching materials and tools about grasslands and ecosystem services, offering ecosystem-based planning solutions to support sustainable multifunctional grassland management, including landscape protection and increased grassland biodiversity (see Section 3.7.5).
- SAM4CP (LIFE13 ENV/IT/001218) in Italy is slightly different as it focused on ecosystem services provided by healthy, biodiversity-rich soils. It developed online simulators (Playsoil and Simulsoil) to allow town planners and other relevant decision-makers to take the ecological functions of soil into account when assessing the environmental and economic costs and benefits of potential urban planning and land-use measures and choices. Tested in four municipalities of the Metropolitan City of Torino it protected 500 ha of soil from being sealed.
- In Italy LIFE Making Good Natura (LIFE11 ENV/IT/000168) identified and evaluated the ecosystem services provided by Natura 2000 sites. This information was used to create and demonstrate innovative models for funding the implementation of Natura 2000 management plans and conservation measures. It produced a manual for the valuation of ecosystem services and implementation of PES schemes in agricultural and forest landscapes, targeted at those involved in designating and managing Natura 2000 sites.

- LIFE Green-Go!Carpathians (LIFE16 GIE/PL/000648) promotes green infrastructure in Natura 2000 in southern Poland, raises awareness of the need for maintaining and restoring ecological connectivity, and increases the level of knowledge about the importance of ecosystem services for sustainable local development. It has a strong focus on stakeholder involvement in joint activities for the maintenance, restoration and enhancement of green infrastructure in Natura 2000 network sites in the Polish Carpathians among others by setting up cooperation networks consisting of local action groups and local governments.

The EU Biodiversity Strategy for 2030 points to the intricate link between biodiversity conservation and climate change, both in terms of the role of healthy ecosystems in mitigating climate change or adapting to its effects. The Strategy focuses on the role that nature conservation can play in this process, by offering nature-based solutions, as demonstrated by some of the examples above.

The Strategy's provisions to apply more nature-based solutions and establish a Trans-European Nature Network will increase the resilience of Natura 2000 sites by increasing connectivity and allowing species to move between fragmented populations, certainly when driven by changing climatic conditions. Green infrastructure elements are also expected to increase the provision of a number of ecosystem services in connection to climate change, such as water storage, flood prevention, reducing the urban heat island effects and decreasing erosion.

The EU Adaptation Strategy, adopted in 2013, includes an action on LIFE funding to support capacity building and step up climate change adaptation action in Europe. This Adaptation Strategy led to the inclusion of a new strand on climate change adaptation (CCA) in the LIFE programme 2014-2020.

Some of the examples listed above demonstrate also that restoring habitats will help to store carbon (e.g. by rewetting peatlands) or reduce the risk of forest fires (e.g. by creating networks of semi-natural grassland strips as buffers between fire-prone forest patches). The publication 'LIFE and Climate change adaptation' provides more examples of relevant LIFE projects.

5.2 LIFE SUPPORTS SUSTAINABLE AGRICULTURE, FORESTRY AND FISHERIES

KEY MESSAGES

Making agriculture and forestry in Europe more sustainable is not a core target of the LIFE programme or individual LIFE projects. Although a majority of LIFE Nature projects focus on grasslands and forests, projects mostly cooperate with farmers and foresters to bring back extensive practices to restore and manage target natural habitats. Key successes relate to making farming and forestry practices more sustainable and to setting up agri-environment schemes and improved forestry practices at the national level. Some LIFE projects are particularly successful by developing tools, raising awareness or supporting governance.

Three quarters of Europe's land territory is covered by farmland, forests and wooded lands (EEA, 2019). This represents an immense surface area that historically has shaped Europe's landscapes and much of the associated biodiversity. For example, without the various extensive forms of agriculture, most semi-natural grasslands and their associated richness in plant and invertebrate species would not exist. However, intensive agricultural and forestry practices today are among the main reasons for the continuing decline of biodiversity in Europe.

According to the recent European environment report (EEA, 2019) many of Europe's terrestrial natural areas are subject to significant pressures from agriculture, such as the intensification or abandonment of traditional, extensive farming practices or even land abandonment, in particular in areas with natural constraints. Unsustainable farming practices lead to pollution of soil, water, air and food, overexploitation of natural resources and biodiversity loss and ecosystem degradation. The pressures and threats for all terrestrial species, habitats and ecosystems most frequently reported by Member States are associated with agriculture (EEA, 2020). Natural, old-growth forests are also subject to management intensification and their unique biodiversity and structural features are irreversibly being lost.

Europe's marine areas are under continued pressure from unsustainable fishery practices. The EU 2020 biodiversity strategy, and in particular Target 4 required that fishing become sustainable (Maximum Sustain-

able Yield had been achieved) by 2015 and that fish stocks become healthy by 2020. Fishing must have no significant adverse impacts on species or ecosystems, so that all European oceans and seas can be ecologically diverse and dynamic, as well as clean, healthy and productive, by 2020. However, around 45% of the assessed commercially exploited fish and shellfish stocks in Europe's seas are not in good status based on both fishing mortality and reproductive capacity criteria or on only one criterion where only one was available. There are strong regional differences though, with the situation in the North-East Atlantic Ocean and the Baltic Sea being relatively better than that in the Mediterranean Sea and the Black Sea[41].

The LIFE programme represents a great opportunity to contribute to the transition towards more sustainable agriculture, forestry and fisheries, through all its strands but especially through LIFE Nature. Around 40% of the Natura 2000 total area is farmland, and forests make up 48%. Around 9% of agricultural land and 27% of forests is included in the Natura 2000 network (EEA, 2019).

5.2.1 Agriculture

Many valuable habitats in Europe are maintained by traditional extensive farming practices and an estimated 50% of all species in Europe rely on these types of practices for their survival. Many of the LIFE Nature projects are closely linked to agriculture, as much of the now threatened and protected habitats and species in Europe depend on the continuation of extensive and small-scale farming practices. Abandonment of such traditional practices is one of the main threats to the habitat types and species associated with them. Important conservation activities in these areas include restoring habitats, testing agri-environment measures, and introducing dedicated land-use techniques such as extensive mowing and grazing regimes (EC, 2008).

Nearly one fifth of all LIFE Nature projects target natural and semi-natural grasslands (528 projects), one of the key agricultural habitats. Other types of agricultural habitat types, such as traditionally managed olive groves, terraces or species-rich arable fields are covered by other LIFE strands as well.

LIFE projects, the Integrated Projects in particular, are a lever for mobilising funding from the Rural Development Programmes to ensure continued biodiversity-friendly management of grasslands or small landscape elements (see also Section 6.6).

LIFE projects are mostly working with farmers when it comes to managing restored habitat types, such as grasslands. While doing so, many projects contribute to the transition of intensive farming practices to more sustainable approaches in terms of land use (e.g. reduced use of artificial fertilisers and pesticides, different mowing regimes). The list below presents a number of such example projects:

- In the Flemish polders (Belgium) a series of three LIFE projects (**Flemmish polders** - LIFE99 NAT/B/006295, **UITKERKSEPOLDER** - LIFE03 NAT/B/000023, and **LIFE Oostkustpolders** - LIFE12 NAT/BE/000252) have focused since the 1990s on restoring saline coastal grasslands, while engaging 45 farmers through management contracts to farm in a more sustainable way, adapting their use of the land and at the same time raising water levels. The project achieved successes for nature (see Section 3.5.4), massively expanded the nature reserve (see Section 4.1), while at the same time offering an economic future for local farmers, increasing soft recreational use, as well as increasing some other ecosystem services such as water storage and carbon sequestration.
- Also the project **Tetrax** (LIFE02 NAT/P/008476) in Portugal succeeded in maintaining farmer incomes while conserving the threatened Little bustard (*Tetrax tetrax*) in Alentejo. Over 120 contracts were signed with 45 farmers to adopt agri-environmental management measures in favour of the bird species and the extensive agro-pastoral systems with dry cereals, legume crops and grasslands that it depends on.
- In Spain **LIFE Olivares Vivos** (LIFE14 NAT/ES/001094) implements a demonstrative management scheme on more than 2,000 ha of olive groves. The model will be agriculturally, economically and socially viable, while contributing effectively to halt soil erosion and the loss of the rich biodiversity that is typical to traditionally managed olive groves. By restoring landscape elements such as roadsides, stone walls and ponds, biodiversity will be improved and recognised by a value added brand 'Olive Alive'. The long-term management will be ensured through land stewardship agreements.
- **GrassLIFE** (LIFE16 NAT/LV/000262) in Latvia establishes a long-term sustainable grazing system

41 https://www.eea.europa.eu/data-and-maps/indicators/status-of-marine-fish-stocks-4/assessment

on priority grassland areas. Grazing is integrated into farming practices, among others by setting up mobile grazing units. It explores opportunities to improve the economic perspective of sustainable grassland use by identifying and marketing the grassland products with high added value, and by finding alternative options of agricultural or non-agricultural use of priority grasslands and their services. The project also submitted to the Ministry of Agriculture an expert proposal for agri-environment measures related to the conservation of the project's target habitats for integration into the 2021-2027 RDP of Latvia.

- Also **BurrenLIFE** (LIFE04 NAT/IE/000125) contributed to the Irish agri-environmental programme by pioneering a results-based approach to rural development payments. The project identified and provided solutions to a number of key issues that local farmers are faced with and that support both farming and the protection of the local priority habitats. Building on its success among the 20 pilot conservation farms, a much larger 'Farming for Conservation Programme' was launched, offering a number of best practice guidelines.
- In a different category but with a potentially important impact on biodiversity in the wider countryside is **LIFEBioStandards** (LIFE15 GIE/DE/000737) in Germany. This project develops biodiversity criteria for food sector standards and labels. A part of this process is the development and implementation of the 'Biodiversity Performance Tool' to improve biodiversity measures in certified farms. The project aims at reaching 500 business associations and 5,000 companies (including retailers and 50% of the large food processing companies).

5.2.2 Forestry

The largest share of LIFE Nature projects targets forest habitats, nearly one fourth of the total since 1992 (605 projects). In many cases these projects aim at making intensive forestry practices more sustainable and biodiversity-friendly or at expanding the area of targeted forest habitat types by taking restoration measures.

Examples of LIFE projects that contributed to achieving a more sustainable forest management (SFM) include:

- Already in 1995 a LIFE project (LIFE95 ENV/F/000542) focused on raising awareness of integrating biodiversity in the management of forest ecosystems. In particular, it focused on training forest managers in Natura 2000 sites in the French-speaking countries France, Wallonia and Luxembourg about how to deal with the stipulations of the Habitats Directive. This has laid the ground for SFM across the region and the EU.
- The Italian **ManFor C.BD.** (LIFE09 ENV/IT/000078) focused on tools (data sets, indicators, set of good practices) to support SFM, including biodiversity, by assessing and developing indicators of SFM. In pilot cases it raised awareness about multifunctional forest management and assessed the impact of forest management options on fauna.
- **LIFEMontserrat** (LIFE13 BIO/ES/000094) implemented a local land management model around the Spanish Montserrat mountains (an area subject to recurrent forest fires) that consisted in forestry works in pine woodlands to reduce the tree density and to enable livestock grazing into the forest. This resulted in an increase of the commercial value of forests and the establishment of new livestock farms in the area while enhancing the overall biodiversity of the area by diversifying habitats, such as the recovery of open habitat types *Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea* (6220*) and *Mediterranean tall humid grasslands* (6420). It also significantly reduces the risk of large forest fires.
- **TAXUS** (LIFE11 NAT/ES/000711) implemented concrete conservation actions in 213 ha of woodlands to enhance *Mediterranean Taxus baccata woods* (9580*), succeeded in establishing 26 land stewardship agreements with forest owners and developed technical management plans for forest owners and managers to ensure sustainable forestry practices in the yew groves.
- A more recent step in Italy is the development of a network for forest biodiversity conservation to exchange best practices, as implemented in the ongoing **GoProFOR LIFE** (LIFE17 GIE/IT/000561).

5.2.3 Fisheries

The fishing sector depends on healthy marine biodiversity, but current fishing practices are not always sustainable. While the pressure on commercial species is obvious, these activities also damage the marine ecosystem as a whole.

Funding through the LIFE programme to make fisheries more sustainable has been very limited so far. According to the LIFE project database only three projects address

fisheries in some way, which mirrors the lack of LIFE projects targeting marine habitats (see Section 3.7.2).

Still, LIFE has made important contributions to improve sustainability of fisheries and integrate biodiversity concerns into the sector. In particular, in contribution to sustainable fisheries, LIFE has (EU, 2018b):

- tested ways to reduce discards from fishing vessels, with technologies for more precise fishing and mapping of fish stocks (e.g. **FISH SCALE** - LIFE09 INF/IT/000076);
- organised campaigns to encourage consumers to eat discards, reducing the pressure on overexploited species of fish;
- reduced pressures on marine protected areas caused by recreational fishing from the shore.

PISCES (LIFE07 ENV/UK/000943) played an important role in this drive towards more sustainable fisheries. It developed guidelines, in a multi-stakeholder process including fisheries, for implementing the ecosystem approach through the EU Marine Strategy Framework Directive (MSFD). This was done for the Celtic Sea with the involvement of the UK, France, Ireland and Spain, achieving a commitment by the involved stakeholders for sustainable cross-sectoral marine management through the ecosystem approach, which integrates biodiversity concerns into marine management. The guide[42], including recommendations for stakeholders, has meanwhile been fully adopted by the sector across Europe and is used by Member States as a basis for implementing the MSFD.

TARTALIFE (LIFE12 NAT/IT/000937) contributed to the creation of a quality mark 'Turtle Safe' for boats that adhere to the principles contained in the relevant regulation developed in collaboration with the NGO 'Friend of the Sea'. It is the first brand that acknowledges low-impact fishing activities for sea turtles (in particular Loggerhead (*Caretta caretta)* in Italy) in the entire Mediterranean. The Tartaworld campaign has produced almost 5,000 dissemination events (high resonance of the project among the specialised and general public), about one million tourists involved in project dissemination activities; and nearly 600 articles (national and local press, news on websites) were produced on the project activities.

42 *Downloadable from https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3281*

5.3 LIFE COMBATS INVASIVE ALIEN SPECIES

KEY MESSAGES

Although invasive alien species were covered by LIFE since its start, the EU IAS Regulation has given a boost to LIFE projects that prevent their establishment and spread, eradicate species, control their pathways of introduction or manage already established populations of IAS. In addition to practical measures in the field, LIFE has been particularly effective in developing guidance, raising awareness, and producing tools to help stakeholders reduce the pressure by IAS on native species and natural habitats.

According to the EC Regulation on the prevention and management of the introduction and spread of invasive alien species: '*Invasive alien species (IAS) represent one of the main threats to biodiversity and related ecosystem services, especially in geographically and evolutionarily isolated ecosystems, such as small islands. The risks such species pose may intensify due to increased global trade, transport, tourism and climate change. It is estimated that 10-15% of the c. 12,000 alien species in Europe are invasive, imposing risks that include severe impacts on native species and the structure and functioning of ecosystems through the alteration of habitats, predation, competition, the transmission of diseases, the replacement of native species throughout a significant proportion of range and through genetic effects by hybridisation, and impacts to human health and the economy*'.

The EU IAS Regulation was formulated in response to Action 16 of the EU Biodiversity Strategy to 2020 and aims at controlling the threat of IAS to the environment and biodiversity of the EU. It foresees a range of measures for tackling the problem: prevention; early detection and rapid eradication; and management of IAS. A recent EC guidance document highlights the close link between the IAS Regulation and the EU Nature Directives and demonstrates how IAS surveillance, rapid eradication, management, and restoration measures can be integrated into Natura 2000 site management plans and prioritised action frameworks (PAFs), and sources of funding.

Since 1992, LIFE has been the main source of EU funding for actions aimed at tackling the threats from IAS to species and habitats listed in the EU Nature Directives in Natura 2000 network sites. Between 1992 and 2017, more

In the spotlight: Innovative methods combat invasive alien species in England's protected habitats

RAPID LIFE (LIFE16 NAT/UK/000582) delivers a package of measures to reduce the impact and spread of IAS in freshwater aquatic, riparian, and coastal environments across England. The project has successfully demonstrated the use of biological controls to treat some of the IAS that are most threatening to and hindering restoration of EU habitat types. The project treated Himalayan balsam (*Impatiens glandulifera*), included in the list of IAS of Union concern, using rusts (*pathogenic fungi*). Monitoring to date suggests a high success rate provided the rust is compatible with the strain of *I. glandulifera*. The project also investigated the use of psyllids (jumping plant lice) to combat Japanese knotweed (*Fallopia japonica*) and achieved impressive results. However, more effort is needed to define the best treatment conditions. The project also demonstrated novel monitoring and control methodologies for Signal crayfish (*Pacifastacus leniusculus*), also on the Union List, such as the use of e-DNA and male sterilisation techniques. The project successfully combated *P. leniusculus* in three sites and released captive-reared White-clawed crayfish (*Austropotamobius pallipes*) to restore the native population.

RAPID LIFE is also an example of good practice in stakeholder and volunteer involvement, with the production of IAS management toolkits for water asset managers and water users and protocols for the prevention, detection and control of IAS. The protocol on control provides resources on biosecurity, materials with information about the identification of priority species and the contingency response process to reports of these species, and Good Practice Management Guides for established invasive species. An accreditation scheme for water asset managers who demonstrate excellence in biosecurity was established. Revised or new awareness material was designed for marine anglers, canal boaters and canoe and kayak users and awareness-raising campaigns targeting both the general public and the stakeholders concerned were organised to prevent the intentional release of IAS.

In collaboration with the relevant stakeholders, for each of five regions in England **RAPID LIFE** also produced Regional IAS Management Plans (RIMPs). The RIMPs include Regional IAS Blacklists and Rapid Response protocols to facilitate the early detection and control of IAS introduction/re-introduction. In the same line, the project developed a web-platform with IAS lists and mappers in it for the easy recording of sightings.

than 340 LIFE projects included measures dealing with IAS. These projects either exclusively targeted invasive alien species, or included actions to tackle IAS that were relevant to achieving the main conservation objectives of the project. 265 of these projects (78%) ran from 1992 to 2013 and were examined in the LIFE Nature Publication 'LIFE and Invasive Alien Species'. Of those, 31 projects include IAS as their main or significant focus.

Up to 2013, the overwhelming majority (97%) of LIFE projects dealing with IAS have focused on the eradication and management of IAS that have already become established, with only 2% addressing prevention and 1% addressing early detection and rapid eradication (EU, 2015c). From 2014 onwards, in accordance with the EU IAS Regulation, LIFE projects have continued to tackle eradication and management of IAS but have been increasingly including actions for the development of early warning and rapid response systems (EWRR), the identification of IAS entry or introduction pathways, and the active participation of stakeholders and citizen scientists in the identification and control of IAS.

Some of the exemplary projects in this period include:

LIFE Shiants (LIFE13 NAT/UK/000209), one of a group of LIFE projects[43] that successfully eradicates and controls mammalian predators on seabird islands, adopted a comprehensive and holistic approach to manage invasive Black rats (*Rattus rattus*) on the Shiants isles Special Protection Area (SPA) in the UK. It successfully eradicated rats from the isles using a best-practice methodology (poison-bait stations with minimal impacts on other species) and customising methods for remote and large islands with difficult terrain. The project also formulated biosecurity protocols to ensure the prevention of rat reintroduction and the early detection and rapid response in case of re-introduction. To enable early detection and rapid response, the biosecurity

43 *Capraia/Toscana (LIFE97 NAT/IT/004153), Mink Control (LIFE00 NAT/UK/007073), ISOTOSCA (LIFE04 NAT/IT/000172), SAFE ISLANDS FOR SEABIRDS (LIFE07 NAT/P/000649), Montecristo 2010 (LIFE08 NAT/IT/000353), ANDROSSPA (LIFE10 NAT/GR/000637), Pelagic Birds (LIFE11 NAT/IT/000093), Seabird Recovery LIFE Project: Scilly Isles (LIFE11 NAT/UK/000387), LIFE Puffinus Tavolara (LIFE12 NAT/IT/000416), RESTO CON LIFE (LIFE13 NAT/IT/000471), LIFE ElClimA (LIFE13 NAT/GR/000909), LIFE Arcipelagu Garnija (LIFE14 NAT/MT/000991)*

plans included systematic surveillance through the establishment of 56 permanent monitoring stations, tracking tunnels and camera traps to check at least monthly. The rapid eradication plan included formation and training of an expert incursion response team, ready to act within 48 hours. **LIFE Shiants** constitutes an example of good implementation of the EU IAS Regulation, as well as the Birds Directive, EU Biodiversity Strategy to 2020 and the MSFD. The project instigated a new LIFE project applied on 41 island SPAs, **Biosecurity for LIFE** (LIFE17 GIE/UK/000572). The conservation benefits for seabirds were seen for Storm petrel (*Hydrobates pelagicus*), Puffin (*Fratercula arctica*) and Razorbill (*Alca torda*), which are all Birds Directive Annex I species.

LIFE ASAP (LIFE15 GIE/IT/001039), a LIFE Governance and Information project, implemented at the national scale in Italy, focused on prevention and early detection. It targeted stakeholders from the public sector, the commercial sector, NGOs, science, and private citizens. It offered an extensive training, capacity building, information and awareness-raising campaign, attracting over 160 public bodies to the project. More than 500 technical personnel of public bodies, multipliers of the project, were trained. To better manage the pathways of intentional introduction and promote native species as alternatives to IAS, the project developed Codes of conduct for stakeholders (e.g. trade and use of flora and fauna, fishermen, hunters, pet shops, etc.). The formal acceptance of the Codes of Conduct by 36 botanic gardens and the Italian Botanic Society is an important result. Also, a brochure on gardening alternative species was produced. **LIFE ASAP** supported the adaptation of Italian legislation, including a 'black list' of IAS of Italian concern, to implement the EU IAS Regulation. In order to facilitate early detection and rapid response, a citizen science campaign was organised and a Smart-App was developed, so that the citizen scientists and trained public officials can use it to report on the presence of IAS in Italy. The project is a reference for all issues related to invasive species in Italy.

LIFE ARTEMIS (LIFE15 GIE/SI/000770) is another Governance and Information project that increased awareness and knowledge about IAS in forests. It developed methods for identifying pathways of introduction, established an institutional framework for EWRR and its pilot implementation, and built capacity of stakeholders, volunteers and citizen scientists. The main focus and added value of the project in terms of the EU IAS Regulation is the effective establishment and pilot implementation of the EWRR System which includes:

- an EWRR institutional framework for forest IAS to be included in the new Nature Conservation Act;
- rapid response plans for five species: the Union List species *Heracleum mantegazzianum, Pueraria montana* var. *lobata*, and *Vespa velutina,* as well as *Phytophtera alni* and *Geosmithia morbida;*
- a national forest IAS alert list, including the determination and analysis of introduction pathways;
- a manual for EWRR in Slovenian forests and a forest IAS field guide;
- EWRR training and transferability workshops for forest-related stakeholders (trainers, foresters, private forest owners, volunteers, businesses);
- an on-line IAS Information System and App, including 132 forest IAS with photos and information. Its use led to the first detection in Slovenia of Kudzu vine (*P. montana* var. *lobata*). This led to its rapid eradication, a success of the project's EWRR System.

Furthermore, a pilot demonstration of surveying and eradicating forest IAS by volunteers in a pre-selected urban setting was developed. Special training seminars and field activities for volunteers were organised. Alien plants were inventoried and the sites where eradication should take place were selected. An IAS management action plan and a supporting on-line tool are developed. Also, a pilot demonstration, targeting mostly private forest owners and farmers, started to raise awareness and manage *Eutypella parasitica*, the fungal disease threatening maples. The campaign includes lectures, brochures, field visits and removal of affected maples.

LIFE STOPVESPA (LIFE14 NAT/IT/001128) aimed at containing the invasive Asian hornet wasp (*Vespa velutina*, an IAS of Union concern) and preventing it from further invading Italy. The project identified the pathways of the wasp's introduction from France and within the project area or new areas in Italy. An effective monitoring network of beekeepers, citizens and local authorities (Civil Protection and fire fighters), aiming at the detection and destruction of *V. velutina* nests, was established and enhanced. The trapping stations and sites monitored increased from 40 and almost 500, respectively, in 2016 to nearly 1,700 and over 900, respectively, in 2018-2019, with proportional results in nest detection and destruction. A key innovation of the project is the development and testing of two harmonic radar prototypes, able to track flying hornets in real time up to a distance of 500 m and to detect the position of their nests. The project also tested complementary methods for the control of the species, such as the intensive

V. velutina queen spring trapping. This technique seems able to decrease the impact of *V. velutina* on the Honeybee (*Apis mellifera*). However, the technique may have negative effects on native insects, and more research is needed before further applying the method.

The efforts and efficiency of the management strategy increased in the years, both in terms of nests directly managed by the project and in terms of nests destroyed before the emergence of reproductive individuals (males and new founder queens). The percentage of nests destroyed before the month of September (when the reproductive phase of the colony begins) increased from 6% in 2015 up to 46% in 2018. Important was also the work on assessing the biodiversity impacts of the IAS control by the project. Experimental apiaries show that *V. velutina* presence generates an average loss of 18% of Honeybee colonies. Monitoring of native insect species highlighted which wild bee genera are more susceptible to *V. velutina* predation, and a significant negative correlation between the number of *V. velutina* nests and the abundance of wild bees, native wasp species (*Vespa crabro, Vespula* spp.) and Lepidoptera in the sampled areas.

On the policy front, the project contributed to the drafting of the National Action Plan on Vespa velutina, established a collaboration with EASIN (European Alien Species Information Network), and contributed to the EC document 'Information on measures and related costs in relation to species included on the Union list' in relation to *V. velutina*.

Life Oxyura (LIFE17 NAT/FR/000542) aims to eradicate Ruddy duck (*Oxyura jamaicensis*, an IAS of Union concern) to save the endangered native White-headed duck (*O. leucocephala*) from extinction in France. It builds on lessons from **ERDUK** (LIFE05 NAT/UK/000142).

The project produced a guide of procedures on how to handle captive and wild *O. jamaicensis* and disseminated this to all relevant staff in France. It initiated the training of the project's field officers to improve their know-how on hunting and trapping techniques, in collaboration with experienced shooters from **ERDUK**. Also, it completes the relevant regulatory framework by issuing decrees that allow the project team formal access and the right to shoot *O. jamaicensis* at all sites where they are observed.

New control methods that aim at better spotting, attracting and trapping *O. jamaicensis* are developed and tested, such as placing watchtowers in parts of lakes where Ruddy duck have been observed, the use of a floating and camouflaged lookout boat to drive birds towards shooters, and the establishment of a trapping cage with a live luring Ruddy duck inside. The project also implements more intensive efforts to find *O. jamaicensis* nests and female birds and destroy them.

An EWRR System is developed through the creation of a network of observers/informants. Furthermore, in order to prevent new introductions in the wild, owners of captive Ruddy duck are included in an inventory to improve information exchange.

The project team actively collects and analyses scientific information, needed to report on, evaluate and possibly adjust control practices. Most interestingly, the information and data collected so far were used to develop a population dynamics model that estimates the number of birds that should be caught in order to achieve full eradication of the population. The current population in France is estimated to hold less than 100 individuals, which is very encouraging and strengthens the project's prospects for the full eradication of the Ruddy duck population in France. No new introductions of *O. jamaicensis* have been noted since the project's start.

Photo: An IP protecting freshwater habitats in Finland - LIFE14 IPE/FI/000023 - © Isojoki_Pauliina Louhi/Metsähallitus

6. LIFE enables and empowers

6. LIFE enables and empowers

Nature conservation improvements take time. This is why to achieve positive outcomes on the ground, the results from the conservation actions should be sustained. Three key factors are necessary to ensure the sustainability of LIFE projects results[44]. Two of them are linked to governance and capacity building: i) the projects should rely on a stable organisation and ii) the projects should be supported by the authorities. The third highlighted factor relates to the continuation of funding. Other key enabling factors that are common in most LIFE projects include stakeholder engagement, law enforcement, networking and awareness-raising. This Chapter presents a selection of some of LIFE's most illustrative projects in this field.

The 2014-2020 LIFE programme introduced a new tool to strengthen its impact on Natura 2000 policy implementation: the nature Integrated Projects (IPs), which have a strong focus on enabling processes. The IPs should indeed include a combination of actions that contribute directly to the implementation of measures of the prioritised action framework (PAF) of the Member State as well as horizontal actions that facilitate the implementation of the PAF. In a platform meeting hosted by **BNIP** (LIFE14 IPE/BE/000002) in October 2019, and gathering all nature IPs, participants highlighted the added value of IPs to enhance Natura 2000 governance, among other themes. In their view, IPs are creating a leverage effect by offering capacity to:

- build relations between many actors;
- jointly develop nation- or region-wide strategies and conservation priorities and objectives;
- enable communication and cooperation between hierarchical levels (vertical) and between sectors and actors at the same level (horizontal);
- facilitate cross-pollination between the actors, cross-border cooperation, and stakeholder engagement;
- open 'doors' for stakeholders that would otherwise be reluctant or not interested in the targeted objectives, by giving European weight.

The new LIFE programme 2021-2027 will put further emphasis on these aspects through a new type of projects called 'Strategic Nature Projects' (SNaPs) for all Member States to improve their governance and help mainstream nature and biodiversity policy objectives into other policies and financing programmes, such as agriculture and rural development.

6.1 LIFE AND GOVERNANCE AND CAPACITY BUILDING

KEY MESSAGES

Governance and capacity building are crucial for sustaining conservation results in the long term, and to continue, and expand implementation towards achieving the conservation objectives. LIFE is a key factor in many countries in setting up effective governance structures and building capacity. Particularly successful is the development through LIFE of transboundary governance for migratory species, such as flyways of birds. Important tools that have been developed and implemented with LIFE funding to support governance include site management plans and species action plans.

6.1.1 The importance of governance and capacity building

Good governance is widely recognised as a key element for the successful implementation of the EU Nature Directives (Tucker et al., 2019), at all levels – from the EU to the site level. Within the field of Natura 2000 policy implementation, governing entails defining clear and relevant nature conservation objectives, translating these objectives into coherent actions integrating the objectives into other policies, and engaging all relevant stakeholders. Thus, good governance does not only mean an effective support of the institutions in charge, it also strongly depends on the capacity of these institutions and other stakeholders to enforce the legislation, implement policy on the ground, and mainstream nature conservation objectives into other sectoral policies. Governance and capacity building are intricately linked to each other, which is why both are treated here together.

Since its beginning, the LIFE programme has supported the development of Natura 2000 governance systems and capacity building in nature conservation organisations, in particular, and in project areas more generally. For example, two LIFE projects had a crucial role in the

44 *LIFE makes a difference*

development of Natura 2000 site management plans in France and in Italy[45]. In both countries this started in the late 1990s, making them among the first EU Member States to produce guidelines for managing Natura 2000 sites. 'LIFE for Natura 2000', taking stock of the LIFE contribution to Natura 2000 policy, already concluded in 2003 that:

- LIFE Nature has been able to propose a large number of sites for the Natura 2000 network through its work on inventories and the momentum it gave at local level to acceptance of this policy;
- national authorities have often used the LIFE programme to develop policies to structure Natura 2000 and their own networks of protected areas;
- many local bodies have, through LIFE Nature projects, been able to support their conservation policy in synergy with the development of the Natura 2000 network. This financial instrument has also helped NGOs to develop and become more professional;
- the LIFE Nature programme has provided an opportunity to integrate socio-economic stakeholders into partnership and participation initiatives in favour of biodiversity conservation.

In the last decade, the LIFE contribution to enhanced Natura 2000 governance processes has been especially important in newer Member States. For instance, in Slovenia, **SI Natura2000 Management** (LIFE11 NAT/SI/000880) set up a Natura 2000 Management Programme for the 2015-2020 period, laying the foundations for achieving improved conservation status of Natura 2000 species and habitat types in the future and providing a basis to apply for specific EU funds. Measures from the Natura 2000 Management Programme have already been integrated into several sectoral and other operational programmes, such as the Rural Development Programme. The Ministry of the Environment and Social Planning, coordinating the project, also prepared additional documents such as the PAF, with LIFE funding.

A previous LIFE Nature project in Slovenia, **Triglav** (LIFE00 NAT/SLO/007231), implemented before the accession of Slovenia to the EU, had already paved the way for the establishment and the management of the Natura 2000 network (e.g. with a peat bog site management plan that was the first of its kind in Slovenia and served as a template for later Natura 2000 site management plans).

The LIFE project actions for governance entail in particular the set-up of governance organisations or schemes, the establishment of management plans for Natura 2000 sites involving all relevant stakeholders, as well as liaising, raising awareness and training decision-makers, not only in the field of environmental policies but also in other sectors, as well as administrations and professional stakeholders (farmers, hydropower plant managers, etc.).

Thus, LIFE has also deeply contributed to building capacity in different types of stakeholders: public authorities and economic operators, as mentioned above, and also within nature conservation organisations themselves. Capacity building has been one of the most significant achievements of the LIFE programme (EU, 2014).

Examples on enhanced capacity building can be found in all Member States, and from the beginning of the LIFE programme. For example, in Romania three LIFE projects had supported the establishment of an independent network of experts and managers, who were then able to advise the Romanian Environment Ministry on large carnivore issues (**Vrancea** - LIFE02 NAT/RO/008576, **Carnivores Vrancea II** - LIFE05 NAT/RO/000170 and **URSUSLIFE** - LIFE08 NAT/RO/000500). When the first project began in 2002, there was a team of three people and in 2013 they were more than 25 of them working on large carnivore conservation issues, either within URSUSLIFE or other projects running in parallel. The expert network created and reinforced over the years has proved especially useful for instance in monitoring activities. Thanks to these LIFE projects, more organisations have now the know-how and the capacity to lead large nature conservation projects.

For instance, **WOLFLIFE** (LIFE13 NAT/RO/000205) is coordinated by the Vrancea County Environmental Protection Inspectorate, which led the LIFE02 project, with the Asociatia Pentru Conservarea Diversitatii Biologice (APCDB) as an associated beneficiary. The APCDB was a local NGO at the time of the first project in 2002. In 2013, it was still managed by the same core team of experts and had managed six other projects in favour of large carnivore conservation funded by different sources (from National Geographic to EEA grants – more than €2 million investment in total), drawing on the initial capacity building impact of LIFE. In Romania, the Wolf has a good conservation status, which has remained stable over the years (see Section 3.6.5).

45 *More information in the LIFE Focus brochure 'Integrated management of Natura 2000 sites' (EC, 2015).*

6.1.2 LIFE's contribution to better governance and improved conservation

Numerous LIFE Nature projects or LIFE Governance and Information (GIE) projects have included actions for better governance, the most common action being the establishment of Natura 2000 sites and corresponding management plans. Here we highlight successful nature conservation cases, where such actions seemed to have played a significant role in the observed conservation improvements. Similarly, we identify a few success stories where the integrated Natura 2000 site management promoted by LIFE projects has been particularly important in the achievements.

Through **Blanket bog** (LIFE00 NAT/UK/007075), the government body Scottish Natural Heritage developed a long-term strategy for the region (2005-2015), which brought together major stakeholders (public authorities, nature conservation NGOs, landowners, economic operators, universities) in the Peatlands Partnership that has continued to work towards the objectives of the strategic plan developed within the LIFE project. In particular, the Peatlands Partnership developed and implemented a five-year project entitled 'Flows to the future'. With a budget of £10.6 million funded by the UK National Heritage Lottery Fund and other partners, the project undertook large-scale peatland restoration, as well as an extensive awareness-raising programme of school and community activities. The long-term strategy and the support of an integrated governance structure have certainly contributed to the conservation improvements highlighted in Section 3.7.6 for blanket bogs.

In Cyprus, **OROKLINI** (LIFE10 NAT/CY/000716) laid down the foundations for the sustainable management of Lake Oroklini SPA and the long-term conservation of two Annex I bird species, the Spur-winged lapwing (*Vanellus spinosus*) and the Black-winged stilt (*Himantopus himantopus*), by improving governance in the SPA. The project brought together competent authorities and specialists to prepare an action plan for the birds of the SPA, establishing Favourable Reference Values (FRVs) for the two main targeted species, and for two other Annex I species that regularly nest or nested at Cyprus's Oroklini Lake: Eurasian stone-curlew (*Burhinus oedicnemus*) and Kentish plover (*Charadrius alexandrinus*). Moreover, Oroklini Lake was included in the list of water bodies monitored by the Water Development Department and all project partners involved in the wetland management committed to an integrated management framework taking into account nature conservation and water quality objectives. The project thus offered a model of cooperation between government bodies, NGOs and local community, as well as an example of an efficient and effective management of an important site with specific conservation objectives, especially on the issue of hydrological management of a seasonal wetland, which can be used as a management model for other areas in Cyprus. At the end of the project, the monitoring results were encouraging. The project team observed that bird numbers started moving towards the FRV target for *Vanellus spinosus*, while other Annex I species that do not regularly breed on site were recorded nesting during 2014 and 2015 (e.g. Little tern - *Sternula albifrons, C. alexandrinus, B. oedicnemus*, Cattle egret – *Bubulcus ibis*).

The conservation of the Spanish imperial eagle (*Aquila adalberti*) is another example where the LIFE programme has had a catalytic effect regarding the creation of coordinated governance structures at national level. Since 1987, the Ministry of Environment and the Madrid, Castilla y León, Castilla-La Mancha, Extremadura and Andalusia Regional Governments have been carrying out a Coordinated Plan of Action for Imperial Eagle Conservation, with the essential support of several LIFE projects since 1992 (five LIFE92 projects[46], one for each region, which were followed by others[47], building up on these first projects). In each of the five regions, the LIFE projects aimed to develop a joined-up approach to i) reduce the non-natural mortality rate of the species, ii) improve the feeding habitat, and iii) increase the breeding success. Strong emphasis was given to coordination and information sharing across the projects. To this end, the different regional authorities and national government departments established a common LIFE programme Steering Committee. From 1997, the group, known as the Imperial Eagle Task Force, has ensured the coherence between the different species action plans established at the regional level, and it even succeeded in developing a national conservation strategy. The Imperial Eagle Task Force also facilitated the integration of the conservation actions for *A. adalberti* into the regional Rural Development Programmes. This unprecedented cooperation at the national level in favour of species conservation has undoubtedly contributed to the species conservation improvements observed in Spain (see Section 3.5.4 and the study 'Long-term impact and sustainability of LIFE Nature' for more information).

46 LIFE92 NAT/E/014300; LIFE92 NAT/E/014301; LIFE92 NAT/E/014302; LIFE92 NAT/E/014303; LIFE92 NAT/E/014304
47 LIFE94 NAT/E/001044; LIFE94 NAT/E/004823; LIFE94 NAT/E/004824; LIFE94 NAT/E/004825; LIFE94 NAT/E/004826; LIFE95 NAT/E/000593; LIFE95 NAT/E/001150; LIFE95 NAT/E/001151; LIFE95 NAT/E/001152; LIFE95 NAT/E/001153; LIFE99 NAT/E/006327; LIFE99 NAT/E/006336; LIFE00 NAT/E/007348; LIFE03 NAT/E/000050; LIFE04 NAT/ES/000034; LIFE06 NAT/E/000209; LIFE07 NAT/E/000742; LIFE08 NAT/E/000062; LIFE09 NAT/ES/000533; LIFE12 NAT/ES/000595; LIFE13 NAT/ES/001130

The successful result of Saint Hubert (LIFE03 NAT/B/000019) in Belgium is also partly due to their work on governance structures. Within this project, a unique State Nature Reserve (Réserve Naturelle Domaniale, la 'RND du Plateau de Saint-Hubert') was created on 624 ha, along with detailed management plans. This is the largest nature reserve established in the Walloon region in Belgium in the past 20 years. The reserve is managed by the Forestry administration together with an advisory Management Committee, formed by scientists. The multidisciplinary nature of this committee is guaranteeing a global vision for the management of the reserve. The project provided a successful model for a number of other LIFE Nature projects in Wallonia targeting the restoration of peatlands and wetlands. This has resulted in an improved conservation status of Bog woodland (91D0). More information on this conservation success for peatlands in Belgium can be found in Section 3.7.6.

The improved conservation status of the Yelkouan shearwater (*Puffinus yelkouan*) in Malta is also partly due to better governance, to which LIFE projects significantly contributed. GARNIJA-MALTIJA (LIFE06 NAT/MT/000097) managed to establish an effective partnership between NGOs and governmental services with long-term management plans for the Rdum tal-Madonna SPA in place at the beginning of the project. Thanks to the partnership established and intensive monitoring work from NGOs, the project has led to important results, as described in Section 3.5.4.

Another illustration on how governance is important for sustainable conservation results, and how LIFE can play a key role in that matter, is given by Gulf of Finland (LIFE03 NAT/FI/000039). This project has established a functional network of 12 Natura 2000 wetland areas along the northern coast of the Gulf of Finland flyway and has resulted in conservation improvements for target coastal wetland habitats and increased numbers of breeding and staging birds (Section 2.3.6). More than 10 years after the end of the project, the long-term conservation management of the sites was still ensured, which explains the very good results observed. This is partly thanks to the work of the project team on governance. Participatory planning processes were used to settle conflicts between nature conservation objectives and other land use objectives and prepare management plans for 10 sites, defining clear and concerted goals for management, as well as the procedures to attain them. In the planning stage, further funding was also determined, as well as the parties responsible for management after the project. The good working relationships established between the various stakeholders (e.g. birdwatchers, hunters and landowners) have remained active after the end of the project. It is worth noting that long-term site management has also been facilitated by the technical, financial and administrative expertise gained in the project partners' organisations during the LIFE project (many staff members still work there).

In the French overseas department of La Réunion, CO-REXERUN (LIFE07 NAT/F/000188) and LIFE+ Forêt Sèche (LIFE13 BIO/FR/000259) have sought to enhance local governance so as to make sure that the local population, municipalities and local players understand the dry forest conservation issues, take ownership and eventually carry on conservation actions for the dry forest after the end of the project. Participatory processes have been used all along the project to engage local players in the project actions. This has resulted, for instance, in a massive participation of volunteers in the planting operations carried out within the two projects to restore and improve the connectivity between existing patches of semi-dry forest habitats; for **CO-REXERUN** alone it was estimated that some 1,700 volunteers were involved in such operations. This had a multiplier effect for these restoration operations.

Numerous LIFE projects have directly contributed to the establishment of species or habitat action plans, which have then led to improved conservation results. This is for instance the case for the Lesser kestrel (*Falco naumanni*) in France (Faucon crécerellette - LIFE97 NAT/F/004119 and LIFE TRANSFERT - LIFE05 NAT/F/000134). The first project set the basis for a long-term conservation programme and resulted in the establishment of a Sspecies Action Plan (SAP), implemented after the end of the projects. The conservation actions, including the reintroduction programme launched within **LIFE TRANSFERT** were carried on after the end of the project. This continuous effort has resulted in an increasing trend of the species in France for the last 20 years (see Section 3.5.4). Similarly in Italy, a series of LIFE projects have contributed to an increasing trends for *F. naumanni* (the population has more than doubled between 2005 and 2018; NEEMO, 2018). The SAP established in Un Falco per Amico (LIFE11 NAT/IT/000068) is expected to consolidate this positive trend.

At a larger scale, the preparatory project EuroSAP (LIFE14 PRE/UK/000002) has recently drafted eight SAPs[48], as well

48 *For Monteiro's storm petrel (*Oceanodroma monteiroi*), Yelkouan shearwater, Velvet scoter (*Melanitta fusca*), White-headed duck (*Oxyura leucocephala*), Dalmatian pelican (*Pelecanus crispus*), Gypaetus barbatus, Cinereous vulture (*Aegypius monachus*) and European turtle dove (*Streptopelia turtur*).*

as a multi-species action plan[49], all adopted by Member States for implementation. To ensure the effective coordination, transparency and broader consensus among the **EuroSAP** partners and key stakeholders (namely governments, NGOs and research institutes), the project produced a collaborative platform called the 'Species Action Plan Tracking Tool' (SAP TT)[50]. Some of the target species have already seen their conservation status or population trend improved in some countries partly thanks to LIFE projects (e.g. the Bearded vulture (*Gypaetus barbatus*) in France), and these international action plans should favour their conservation. The plans developed under the EuroSAP project were the EU contribution to the international multi-species action plan to conserve African-Eurasian vultures (Vulture MsAP) that was adopted in 2017 by the CMS parties.

Some LIFE supported projects have also been particularly good at cross-border and international cooperation, this leading to significant benefits for the conservation of the target species or habitat across their flyways or distribution areas. For instance, **Mikri Prespa** (LIFE02 NAT/GR/008494) managed to restore appropriate water-level management in the lake Mikri Prespa, part of the transboundary Balkan Prespa Park designated in 2000 by Albania, the Republic of North Macedonia, and Greece, thanks to a series of local stakeholder consultations. This has benefited many water bird species populations, including the Dalmatian pelican (*Pelecanus crispus*) and Pygmy cormorant (*Microcarbo pygmaeus* syn. *Phalacrocorax pygmeus*) (see Section 3.5.4).

Anser-Eur (LIFE05 NAT/FIN/000105) and **Safeguard LWfG** (LIFE10 NAT/GR/000638), targeting the Lesser-white fronted goose (*Anser erythropus*), have improved the cooperation between five countries along the species flyway (Finland, Norway, Estonia, Hungary and Greece) including the preparation of coordinated national SAPs (approved by the end of the project in Norway, Estonia and Finland) and a joint contribution to the new international single-species action plan for the conservation of the western Palearctic population of the *A. erythropus*, which was adopted by the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). This coordinated effort has led to a positive trend in the breeding populations in Finland.

The **Return of the Neophron** (LIFE10 NAT/BG/000152) and more recently the **Egyptian Vulture New LIFE** (LIFE16 NAT/BG/000874; see Section 3.5.4) offer also a good illustration of a strategic flyway conservation approach, with actions in south-eastern Europe (Bulgaria and Greece) and in Africa (Ethiopia). **Return of the Neophron** developed a national SAP for Egyptian vulture (*Neophron percnopterus*) in Greece, as well as a national strategy against poison and a National Task Force. The project mobilised the international conservation community for the elaboration of a flyway action plan. **Egyptian Vulture New LIFE** is building on the first project results, and foresees in particular the development of a stable network of organisations established, both governmental and non-governmental, working towards halting the decline of the population of the species in its EU easternmost breeding grounds and in the congregation, bottleneck and wintering grounds along the flyway. Although it is too soon to see any significant conservation improvements reflected in the Article 12 report (two additional breeding pairs were observed at the end of **Return of the Neophron**), it is a necessary step in the long-term conservation strategy of such migratory species.

Other examples of conservation improvements that are linked to effective transnational governance approaches in LIFE projects include: coastal dunes in the Atlantic biogeographical region (see Section 3.7.3), Bearded vulture in the Alps and more generally in the EU with a remarkable historic cooperation between nature conservation actors, and more recently an effective and strategic coordination by the Vulture Conservation Foundation, the Great bustard (*Otis tarda*) in Austria-Hungary and Slovakia , or the Brown bear (*Ursus arctos*) in Slovenia, Austria, Croatia and Italy (**LIFE DINALP BEAR** - LIFE13 NAT/SI/000550).

6.2 LIFE AND WILDLIFE CRIME

KEY MESSAGES

In some EU Member States wildlife crime hinders the recovery of species and frustrates the impact of LIFE projects aiming at species conservation. Law enforcement is an essential component of the implementation of the EU Nature Directives. Although relatively few LIFE projects focus on wildlife crime, they prevented species from becoming extinct locally. Especially raptors seem to be the victim of most LIFE enforcement projects.

49 *For 'Baltic' dunlin (*Calidris alpina schinzii*), Black-tailed godwit (*Limosa limosa*), Common redshank, Common snipe, Eurasian curlew, Eurasian oystercatcher (*Haematopus ostralegus*), Northern lapwing (*Vanellus vanellus*) and Ruff (*Calidris pugnax*).*

50 *www.trackingactionplans.org/pages/landing_saptt.html*

Implementing nature conservation policy and legislation correctly and effectively across national borders is an essential element in achieving conservation success, especially regarding migratory species.

The Nature Directives are accompanied by relatively high numbers of complaints to the EC and infringement cases every year (1,213 infringement cases on 'nature' since 2002, out of a total of 51,004 for all EU policy areas[51]). This indicates that inspections and enforcement, primarily a responsibility of the Member States, needs to be strengthened. The EU Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the EU, EEA and European Free Trade Association (EFTA) countries and it has an important role to play in respect to wildlife crime. Nature protection is one of the main topic areas in its strategy, covered by a dedicated Green Expert Team. It contributes to strengthening the implementation of EU nature legislation among others by raising awareness, exchanging best practices, improving cooperation between (enforcement) experts, or organising joint inspections. Combating the illegal killing of birds and the implementation of nature directive requirements within the Natura 2000 network are among IMPEL's key areas of work, making it an essential partner for implementing the LIFE programme. IMPEL also occasionally leads a LIFE Project, such as **LIFE SWEAP** (LIFE17 GIE/BE/000480), which aims at increased compliance of the industry with the Waste Shipping Regulation. Its goal is to help reduce the amount of plastic waste in the seas and oceans, a key pressure to marine wildlife. **LIFE SWiPE** (LIFE19 GIE/BG/000846) will build on the knowledge base developed through LIFE and IMPEL and aims at developing a robust and reliable evidence base on European wildlife crime in 11 target countries.

The publication 'LIFE & wildlife crime' presented an in-depth overview of the contribution of the LIFE programme to combating wildlife crime. The current text presents a summary of that report.

Wildlife crime, often cross-border, has a negative impact on biodiversity across the world. It can take many shapes, such as illegal trapping and poaching for food, illegal predator/pest control, illegal killing for sport of protected species, illegal egg collection and taxidermy, illegal poisoning, illegal trade of protected species, and illegal destruction of protected habitat. These types of activity can be very profitable for the perpetrators, and they are very hard to detect.

LIFE has played a pivotal role in piloting actions that can help prevent and reduce wildlife crime across the EU (EC, 2018c). Until 2017, the programme has invested more than €70 million in 43 LIFE projects that have targeted illegal activities connected to wildlife.

Of these 43 LIFE projects, the majority have addressed the problem of poisoning of protected species, in particular birds, such as raptors and vultures, as well as large carnivores. Projects have also targeted other wildlife crimes, such as illegal hunting, trapping and poaching, and species trafficking.

LIFE projects dealing with wildlife crime have been mainly located in southern and central Europe. This is in line with the highest incidences of wildlife crime in Europe, according to BirdLife's Killing 2.0 report. However, several Member States, in particular in central Europe, have yet to have a LIFE project addressing wildlife crime activities. Some projects have implemented trans-border actions, such as the Bulgarian-led **Return of the Neophron** project, which is also active in Greece.

Within the main categories of actions as identified in the EC Roadmap towards eliminating the illegal killing, trapping and trade of birds' examples of **activities** in LIFE projects include:

- monitoring and data collection: collecting cases (database) and reporting of wildlife crimes, and identifying which species are targeted by which types of illegal activities and where;
- information exchange, training and awareness-raising: training enforcement officers, training dogs to detect poison baits, training in evidence collection (poison kits), and setting up public information campaigns against the illegal use of poison;
- enforcement and legal aspects: updating and implementing legislation, fines and sanctions, training specialised prosecutors in judicial processes, and helping to establish or resource specialised wildlife crime units within police forces;
- prevention: setting up surveillance zones in collaboration with local hunters' associations.

Key achievements of implementing such LIFE activities include:

- monitoring and data collection with new satellite tagging technologies;

51 https://ec.europa.eu/atwork/applying-eu-law/infringements-proceedings/infringement_decisions/ *(consulted 14/02/2020)*

- database of incidents (potential to become pan-European);
- anti-poison detection and prevention patrols in almost all EU Mediterranean countries;
- anti-poison networks involving hunters and shepherds etc.;
- working with technology and people, often cross-border;
- getting the media involved – making people aware that wildlife crime is a crime;
- awareness-raising campaigns across Member States;
- specialised awareness-raising and training for statutory authorities, police, customs, public prosecutors, environmental lawyers and judges;
- strong and clear penalties, more routinely enforced.

The conservation status of the Eastern imperial eagle (*A. heliaca*) in Hungary is seriously threatened by the exponential increase in deliberate killings by poisoning and shooting. Over 50 imperial eagles are believed to have been killed between 2005 and 2010 – 23% of the national and 14% of the EU breeding population in 2010. The main objective of HELICON (LIFE10 NAT/HU/000019) and **PannonEagle LIFE** (LIFE15 NAT/HU/000902) was to improve the conservation status of the Eastern imperial eagle population in Hungary by significantly reducing non-natural deaths caused by persecution incidents.

The project's key conservation measures that led to the decrease in persecution incidents were creating best-practice protocols and establishing a bird-crime database, conducting satellite tracking of eagles and nest guarding at key Natura 2000 network sites (SPAs), providing safe feeding places and constructing artificial nests. **HELICON** established the first multi-partner collaboration, an anti-bird-crime action group and the first field dog unit for Central Europe to detect, investigate and mitigate wildlife crime, particularly illegal poisoning. This anti-poison dog unit proved to be a big success, not only in it being an effective detection approach but also in raising awareness with the local public of the issue of illegal killing of wildlife. Through lots of communication activities both projects have made a substantial number of people in Hungary and abroad more aware of the imperial eagle, bird crimes – including deliberate poisoning, and the related conservation challenges. The projects have supported a steady natural growth of the *A. heliaca* population in Hungary, the source population for neighbouring countries in the Carpathian Basin, which showed a significant increase between 2013 and 2018, from 151 to 245 territorial pairs. A similar significant increase in the number of Eastern imperial eagle pairs was detected in the Carpathian Basin between 2014 and 2018, from 220 to 305 breeding pairs.

BIRD MIGRATION AND TRAPPING (LIFE07 INF/MT/000554) focused on raising awareness among trappers and the general public in Malta about the damage that trapping of wild songbirds made to their populations. It ultimately sought to achieve more rapid implementation of the Birds Directive in Malta, and a measurable decrease in deliberate – and illegal since 2009 – trapping of wild songbirds. Being a LIFE information and communications project, the focus was on activities such as calendars, stickers, a TV series, an international seminar, face-to-face contact with trappers, and education activities for primary and secondary schools. This significantly contributed to reducing songbird trapping by making more than 84% of the general public aware of the threat represented by trapping for bird species, by making around 40% of the public aware that trapping of wild songbirds is forbidden in EU countries, by reducing the number of actively used trapping sites from nearly 4,800 in 2008 to less than 1,200 in 2010, and by decreasing the number of licensed trappers from over 4,600 in 2008 to fewer than 2,900 in 2010.

In the UK, LIFE hen harriers (LIFE13 NAT/UK/000258) addressed the decline of one of the country's most threatened raptor species, the Hen harrier (*Circus cyaneus*). A key reason for its recent decline is its illegal persecution associated with commercial shooting of Red grouse (*Lagopus lagopus scoticus*), especially in northern England and southern and eastern Scotland. The project improved the understanding of Hen harrier movements and of the intensity and nature of persecution in the project area. It protected Hen harriers at over 100 breeding sites and at 150 wintering sites, involving over 45,000 volunteer hours. The project maintained habitat that is suitable for harrier recovery, it engaged local communities by speaking with over 13,000 people at events and talks, and it raised public awareness of Hen harriers, the threats they face and conservation efforts to overcome these. Despite these important achievements a further 24% decline in the *C. cyaneus* population was recorded. To stop the illegal activity that is currently causing the decline of Hen harriers and other birds of prey, the project formulated lessons learned, such as the need for a licensing system, underpinned by effective monitoring and enforcement, which would hold grouse moor owners accountable for managing their land sustainably and legally, as well as the need for a coordinated European Species Action Plan to understand the reasons for this wider decline and protect Hen harriers across their range.

A project that covers the wider Mediterranean region is LIFE Against Bird Crime (LIFE17 GIE/NL/000599). Working with priority countries, such as Cyprus, Greece, Italy and Croatia, and with relevant international convention secretariats, the project aims to expand and improve knowledge on the illegal killing of birds; raise awareness; support increased international and national advocacy efforts; design and implement pilot projects with key stakeholders in priority countries; contribute towards achieving the objectives of the Birds Directive, the EU roadmap for combating illegal killing, trapping and trade of birds, and the EU Biodiversity Strategy; and to maintain and strengthen the networks of civil society organisations and stakeholder groups working together to address illegal killing.

6.3 LIFE AND NETWORKING AND SHARING EXPERIENCE

KEY MESSAGES

Networking to share experience and increase impacts is an essential component of the LIFE programme. Networking takes various forms: between partners within projects, from one project to the next in a same region (meta-projects), between projects across biogeographical regions, or with other stakeholders. Examples from LIFE meta-projects have shown the enormous value of continued effort in a same region or on a same habitat type or species, where projects over time build on experiences and lessons from earlier projects, achieving much greater and continued impact by upscaling and replicating lessons learned.

The people and organisations involved in the LIFE programme make a vast and committed community. Whether it concerns the beneficiaries within an individual project or between a set of LIFE projects, stakeholders joining in steering groups or specific actions, co-financers or the staff at the European Commission, EASME, or the external monitoring team, all these involved actors participate in a Europe-wide network that is dedicated to conserve and restore Europe's most precious nature.

Because LIFE Nature projects cover hundreds of sites across Europe with similar habitat types or species groups and similar conservation issues, networking and sharing of experiences between the project actors is essential. Networking helps build capacity, makes the use of resources – including personal knowledge – more efficient, and increases the impact of the investment that the LIFE programme makes. It also is an important means to find out if impacts of restoration go beyond the individual project area, to create ownership and engagement among stakeholders and to share the pride and commitment to work on often unique natural features.

Networking to share knowledge is a standard requirement for all LIFE projects. However, some are designed with networking as a key outcome. For example **CAP DOM** (LIFE09 NAT/FR/000582), on the conservation of French overseas threatened bird species and their habitats, developed strong ties and collaboration with local players and volunteers in a participative approach. It created a conservation network of managers working on three overseas nature sites on three continents (Réunion, Martinique, and French Guiana). The Habitats and Birds Directives do not apply to these areas but the project set up a counterpart to the Natura 2000 network to build on the expertise that is available in Europe. This has resulted in a joint toolbox for conservation and improved populations of a range of threatened bird species.

The Spanish **LIFE RESECOM** (LIFE12 NAT/ES/000180) demonstrated that the coordination of a diverse set of monitoring teams (rangers, volunteers, scientists, freelance specialists, and technicians) can facilitate a robust and self-sustaining monitoring network able to continue on its own after the project (and to be replicable in other regions). It invested a lot of effort in training the network members to monitor the distribution and abundance of 26 endangered plant species in a range of 13 habitats in the Aragón region. The work of the project gathered information for the regional Article 17 report. For example, with improved knowledge the conservation status of one of the target species *Centaurea pinnata* went from poor to good.

More often, networking for knowledge exchange and sharing best practice is done between projects that work on similar themes, often across national borders, be it a same species or habitat in a wider region, a common threat, or on an ecological connector, such as migration flyways. **Anser-Eur** (LIFE05 NAT/FIN/000105) and **Safeguard LWfG** (LIFE10 NAT/GR/000638) for example, set up a network of experts and field observers along the European flyway of *Anser erythropus*, stretching from the north of Norway over eastern Europe to Greece in the southeast. This network continued active collaboration during the project and afterwards.

The project **Egyptian Vulture New LIFE** does something similar by establishing a stable network of organisations, both governmental and non-governmental, along the eastern European flyway of *Neophron percnopterus*, from the Balkans to northeast Africa and the Middle East (see Section 3.5.4 and Section 6.1.2).

For over 20 years a series of LIFE projects focusing on coastal dunes in the Atlantic biogeographical region have shared experience through European and national networks, workshops and field visits. A similar dune network was established in Italy to share the experience of several projects in habitat restoration, control of invasive species and management of recreation pressure, such as **LIFE RES MARIS** (LIFE13 NAT/IT/000433) and **SOSS DUNES LIFE** (LIFE13 NAT/IT/001013) in Sardinia focusing on *Coastal dunes with Juniperus spp.* (2250*), a habitat covered by over 40 LIFE projects in the Mediterranean area.

A different kind of networking is that taking part in 'meta-projects', a series of LIFE projects over time that complement each other and of which the impact is greater than the sum of each project. This is certainly the case for dune habitat restoration projects in Belgium, the Netherlands and Denmark. Through knowledge sharing and milestone events such as international meetings there is an improvement in scientific knowledge which in turn improves the focus and success of restoration actions. As an example, the Danish **LIFE LAESOE** (LIFE11 NAT/DK/000893), **LIFE WETHAB** (LIFE12 NAT/DK/000803) and **REWETDUNE-LIFE** (LIFE13 NAT/DK/001357) all operating in the County of Nordjylland, have developed new approaches to dune management by working closely with private landowners to control scrub and tree growth, introduce grazing and remove invasive alien species. The international conference 'Management of coastal dunes and sandy beaches', held by **Life FLANDRE** (LIFE12 NAT/BE/000631), greatly supported networking opportunities.

Also in Belgium, the series of projects to restore peatland on the plateaux in the Ardennes is a meta-project building on 17 years of consecutive networking (see Section 3.7.6). Thanks to the networking over time, building on lessons from previous projects, great successes are reported for peat recovery as well as species recovery.

Such networking between projects already starts from the moment that LIFE funding has been granted to projects, during the annual LIFE welcome meetings organised by EASME that kick-off the project implementation for all new projects and facilitate project partners to exchange experiences and identify connections.

A long-lasting network that was set up as part of **ECRR** (LIFE99 ENV/DK/000619) is the **European Centre for River Restoration**. The ECRR is the key network to promote and build capacity for ecological river restoration across Europe, supporting various European and global policies, including the EU Biodiversity Strategy and the Nature Directives. Established with LIFE funding in 1995, the network was continued with LIFE support in **RESTORE** (LIFE09 INF/UK/000032) and then hosted by Dutch and Italian institutions until it became a legal entity in 2014, a major, lasting achievement of LIFE.

Networking between projects in a same region is also facilitated in some areas by the external monitoring team, through **InterLIFE meetings**. These are held on an annual basis and bring together all running LIFE projects in a same monitoring region (e.g. Benelux). Usually such events take two days, including a day of presentations of individual LIFE projects or of specific themes, a visit to a LIFE project with the beneficiaries, and social networking. The impact in terms of project efficiency and the multiplier effects is not to be underestimated.

Networking events focused on a particular theme are also held by the external monitoring team, called **platform meetings**. These events gather LIFE projects from across the EU that work on a similar theme, allowing them to learn from each other, while also providing relevant policy input to DG ENV from practitioners on the ground. In the past few years, platform meetings were held on topics such as river restoration, invertebrates, species reintroduction and ecosystem services.

A much wider networking opportunity is offered through the **Natura 2000 Biogeographical Process**[52] and the Natura 2000 Communication Platform. Launched by the European Commission some 10 years ago it is set to help Member States achieve good conservation status for habitats and species protected under the EU Habitats and Birds Directives. It enhances coordinated and collaborative approaches among those countries sharing a common biogeographical context and by doing so is strongly dependent on the active involvement of Member States and stakeholders (e.g. NGOs). The Process involves mul-

52 https://ec.europa.eu/environment/nature/natura2000/seminars_en.htm

tiple stakeholders cooperating at biogeographical level through seminars, workshops, networking events and joint activities. It aims to enhance the effective implementation, management, monitoring, financing and reporting of the Natura 2000 network.

LIFE supports the Natura 2000 Biogeographical Process by:

- building and sharing knowledge and best practices on species and habitat conservation and restoration at biogeographical level;
- building partnerships between stakeholders for Natura 2000 management;
- providing funding and identifying complementary funding opportunities to implement agreed actions;
- raising awareness of Natura 2000;
- establishing networks for exchanging experiences, case studies and best practices across the EU;
- monitoring of project results (in support of Birds Directive Article 12 and Habitats Directive Article 17 reporting);
- promoting integrated Natura 2000 site management.

6.4 LIFE AND STAKEHOLDER ENGAGEMENT

KEY MESSAGES

Stakeholder engagement is a condition for the success of each LIFE project and at the same time a key impact of the LIFE programme. Cooperation between the many actors ensures understanding the needs for the protection/restoration, larger societal support, continuation of efforts and long-term impact of the LIFE investment. Stakeholder approaches are customised per project depending on each specific situation. Apart from the local societal impact the stakeholder actions jointly build a growing LIFE community.

The Natura 2000 network is not a system of strict nature-protected areas that systematically excludes all human activities, but adopts a different approach – humankind is an integral part of nature and the two work best in partnership with one another. Indeed, many sites in the Natura 2000 network are valuable precisely because of the way they have been managed up to now. Thus, rather than nature conservation being incompatible with human activities, in many areas protected habitats and species are dependent for their management and survival upon people making a living from the land.

The management of Natura 2000 sites is best done by working closely with the landowners and land managers and stakeholder groups in or around individual Natura 2000 sites in order to agree on the most appropriate ways to conserve the species and habitats whilst respecting the local socio-economic and cultural context.

An indication of stakeholder involvement is given by the partnerships in implementing LIFE projects. Figure 8 in Section 2.5.2 shows the diversity of stakeholders that have a leading role in implementing LIFE projects.

Stakeholder involvement, however, often goes beyond the project partnership, through steering committees, public hearings, or advisory groups. Although the databases of LIFE projects do not allow for analysing such involvement, 'LIFE and new partnerships for nature conservation' describes in detail a number of best cases, selected from some 90 LIFE projects that are exemplary for their focus on stakeholder engagement.

6.4.1 Volunteering

A specific group of stakeholders are volunteers[53]. Mobilising volunteers helps protect nature in numerous ways. It enables activities that would otherwise not be possible and involves society in conservation activities, which leads to greater public awareness, trust, and ownership of the process. The experience of volunteering can help people learn new skills, become socially integrated, and contribute to a better future. Understanding volunteers' motivations for participating in nature conservation programmes is an important element in the design and provision of programmes intended to harness the increasingly important talents and labour that volunteers bring to conservation programmes.

The activities carried out by volunteers within LIFE projects range widely – from practical restoration work, such as planting, removal of vegetation, fighting invasive alien species, and setting up structures important for biodiversity, to citizen science, such as reporting on nature observations or monitoring species.

Since the beginning of the LIFE programme, it is estimated that more than 160 projects have reported the inclusion of voluntary activities. LIFE Nature and Biodiversity projects in particular have benefited from the ability of nature conservation non-governmental organisations (NGOs) to leverage their networks of volunteers.

53 *"Volunteering for Nature Conservation", LIFE Platform Meeting 2018, Estonia*

The value of building volunteer networks is for example seen in the impact achieved by two French projects, CHIROFRSUD (LIFE04 NAT/FR/000080) and COREXERUN (LIFE07 NAT/F/000188). **CHIROFRSUD** targeted the conservation of three cave-dwelling bat species in southern France whose populations were in spectacular freefall – attributed to deterioration of their natural habitats and particularly disturbance of roosts by human activities such as caving. An important aspect of the project was its creation of a network of volunteer bat specialists from across the south of France to heighten awareness amongst local people and cavers about the need and means to conserve bat habitats. They in turn worked with almost 200 non-specialist volunteers in carrying out numerous studies to better understand the species.

In **COREXERUN** Réunion's national park authority used LIFE co-funding to target the conservation and restoration of relict areas of semi-dry forest habitats, which are today only found in degraded form and in inaccessible areas of gullies and cliffs. In order to preserve these very rare habitats and to get the local community on board, the project formed more than 30 partnerships. These involved islanders, local authorities, schools, companies, the army and other associations. The goal was to fully integrate the project into the community to ensure its longevity. More than 1,700 volunteers took part.

The EU Action plan for nature, people and the economy (Action 15) defined the following objective: 'Involve young people actively in measures dealing with societal needs by giving them the opportunity to get involved in nature protection in Natura 2000 sites (European Solidarity Corps - ESC)'. The ESC was launched by the European Commission in December 2016. This initiative gives young people between 18 and 30 a chance to support an NGO, local authority or private company that is active in addressing challenging situations across the EU, including nature conservation activities in Natura 2000 sites. Up till now, however, this type of LIFE project has not been widely adopted. Only six projects[54] were funded in the strand ESC in 2016-2017, focusing on monitoring, cleaning up river banks, awareness-raising, network development, or practical restoration works.

6.4.2 Monitoring and citizen science

Public participation in science has grown tremendously in recent years. When members of the public contribute to scientific work, often in collaboration with professional scientists, it is called 'citizen science'. The recent growth in citizen science has been facilitated by technology, for example, improved communication between scientists and the public via the internet, automated image recognition, observation portals, and the use of observation apps. Increasingly LIFE projects benefit from the involvement of volunteers in, for example, monitoring the impact of the restoration works, detecting invasive alien species, or tracking species migration.

In LIFE Euro Bird Portal (LIFE15 PRE/ES/000002) the partners of the European Bird Census Council developed a full-fledged web portal (EBP) that shows the distribution of 105 bird species across Europe, on weekly animated maps displaying data from January 2010 up to the current week, and at a resolution of 30x30 km. The bird observation data is collected on a daily basis from 28 European countries and is submitted automatically to a central repository created during the project. The main outcome is the production of daily maps and graphs showing near real-time information. The EBP viewer and the central database now cover all EU countries (except Malta) plus Turkey, Norway and Switzerland and have been updated with more than 320 million pieces of new data since the LIFE project started, thanks to the participation of more than 120,000 bird watchers across the EU.

The project is an example of efficient and far-reaching collaboration between 82 European entities. It is the largest citizen science initiative at EU level and is also the only big data project in Europe dealing with biodiversity data. It shows how the work of many entities, scientists and bird watchers can be combined and gathered to deliver relevant outcomes at European level.

The final project outputs are highly relevant for research, nature conservation, education and policy enforcement and development. The EBP offers enormous possibilities for the future, although it will depend largely on external funding. Future collaborations with relevant organisations and institutions at EU level will be crucial to make the best use of the data produced.

Other outstanding examples of LIFE projects with a strong aspect of citizen science include:

- MIPP (LIFE11 NAT/IT/000252) produced protocols to monitor five insect species listed in Annexes II and IV of the Habitats Directive. It also created a website for the collection of data on eight Habitats Directive target insect species. The citizen science approach has

54 LEWO - LIFE16 ESC/ES/000001; LIFEFOLLOWERSRN2000 - LIFE16 ESC/ES/000003; CHOO-NA - LIFE16 ESC/IT/000002; LIFE ESC360 - LIFE17 ESC/IT/000001; VISPO - LIFE17 ESC/IT/000002; VOLUNTEER ESCAPES - LIFE17 ESC/PT/000003

allowed the beneficiaries to significantly increase their knowledge about the presence of the target species at the national scale (> 2,500 records to date), thus enhancing the data collection necessary for the national report under Article 17 of the Habitats Directive. Among the activities was a sniffer dog being trained to be able to recognise the presence of Hermit beetle (*Osmoderma eremita*) and to signal it with remarkable accuracy.

- **LIFE IP Marine Habitats** (LIFE16 IPE/FR/000001) develops a citizen science programme to involve citizens in marine habitats monitoring. This is done through the organisation of workshops, preparation of monitoring protocols (targeting different marine habitats: maerl beds, seagrass, gorgonian habitats and intertidal habitats), training on the use of the protocols, organisation of working groups to discuss the data collected and the development of an online platform to share the outputs with participants and the public. The setting up of a deep-sea observatory is also foreseen, as well as events like a 'citizen science' day.

6.5 LIFE AND PUBLIC AWARENESS RAISING

KEY MESSAGES

The LIFE programme has become a brand for nature conservation and restoration across Europe, raising awareness on Natura 2000, changing attitudes towards protecting nature. The joint communication activities by the LIFE community reach large audiences. For example, in the 2007-2013 period alone over 6 million people were reached annually, including some 1.2 million pupils and students, raising awareness of Natura 2000 and the LIFE programme. Without 28 years of LIFE there would be much less awareness of the importance of nature. The LIFE programme has created grassroots conservation movements at the local level which are starting to show impact at national level and EU-wide.

Raising awareness and enhancing appreciation of species and habitats can motivate communities and businesses to value them and take responsibility for their protection (Tucker et al., 2019). All LIFE projects entail awareness-raising actions targeting various stakeholders and the general public. Some projects specialise in information and communication activities, the former LIFE information and communication (INF) projects, now governance and information projects (GIE).

Most LIFE Nature projects deploy a similar set of public awareness tools and actions, such as notice boards, websites, meetings, or trainings. Some go beyond the usual approach and develop more innovative ideas, such as caravans with mobile exhibitions, theatre plays, or games.

The publication 'Long-term impact and sustainability of LIFE Nature' stresses that 'successful LIFE Nature projects [...] raise awareness about European nature values'. It also concludes however that there is still some way to go before public opinion really supports nature conservation (and not only accepts it).

Raising public awareness may change behaviour (e.g. limit disturbance/damages caused by outdoor human activities, restore/develop traditional land use, etc.), ensure support to the conservation actions and respect to protected area delimitations, induce decision-makers to take action, etc. Types of public awareness actions implemented within LIFE projects include[55]:

- creating infrastructures for sight-seeing: visitor trails, observation platforms;
- producing and disseminating information material: notice boards, leaflets, webcams on bird nests or bat roosts, comic books;
- campaigns using for instance mobile exhibitions, video films, social media, photo contests, or even more original, a van (**LAG'Nature** - LIFE07 NAT/F/000193) or a caravan (**BNIP**, **LIFE+ DESMAN** - LIFE13 NAT/FR/000092) moving to meet people where they are (festivals, small Pyrenean valleys, beaches, etc.), a local carnival parade (**Blues in the Marshes** - LIFE11 NAT/NL/000770);
- educational activities for schoolchildren and other target groups;
- large variety of awareness-raising events: from large public conferences to guided tours in the field.

LIFE Activa Red Natura 2000 (LIFE11 INF/ES/000665) is a key example of a project set out to improve the overall awareness and understanding of Natura 2000. According to surveys at the start of the project in 2011, just 10% of Spanish people had heard of Natura 2000. The project's ethos was therefore simple: no one will care about protecting something that they don't even know exists.

55 *See also NEEMO, 2018.*

The NGO SEO/BirdLife joined forces with the Spanish international news agency, Agencia EFE, to carry out a range of communication activities, such as a series of half-hour documentaries showcasing Natura 2000 sites and their local communities across different regions of Spain. Beautifully filmed and narrated, they let viewers discover some of the most interesting and biodiversity rich areas of the country from the comfort of their armchair. The videos were broadcasted on Spanish TV, attracting an audience of some 5 million viewers and 800,000 radio listeners.

The project developed a set of toolkits for people that live and work in Natura 2000, for local administrations, for competent authorities etc. A handbook for journalists offered explanations and tips on how best to bring the nature importance to the public at large. An extensive information campaign on Natura 2000 was held in 50 hypermarkets in 14 regions in Spain. One of the main achievements of the project was the declaration of 21 May as Natura 2000 Day by the Ministry of Agriculture and Environment in Madrid and Daniel Calleja Crespo, General Director of Environment at the European Commission. This has become the annual occasion for celebrating Natura 2000 and the LIFE programme across Europe.

At the end of the project in 2017, the number of people who knew about the Natura 2000 network in Spain increased from 10% to 22%. The degree of interest in Natura 2000 had also increased: in 2003, 76% of the people who knew the network had visited at least one of the sites, by 2017 this had risen to 90%. It is thus for good reasons that the project received the Natura 2000 Communication award in 2018.

LIFE projects have sought to shed light on the nature value of certain habitats or species, in order to get public support (sometimes starting with hostile attitudes) and encourage decision-makers to undertake actions for their protection. The concept of ecosystem services is often used to enable such transition (see Section 5.1). Thanks to some LIFE projects many species and habitats are now benefiting from strong public support, for example:

- Hungarian meadow viper (*Vipera ursinii rakosiensis*): the integration of the public in awareness campaigns has been identified as a key factor for the success of the conservation programmes targeting this species.
- *Gypaetus barbatus* in the Alps (four projects[56]): the species suffered from a bad image, which has been rehabilitated partly thanks to LIFE projects. A large range of awareness-raising activities has been developed over time: communications at events, exhibitions, activities with school children, small meetings in mountain refuges for hikers in summer, in local village halls in winter, etc. They contributed a lot to changing people's perception by reaching a large number of local inhabitants over the years. Now the species is considered an attractive element for the territories where it nests or can be observed;
- Great bustard (*Otis tarda*) in Portugal: **EstepÁrias** (LIFE07 NAT/PT/000654) achieved a high social identification with the target species (in particular *O. tarda*): after the project several local institutions and products have *O. tarda* as its mascot and logo. Along with usual communication tools (notice boards, seminars, etc.), two types of awareness-raising activities have probably highly contributed to this result:
  - an extensive programme targeting school children: more than 1,100 children were reached in total from 20 schools with a wide range of activities: presentations on the project, field trips, but also more unusual activities such as a comic contest, reading sessions and theatre plays around a children's tale involving the bird;
  - a public consultation process to know more about local people's opinions about steppic bird conservation;
- Spanish imperial eagle (*Aquila adalberti*) in Extremadura (**LIFE Imperial** - LIFE13 NAT/PT/001300; **LIFE "Oeste Ibérico"** - LIFE12 NAT/ES/000595; **Innovation against poison** - LIFE09 NAT/ES/000533; **CBD 2003** - LIFE03 NAT/E/000050): the head of service of nature conservation projects in Extremadura reckoned that awareness-raising and educational activities within LIFE projects contributed to changing perceptions and attitudes towards *A. adalberti* ('from a pest to a national icon that needs to be protected') and thereby reducing direct killing (EU, 2014). Awareness-raising actions targeting the general public included for instance the distribution of goodies (stickers, T-shirts etc.), the publication of a book and the production of a travelling exhibition that was shown in 62 municipalities of Extremadura. The project creation of job opportunities (watch guards, increased attractiveness for tourism) as well as compensatory measures for damage to livestock have contributed to this change of attitude;

56 *Stelvio - LIFE96 NAT/IT/003074; Gypaete/Alpes - LIFE98 NAT/F/005194; GYPAETE - LIFE03 NAT/F/000100; LIFE GypHelp - LIFE13 NAT/FR/000093*

- Eurasian hamster (*Cricetus cricetus*) in France (LIFE ALISTER - LIFE12 BIO/FR/000979): the species has been considered for long as a pest and was persecuted, especially by farmers (hamsters use fields as foraging areas). The project aimed at reversing this negative image and improve social acceptance of conservation measures. A considerable effort was done in awareness-raising activities, with a significant impact at the regional scale, though protection of the species is still not guaranteed. Before implementing communication actions, the project team conducted a study on local perceptions to *C. cricetus* to better target their work. The communication strategy relied significantly on play activities towards children and the general public with 118 events organised and more than 13,000 persons reached between 2015 and 2017. Three games were produced (including a video game) and a mascot created, which proved to be a very attractive tool giving a positive image of the species, especially at large fairs;
- Large carnivores, e.g. within LIFE WOLFALPS (LIFE12 NAT/IT/000807): poisoning is a main threat to large carnivore conservation. This is why it is very important to raise people's awareness on these species and change attitudes of local people. The project carried out extensive awareness-raising activities, throughout the Alps: 208 events were organised involving more than 17,000 citizens, a drawing and a photo contest reached c. 175,000 people, a theatrical performance was seen by about 3,000 people, an art exhibition with the publication of a related catalogue, a touring exhibition seen by about 43,700 people, and three communication campaigns. Moreover, numerous education activities were addressed to the schools, teachers and students, 28 training sessions for more than 560 trainers (educational operators), and 316 workshops in the parks and museums involving about 6,300 young people. An ecotourism scheme was also developed and promoted.

In other cases, local people and stakeholders simply did not care about the targeted species or habitats. Some best practices show that public appreciation can be improved, and benefit the species/habitat conservation:

- *Falco naumanni* in Basilicata, Italy: RAPACI LUCANI (LIFE05 NAT/IT/000009) actions greatly increased awareness amongst residents on the importance of conservation of priority birds, through involvement of the inhabitants and local authorities in identification of nesting sites for *F. naumanni* and in rescuing injured birds. The species has seen its conservation status improved (see Section 3.5.4);
- Pyrenean desman (*Galemys pyrenaicus*) in France: **LIFE+ DESMAN** shed light on the species, which was little known even by local inhabitants. The project awareness-raising actions, as well as knowledge development, have contributed to the revision of the IUCN status of the species, from 'least concern' to 'vulnerable', which is a recognition of the conservation needs (see also Section 3.6.5);
- Coastal meadows in Estonia (e.g. URBANCOWS - LIFE10 NAT/EE/000107): awareness-raising activities highlighted the ecological and recreational importance of the city Pärnu's nature reserve. This was achieved in particular through the construction of two observation towers and the creation of a nature trail, the installation of 14 information boards, and the production of a mobile exhibition largely displayed in the project area, which is close to highly visited tourist destinations;
- Scottish machair LIFE (LIFE08 NAT/UK/000204) increased awareness of machair (dune grassland) through its outreach work which helped change attitudes of local people. The project was able to facilitate a variety of community engagement activities and demonstrated great innovation in how they worked with local schools and colleges to raise awareness and appreciation of the landscape. In particular, they set up a 'machair art' project with students from the local secondary school, combining art with learning about crofting on the machair over the yearly cycle. Field trips were organised and students recorded their experiences through drawing and photography. The work was exhibited at a local art centre. See Section 3.7.3 about the conservation improvements;
- Nordic alvar grasslands, e.g. with LIFE to alvars (LIFE13 NAT/EE/000082): active dissemination of the results was an essential part of the project. It was crucial to inform the local residents and visitors of the project areas about the local nature values, the history and the importance of the traditional management of the area re-established in the frame of the project. This was important both to raise awareness and to prevent people from breaking the protection rules, harming wildlife and the valuable habitats. It was achieved through various awareness-raising tools. See Section 3.7.5 for more information about conservation results;
- LIFE Mires Estonia (LIFE14 NAT/EE/000126): raising public awareness at the regional level is one of the main objectives of this long-term project (seven years).

It is meant to influence local inhabitants' attitude towards safeguarding of internationally valuable wetlands, and improve understanding of current nature conservation issues, habitats of EU importance and the Natura 2000 network. In their communication, the project partners put significant emphasis on the links between natural and cultural heritage. This is reflected in the awareness-raising tools produced: information boards, a wheelchair compatible nature trail, 'wild' hiking trips, a fairy-tale book, etc. The involvement of volunteers has increased public awareness and understanding of the need for conservation actions, and it has been very well covered by the media. See Section 3.7.6 for more information about conservation results.

LIFE projects have also raised awareness of targeted stakeholders to induce behaviour changes. Key examples include:

- *Viola hispida* and *Biscutella neustriaca*, rare plant species endemic to France (**Espèces/Seine** - LIFE99 NAT/F/006332): A local climbing association helped raise awareness of other climbers to threats to rare plants and climbers changed their behaviour to avoid damage to the species;
- Petrels in La Réunion island (**LIFE+ PETRELS** - LIFE13 BIO/FR/000075): with a large range of awareness-raising activities, the project has made local people aware of the endemic petrels and threats to their conservation. One of the most impacting activities is the 'lightless night' campaign, encouraging municipalities to reduce light intensity and switch off public lights during the season when most petrels fly off their nests at night;
- River habitats and associated species in France (e.g. within **LIFE Continuité écologique** - LIFE10 NAT/FR/000192): a long awareness-raising and conciliation effort, marked by numerous physical meetings, was provided in order to convince mills and pond owners to accept or undertake actions in favour of river continuity;
- On invasive alien species, **LIFE AlterIAS** (LIFE08 INF/B/000052) has raised awareness of the horticultural sector on the conservation threats caused by invasive alien species and promoted best practices within the sector through a voluntary code of conduct. Surveys conducted before and at the end of the project showed a significant change in attitude and an increase in knowledge concerning invasive plants for horticulture professionals.

6.6 LIFE AND FUNDRAISING

KEY MESSAGES

Without funding from LIFE many conservation activities and Europe would never be implemented, or too late to prevent further biodiversity loss. Moreover, it is clear that LIFE funding acts as catalyst that triggers substantial additional funding from other sources to be mobilised for implementing the Habitats and Birds Directives and other EU nature policy priorities , not just during the LIFE project period, but also afterwards. Often LIFE funding allows necessary preliminary steps to be taken towards positive change, which then trigger wider interest, create a larger carrying capacity among different stakeholders for bigger-scale funding from national and other sources, which otherwise would never have been possible.

LIFE funding often is a lever for continued funding for conservation and management. Such continuation can be in terms of further LIFE funding for upscaling actions, from other EU sources such as agri-environmental measures under the Rural Development Programme, Interreg or Horizon 2020, from local, regional and national public funds or from the private sector. It is difficult to put a figure on it but the LIFE investment no doubt leads to hundreds of millions of euro from other sources being invested in nature conservation in Europe. With the advent of Integrated Projects (IPs) mobilising complementary funds has become a key objective, multiplying the funding for conservation. The future SNaPs under the new LIFE programme are expected to give a further fundraising boost.

Securing a continuation of funding is one of the most important factors for sustaining the results achieved under the LIFE Nature projects, hence for conservation improvements. Several successful projects that had an ex-post visit in 2018 or that are presented in the preceding chapters have managed to secure funding from agri-environmental schemes especially funded by the European Agricultural Fund for Rural Development (EAFRD). In some cases, a clear link can be established between the LIFE project, the establishment of an agri-environmental scheme or measure for the targeted habitat/species conservation, and positive conservation results.

For the past 15 years, for example, several LIFE projects from Estonia, Finland, Latvia and Lithuania have facili-

tated better use of agri-environmental schemes for the maintenance of biologically valuable Boreal Baltic coastal meadows and Nordic alvar grasslands, which provided new economic benefits for farmers. The fact sheet 'LIFE unites people for nature' highlights the role of the activities developed within these LIFE projects in catalysing other funding sources, and involving farmers and local authorities.

Some LIFE projects have also managed to use Interreg projects (funded under the European Regional Development Funds – ERDF) to follow-up or complement the LIFE actions:

- For instance, in the Alps, the Bearded vulture conservation programme has also been supported by several Interreg projects in the Pyrenean and Alpine massifs (**POCTEFA** and **ALCOTRA** projects), which contributed to knowledge acquisition (monitoring with GPS beacons), awareness-raising, etc. ERDF funding has also been used to rehabilitate a specific breeding centre for *Gypaetus barbatus* in the French Alps, through a **POIA** project (inter-regional project in the Alpine massif, but only in France).
- In Belgium, several LIFE projects (see Section 3.7.6) targeting open habitats, mainly by converting spruce plantations, were complemented by Interreg projects which also helped remove exotic conifer plantations in valley bottoms. This has increased the area of Black stork (*Ciconia nigra*) foraging sites (on high plateaux of the Ardennes and in valley bottoms), hence the capacity of the landscape to host more breeding pairs, which has certainly contributed to the improved conservation status of the species.
- The LIFE IP **FRESHABIT** (LIFE14 IPE/FI/000023) has generated the development of several Interreg projects on the treatment of riparian forests, in order to improve the ecological status and biodiversity of water bodies in the Natura 2000 network in Finland.

Another main conclusion from the analysis of LIFE project results (in the preceding chapters and in other publications e.g. NEEMO, 2018) is that, in many cases, it has taken a number of LIFE projects in the same area or across a habitat or species range to secure an improvement in conservation status. It is one of the most important success factors identified. There are numerous examples where successive projects on the same species or habitat, in the same area or in several regions across the EU have led to conservation successes. This is observed for different habitat types and species, across the EU. These projects help target substantial funding over a long period on specific habitats/species, either in the same area or at the European scale (Table 21).

Table 21: Examples of LIFE project series targeting the same species or habitat to achieve greater impact

Species	Country	LIFE projects
Large white-faced darter (*Leucorrhinia pectoralis*)	Belgium	**Ardenne Liégeoise** - LIFE 10/NAT/BE/000706; **Saint Hubert** - LIFE03 NAT/B/000019; **Cx SCAILLE** - LIFE05 NAT/B/000087; **PLTTAILLES** - LIFE05 NAT/B/000089; **PLTHautes-Fagnes** - LIFE06 NAT/B/000091; **NATURA2MIL** - LIFE05 NAT/B/000088
Eurasian otter (*Lutra lutra*)	Sweden	**Moälvsprojektet ReMo** - LIFE05 NAT/S/000109; **Vindel River LIFE** - LIFE08 NAT/S/000266; **ReMiBar** - LIFE10 NAT/SE/000045; **LIFE-TripleLakes** - LIFE13 NAT/SE/000116
Spanish imperial eagle (*Aquila adalberti*)	Portugal, Spain	**Aguila Andalucía - First phase of a conservation programme for the Iberian imperial eagle** - LIFE92 NAT/E/014300; **II phase of an action program for the conservation of the imperial eagle - Andalucia** - LIFE94 NAT/E/004823, LIFE94 NAT/E/004824; **Aguila Castilla La Mancha** - LIFE95 NAT/E/000593 ; **Third phase of an action program for the conservation of the Iberian Imperial Eagle - Andalucía** - LIFE95 NAT/E/001153; **Aguia Imperial** - LIFE13 NAT/PT/001300; **LIFE Imperial** - LIFE13 NAT/PT/001300; **LIFE "Oeste Ibérico"** - LIFE12 NAT/ES/000595; **Innovation against poison** - LIFE09 NAT/ES/000533; CBD 2003 - LIFE03 NAT/E/000050)
Iberian lynx (*Lynx pardinus*)	Spain	**Lince/Castilla León** - LIFE94 NAT/E/001186; **Conservation of the Iberian Lynx** (various regions of Spain) - LIFE94 NAT/E/004809, LIFE94 NAT/E/004810, LIFE94 NAT/E/004808, LIFE94 NAT/E/004811, LIFE94 NAT/E/004813, LIFE94 NAT/E/004814; **Conservation of the Iberian Lynx** (various regions) - LIFE95 NAT/E/004815, LIFE95 NAT/E/004816, LIFE95 NAT/E/004817, LIFE95 NAT/E/004818, LIFE95 NAT/E/004819, LIFE95 NAT/E/004820, LIFE95 NAT/E/004821; **Lince/Extremadura** - LIFE98 NAT/E/005343; **Doñana** - LIFE99 NAT/E/006325; **Cabañeros** - LIFE99 NAT/E/006327; **CBD/especies** - LIFE99 NAT/E/006336; **Lince Andalucía** - LIFE02 NAT/E/008609; **Lince Toledo** - LIFE02 NAT/E/008617; **Reintroducción Lince Andalucia** - LIFE06 NAT/E/000209; **PRIORIMANCHA** - LIFE07 NAT/E/000742; **IBERLINCE** - LIFE10 NAT/ES/000570;

Species	Country	LIFE projects
Arctic fox (*Alopex lagopus*)	Sweden	**Arctic Fox** - LIFE98 NAT/S/005371; **SEFALO+** - LIFE03 NAT/S/000073
Azores bullfinch (*Pyrrhula murina*)	Spain	**Life Terras do Priolo** (LIFE12 NAT/PT/000527); **PRIOLO** (LIFE03 NAT/P/000013)
Lesser kestrel (*Falco naumanni*)	France	**Faucon crécerellette** - LIFE97 NAT/F/004119; **LIFE TRANSFERT** - LIFE05 NAT/F/000134)
Great bustard (*Otis tarda*)	Austria, Hungary, Slovakia	**Grosstrappe** - LIFE05 NAT/A/000077; **OTISSK** - LIFE05 NAT/SK/000115; **OTISHU** - LIFE04 NAT/HU/000109; **LIFE Great Bustard** - LIFE15 NAT/AT/000834
Yelkouan shearwater (*Puffinus yelkouan*)	Malta	**GARNIJA-MALTIJA** (LIFE06 NAT/MT/000097); **MALTA SEABIRD PROJECT; LIFE Arcipelagu Garnija** (LIFE14 NAT/MT/000991)
Bittern (*Botaurus stellaris*)	Belgium	**Midden-Limburg** - LIFE97 NAT/B/004208; **Dijlevallei** - LIFE98 NAT/B/005171; **Haine** - LIFE00 NAT/B/007148; **Life Grote Nete** - LIFE05 NAT/B/000090; **Dommeldal** - LIFE05 NAT/B/000091; **Triple E Pond area M-L** - LIFE08 NAT/B/000036
Brown bear (*Ursus arctos*)	Spain	**Oso/Asturias** - LIFE92 NAT/E/014500; **Oso en Asturias** - LIFE98 NAT/E/005305; **Oso Cantabria** - LIFE00 NAT/E/007352; **Corredores oso** - LIFE07 NAT/E/000735; **LIFE Bear Defragmentation** - LIFE12 NAT/ES/000192
Pied avocet (*Recurvirostra avosetta*)	United Kingdom	**Wild Ness** - LIFE97 NAT/UK/004245); **TaCTICS** - LIFE07 NAT/UK/000938; **saline lagoons** - LIFE99 NAT/UK/006086; **Alde-Ore** - LIFE08 NAT/UK/000199
European pond turtle (*Emys orbicularis*)	Spain	**EmysTer** - LIFE04 NAT/ES/000059; **PROYECTO ESTANY** - LIFE08 NAT/E/000078; **LIFE Potamo Fauna** - LIFE12 NAT/ES/001091
European nightjar (*Caprimulgus europaeus*)	Belgium	LIFE03 NAT/B/000019 **Saint Hubert**; LIFE03 NAT/B/000024 **MILITAIRE GEBIEDEN**; LIFE04 NAT/BE/000010 **LIEREMAN**; LIFE05 NAT/B/000087 **Cx SCAILLE**; LIFE05 NAT/B/000088 **NATURA2MIL**; LIFE05 NAT/B/000089 **PLTTAILLES**; LIFE05 NAT/B/000090 **Life Grote Nete**; LIFE05 NAT/B/000091 **Dommeldal**; LIFE06 NAT/B/000081 **Life Averbode**; LIFE06 NAT/B/000084 **LIFE Turnhouts Vennengebied**; LIFE06 NAT/B/000085 **HELA**; LIFE06 NAT/B/000091 **PLTHautes-Fagnes**; LIFE07 NAT/B/000039 **PAPILLONS**; LIFE08 NAT/B/000035 **Life Abeek**; LIFE09 NAT/BE/000411 **LIFE Kleine Nete**; LIFE09 NAT/BE/000416 **Life Itter en Oeter**; LIFE10 NAT/BE/000706 **Ardenne liégeoise**; LIFE11 NAT/BE/001061 **Most-Keiheuvel**; LIFE11 NAT/BE/001067 **Life Hageland**
Hungarian meadow viper (*Vipera ursinii rakosiensis*)	Hungary	**HUNVIPURS** - LIFE04 NAT/HU/000116, **CONVIPURSRAK** - LIFE07 NAT/H/000322 and **HUTURJAN** - LIFE10 NAT/HU/000020)
European bison (*Bison bonasus*)	Poland	**BISON-LAND** - LIFE06 NAT/PL/000105; **LIFE_BISON_NW_PL** - LIFE13 NAT/PL/000010
Alpine rivers (3230, 3240)	Italy	**Taro** - LIFE98 NAT/IT/005138; **NECTON** - LIFE97 NAT/IT/004089; **NEMOS** - LIFE00 NAT/IT/007281; **Fiume Toce** - LIFE02 NAT/IT/008572
Shifting dunes (2120)	Netherlands	**Dutch dune revival** - LIFE09 NAT/NL/000418; **Amsterdam Dune project** - LIFE11 NAT/NL/000776
Boreal coastal meadows (1630*)	Baltics	**CoastNet LIFE** - LIFE17 NAT/FI/000544, **LIFE CoHaBit** (LIFE15 NAT/LV/000900) and **LIFE Coast Benefit** (LIFE12 NAT/SE/000131), **URBANCOWS** (LIFE10 NAT/EE/000107) **LIFE-IP ForEst&Farmland** (LIFE18 IPE/EE/000007)
coastal lagoons (1150*)	France, Italy	**LAG'Nature** - LIFE07 NAT/F/000193; **LIFE+ ENVOLL** - LIFE12 NAT/FR/000538; **LIFE LAGOON REFRESH** (LIFE16 NAT/IT/000663), **LIFE AGREE** (LIFE13 NAT/IT/000115), **LIFE-SeResto** (LIFE12 NAT/IT/000331), and **LIFE AUFIDUS** (LIFE11 NAT/IT/000175)
semi-dry forest	Réunion Island	LIFE09 NAT/FR/000582 **CAP DOM; COREXERUN** - LIFE07 NAT/F/000188; **LIFE+ Forêt Sèche** - LIFE13 BIO/FR/000259
Fennoscandian wooded meadows (6530*)	Sweden	**GRACE** - LIFE09 NAT/SE/000345; **LIFE Coast Benefit** - LIFE12 NAT/SE/000131; **Bush-LIFE** - LIFE13 NAT/SE/000105; **LIFE BTG** - LIFE15 NAT/SE/000772
blanket bogs (7130) and raised bogs (7110*)	United Kingdom	**Blanket bog** - LIFE00 NAT/UK/007075; **MoorLIFE** - LIFE08 NAT/UK/000202; **MoorLIFE2020** (LIFE14 NAT/UK/000070

These examples show the added value of the LIFE programme. It also shows in contrast that no other source of funding is available to ensure a sufficient continuity in funding, which is why the succession of LIFE projects is sometimes necessary to secure long-term funding for conservation actions targeting the same area/habitat/species and have real impacts.

A few projects have managed to attract other sources of funding, in particular private funding:

- In France the installation of bird beacons on powerlines or other cables is partly funded by the powerline managers themselves. This was the case within LIFE GypHelp (LIFE13 NAT/FR/000093) to reduce electrocution and percussion risks for *Gypaetus barbatus*. A special committee was created in 2004, gathering both nature conservation managers and powerline managers, to mitigate the risks caused by powerlines on birds. The committee assists nature conservation managers in the elaboration of LIFE projects including actions on powerlines. Powerline managers may pay for the equipment of powerlines and electric posts (e.g. in Haute-Savoie department, power grid operator ENEDIS allocates a budget of €25,000 per year for such actions) but also for studies on the impacts of powerlines or on the effectiveness of bird beacons (e.g. thesis work). It benefits all large birds, such as vultures, Bonelli's eagle (*Aquila fasciata*), etc.
- In Belgium, the team of Herbages (LIFE11 NAT/BE/001060) managed to get a co-funding grant from the national Lottery and launched a call for private donations.
- In La Réunion Island, to secure funding for the post-LIFE conservation plan, the national park of La Réunion (coordinator of **COREXERUN** and **LIFE+ Forêt Sèche**) has developed a strategy to attract private funding.
- The Royal Society for the Protection of Birds (RSPB) in the UK regularly launches fundraising campaigns linked to LIFE projects to offset their costs and create a fund for project continuity. For example, LIFE hen harriers (LIFE13 NAT/UK/000258) was able to fit satellite transmitters to 117 birds thanks to public and private donations when the project target had been 24 tags. For every euro spent by RSPB the project attracted eight euro in direct funding and support in kind: their Hen Harrier Appeal alone raised 20% of project costs from RSPB members.

The development of payments for ecosystem services may also bring opportunities for financing nature conservation actions. Several LIFE projects have sought to develop such schemes, although most of them have been working on methodologies (see Section 5.1).

The study 'Drivers for success in the implementation of the Birds and Habitats Directives' (Tucker et al., 2019) acknowledges the importance of conservation plans such as the post-LIFE plans and recommend that financial planning also takes into account the risks of reduction or even cessation of future funding. In order to face these risks and secure long-term funding, diversification strategies should be developed, not to depend on one single source of funding. This remains a challenge for nature conservation operators, hence the relevance of **LIFE Integrated Projects** (IPs). IPs should indeed include actions that may facilitate the mobilisation and use of other complementary funds that can finance the implementation of actions or measures beyond those supported by the LIFE IP – both as regards scope and timeframe.

The LIFE platform meeting hosted by **BNIP** in October 2019 and gathering all ongoing nature IPs was an opportunity to take stock on the funding strategies of IPs, possible obstacles and challenges. Discussions showed that IPs are primarily mobilising funding from the following EU funds: ERDF, European Maritime and Fisheries Fund, EAFRD, Horizon 2020, as well as some national or regional public funds. There is however still some room for improvement to better direct these funds to Natura 2000 areas, and make full use of them in this purpose.

It was nevertheless acknowledged that the use of some funds was less 'popular' than others, e.g. the European Social Fund (ESF), because they are beyond the comfort zone of most actors involved in nature conservation. Still, good examples were shared, showing the relevance of ESF funding: several IPs (**BNIP**, LIFE-IP INTEMARES - LIFE15 IPE/ES/000012 and NATUREMAN - LIFE16 IPE/DK/000006) have used ESF funding in their complementary actions to get certain social groups (cooperatives, volunteers) involved in field work in Natura 2000 territories, or to train targeted groups of stakeholders.

For example, **BNIP** is a lever for achieving targets set by the Federal, Flemish and Walloon PAFs for 2014-2020 on conservation of natural areas, restoration of habitats and preservation of species. To meet those targets, the com-

petent authorities in different parts of Belgium need financial support from other funds and better coordination with other policy sectors. This LIFE IP works to substantially improve policy, capacity and knowledge building and improve cooperation between authorities across the country. It also helps those authorities to access complementary funding (e.g. from Rural Development Programmes and national park funds). This money is used to invest in afforestation and forest management and to facilitate management agreements for conservation in agriculture. The project also gives stakeholders a greater say in decision-making and develops integrated site management plans and monitoring programmes. By strengthening the capacity to form new partnerships, the project increases the likelihood that those partnerships will endure.

It was also highlighted during this platform meeting that public bodies were often reluctant to ask for private funding. Nonetheless, some good examples were shared, including an eco-energy company working with hydropower in Finland where collected revenues are used for habitat restoration, bank financing linked to wood revenues for investment in Natura 2000 sites, and initiatives of a private bank foundation that organises annual calls for applications or lottery foundations that look into financing green projects.

In conclusion, LIFE IPs and future Strategic Nature Projects (SNaPs) are indispensable tools to further improve fundraising and secure funding for long-term conservation actions, which is essential to achieve conservation improvements.

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LIFE "L'Instrument Financier pour l'Environnement" / The financial instrument for the environment

The LIFE programme is the EU's funding instrument for the environment and climate action

Period covered 2014-2020

EU funding available approximately €3.46 billion

Allocation of funds

Of the €3.46 billion allocated to LIFE, €2.59 billion are for the Environment sub-programme, and €0.86 billion are for the Climate Action sub-programme. At least €2.8 billion (81% of the total budget) are earmarked for LIFE projects financed through action grants or innovative financial instruments. About €0.7 billion will go to integrated projects. At least 55% of the budgetary resources allocated to projects supported through action grants under the sub-programme for Environment will be used for projects supporting the conservation of nature and biodiversity. A maximum of €0.62 billion will be used directly by DG Environment and DG Climate Action for policy development and operating grants.

Types of projects

Action Grants for the Environment and Climate Action sub-programmes are available for the following:

- "Traditional" projects – these may be best-practice, demonstration, pilot or information, awareness and dissemination projects in any of the following priority areas: LIFE Nature & Biodiversity; LIFE Environment & Resource Efficiency; LIFE Environmental Governance & Information; LIFE Climate Change Mitigation; LIFE Climate Change Adaptation; LIFE Climate Governance and Information.
- Preparatory projects – these address specific needs for the development and implementation of Union environmental or climate policy and legislation.
- Integrated projects – these implement on a large territorial scale environmental or climate plans or strategies required by specific Union environmental or climate legislation.
- Technical assistance projects – these provide financial support to help applicants prepare integrated projects.
- Capacity building projects – these provide financial support to activities required to build the capacity of Member States, including LIFE national or regional contact points, with a view to enabling Member States to participate more effectively in the LIFE programme.

Further information

More information on LIFE is available at http://ec.europa.eu/life.

How to apply for LIFE funding

The European Commission organises annual calls for proposals.
Full details are available at http://ec.europa.eu/environment/life/funding/life.htm

Contact

European Commission – Directorate-General for the Environment – B-1049 Brussels (env-life@ec.europa.eu).
European Commission – Directorate-General for Climate Action – B-1049 Brussels (clima-life@ec.europa.eu).
European Commission – EASME – B-1049 Brussels (easme-life@ec.europa.eu).

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LIFE Publication / Bringing nature back through LIFE - The EU LIFE programme's impact on nature and society

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