focus

NATURE

LIFE improving the conservation status of species and habitats

Habitats Directive Article 17 report

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Article 17 of the Habitats Directive requires Member States to submit information on its progress in implementation every six years. The latest reports, covering 2001-2006, contain a first assessment of the conservation status of more than 1182 species and 216 habitat types. This is the most comprehensive survey of EU biodiversity undertaken to date, providing an invaluable reference point for measuring future trends.

The results show that Europe's biodiversity is still under heavy pressure, and that only a small proportion of the habitats and species of Community interest are in a favourable conservation status. These findings highlight the urgent need to intensify ecological restoration efforts. Where substantial restoration work has been carried out, it often shows measurable and positive impacts on conservation status.

The LIFE programme has been the most visible EU financial instrument dedicated to nature conservation since 1992. LIFE Nature projects are now well-known across the EU (with more than 1100 projects financed) and are favourably perceived at local level. Their positive contribution has been shown beyond doubt for different types of habitat and species. Several specific habitats or species whose conservation status, as reported by the Member States, is improving have been targeted by LIFE Nature projects.

The link between LIFE projects and improved conservation status has been shown in several cases (for example, the Spanish lynx and peatlands and bogs in several Member States). It is also clear that LIFE projects have helped develop and demonstrate best practice that has subsequently been applied to similar situations elsewhere in Europe, and have made a significant contribution to setting in place the Natura 2000 network and its management.

The overall contribution of LIFE Nature projects remains, however, difficult to quantify as it is heavily dependent on the scale and timeframe of the project actions as well as on the distributions of the species and habitats. Most projects only target species and habitats at a local or regional scale, usually on one or a few Natura 2000 sites, although some have covered the complete distribution range (for example, endemic species and habitats with a restricted distribution). For many projects, the full impact will only be seen after several years or even decades.

The objective of this publication is to provide an overview of the contribution LIFE Nature projects have made to improving the conservation status of a considerable range of species and habitats covered by the Habitats Directive. It must be stressed that this brochure does not aim to show that reported improvements in conservation status are necessarily linked to LIFE projects. Nature simply does not often react that fast and LIFE projects are not the only nature restoration projects working on the ground. It is however certain that LIFE Nature and biodiversity projects will continue to play a vital role in reversing the decline of biodiversity in the EU.

Conservation status reports confirm **need for greater action**

The first-ever systematic assessment of the conservation status of Europe's most endangered habitats and species has been carried out by 25 Member States (Romania and Bulgaria were not part of this reporting exercise), as part of the regular reporting on the implementation of the EU Habitats Directive. The results, covering 2001-2006, show that only a small proportion of the habitats and species of Community interest are in a 'favourable' conservation status. The findings highlight the critical importance of conservation at EU level for the establishment and development of the Natura 2000 network and beyond. If the situation is to improve, ecological restoration efforts should be stepped up at both national and European level.

In 2007, Member States delivered the first comprehensive assessment of the conservation status of the habitats and species of Community interest in 'Article 17' reports, named after the relevant article in the Habitats Directive. The aim of this exercise was to assess the conservation status of the habitats and species at the EU biogeographical scale in order to prepare the composite report that the Commission published[1] in accordance with Article 17 of the Habitats Directive.

The results[2] – compiled and assessed by the European Topic Centre on Biological Diversity (ETC/BD)[3] on behalf of the European Commission – indicate that overall, across the different biogeographical zones and marine regions of Europe, only 17% of habitats and species assessments show a 'favourable condition'; while 18% of habitats and 31% of species assessments are classified as 'unknown' due to a lack of information (see figs 1 and 2).

As the habitats and species listed in the annexes of the Habitats Directive were chosen largely because they were known to be threatened these results come as no surprise. They highlight the challenges that were faced in halting the loss of biodiversity by 2010, as European governments had committed. This major first evaluation effort helps identify habitats and species that require action.

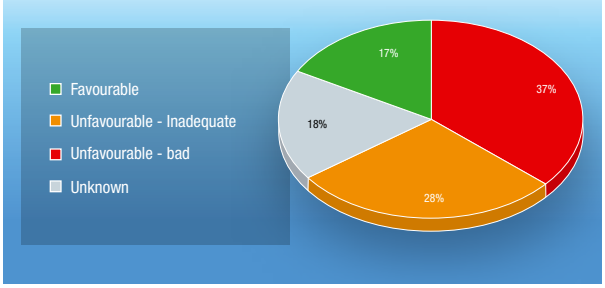
For many of these habitats and species conservation action is already under-

1 "Report from the Commission to the Council and the European Parliament - Composite Report on the Conservation Status of Habitat Types and Species as required under Article 17 of the Habitats Directive (COM/2009/0358 final)

2 The web-based Article 17 Technical Report (2001-2006) http://biodiversity.eionet.europa.eu/article17

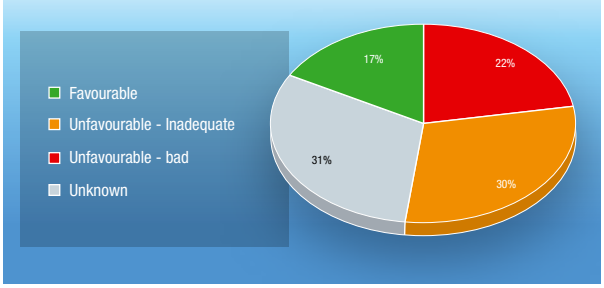
3 One of the European Topic Centres of the European Environment Agency

Figure 1: **Assessment of conservation status for Annex 1 habitats (the percentage relates to the number of assessments made)**



Source: ETC/BD, Paris 2009

Figure 2: **Assessment of conservation status of species (the percentage relates to the number of assessments made)**



Source: ETC/BD, Paris 2009

Photo: LIFE06 NAT/E/000209

The Iberian lynx is one of the most endangered felines in the world and has been the target of many LIFE projects.

way, and several countries have reported that the conservation status of some particular habitats or species, although unfavourable, is improving. Those noted include several that have been targeted by projects funded by the EU's LIFE Nature programme. Examples include projects in Italy and Spain on the brown bear *(Ursus arctos)* – once found all over Europe but now extinct in many areas, as well as endemic flora species such as the highly endangered Lake Constance forget-me-not *(Mysotis rehsteineri)* in Austria; and habitats such as the priority habitat types bog woodland (91D0*) and Caledonian forest (91C0*), both found in the United Kingdom. Many of the plant 'micro-reserves' (small botanical reserves) that have been established in several EU countries have also been created as part of LIFE projects.

ASSESSMENT, MONITORING AND REPORTING

The Paris-based ETC/BD has produced regional assessments of conservation status for each habitat and species listed in the directive's annexes. It has used 25 Member State's reported data to assess conservation status across seven terrestrial biogeographical zones and four marine regions of Europe[4] (see Fig. 3).

4 Given Bulgaria and Romania's recent accession to the EU, the Steppic region and the Black Sea are not included. Four marine regions were added for the purpose of Article 17 reporting.

HABITATS DIRECTIVE – THE BACKGROUND

The Habitats Directive[1], adopted in 1992, together with the earlier Birds Directive[2], forms the cornerstone of Europe's nature conservation policy. It is also a key component of the EU Biodiversity Action Plan, which aims to halt the decline of EU biodiversity by 2010 and beyond[3].

The directive is built upon two pillars: the Natura 2000 network of protected sites (which also includes sites under the Birds Directive) and a strict system of species protection. Its objective is for more than 200 habitats and 1 000 species to reach and be maintained at 'favourable conservation status' thus securing their long-term survival.

The directive is made up of a series of articles and annexes. The articles outline the aim of conserving biodiversity and the means to achieve it. The annexes are lists of habitats and species of Community interest in need of different forms of protection.

Article 1 defines 'conservation status' as the sum of the influences on habitats or species that affect their long-term distribution, structure and function, or abundance. It defines 'favourable' conservation status in terms of stability of range and viability.

Article 11 specifies that the habitats and species of Community importance must be monitored to provide a clear picture of their actual conservation status and trends.

Article 17 specifies – among others - that reports must be made every six years based on such monitoring. The first Article 17 reports, which covered the period 1994-2000, prioritised the transposition of the directive into national laws. The current reports, covering 2001-2006, are the first to include conservation status assessments of the habitats and species of Community interest. The Article 17 reports can be viewed as a 'health check' for the habitats and species covered by the directive – showing where the greatest need for action is and whether the directive is effective.

1 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22 July 1992, p. 7)
2 Council Directive 79/409/EEC on the conservation of wild birds (OJ L 103, 5 April 1979, p. 1)
3 http://ec.europa.eu/environment/nature/biodiversity/comm2006/index_en.htm

The overall conservation status is assessed by combining the results of the following parameters in accordance with an agreed method[5].

Species	Habitats
Range	Range
Population	Area
Suitable habitat	Structure & functions
Future prospects	Future prospects

Each of these parameters is reported as one of the following classes:

Favourable	
Unfavourable - inadequate	
Unfavourable - bad	
Unknown	

For further details, see:
http://ec.europa.eu/environment/nature/knowledge/rep_habitats/index_en.htm

In total, 2 756 separate reports were submitted electronically by national authorities for habitat types and 6 064 for species, with 16 000 associated maps. These were to cover 216 Annex I habitat types and 1 180 species (including subspecies and genera) in Annexes II, IV, and V of the Habitats Directive[6]. The data presented in the Member States' reports and in the biogeographical analysis are based on the number of assessments of habitats and species, not the number of habitats and species themselves.

For further details, see:
http://biodiversity.eionet.europa.eu/article17.

HABITAT ASSESSMENTS

Overall, 37% of the 701 habitat assessments indicate an unfavourable-bad condition, and a further 28% indicate an 'unfavourable-inadequate' condition (see Fig. 1). Only 17% of assessments are 'favourable'. Underlying this figure are substantial variations across the biogeographical regions. For example, three of the four marine regions and one terrestrial region don't have any habitats in 'favourable' condition.

The Alpine biogeographical region has the highest proportion of habitats assessed as 'favourable' and the Atlantic the lowest. The Pannonian and Atlantic biogeograhical regions have the highest proportion of 'unfavourable-bad' assessments.

It is possible to analyse conservation for groups of related habitat types, such as forests or grasslands (see Fig. 4). Dunes, bogs/mires/fens and grasslands are the habitat groups with the worst conservation status. Rocky habitats, such as scree slopes or caves have the best conservation status. A higher percentage of 'priority' habitats[7] were evaluated as having a bad status, compared with non-priority habitats. This was most noticeable for coastal habitats. 'Future prospects' is one of the four parameters of conservation status. It was 'unfavourable' for more than 50% of the habitat assessments. Habitat area trends were negative in over 20% of the assessments.

For more information, see:
http://biodiversity.eionet.europa.eu/article17/habitatsreport.

SPECIES ASSESSMENTS

Of the 2 240 species assessments, 22% indicate an 'unfavourable-bad' condition and a further 30% indicate 'unfa-

5 Based on the parameters given in the Habitats Directive and agreed with the Habitats Committee, made up of experts from the Member States.

6 Further habitats and species were added to the annexes in January 2007, see http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

7 Habitats for which the need for conservation action is thought to be particularly high.

Figure 3: **Biogeographical zones and marine regions used for Article 17 reporting**

Source: ETC/BD, Paris 2009

vourable inadequate' (see Fig. 2). The proportion of species assessments indicating 'unfavourable-bad' is more than 20% in most biogeographical regions and is more than 30% for the molluscs and arthropods, with molluscs the worst (see Fig. 5). Half of the assessments of the subgroups of marine and freshwater molluscs are 'unfavourable-bad'; the conservation status of terrestrial snails seems to be better.

Note, however, that the mollusc group is relatively small (81 assessments). The highest percentage of the favourable assessments is for vascular plants. In general there are negligible differences between the conservation status of priority and non-priority Annex II species.

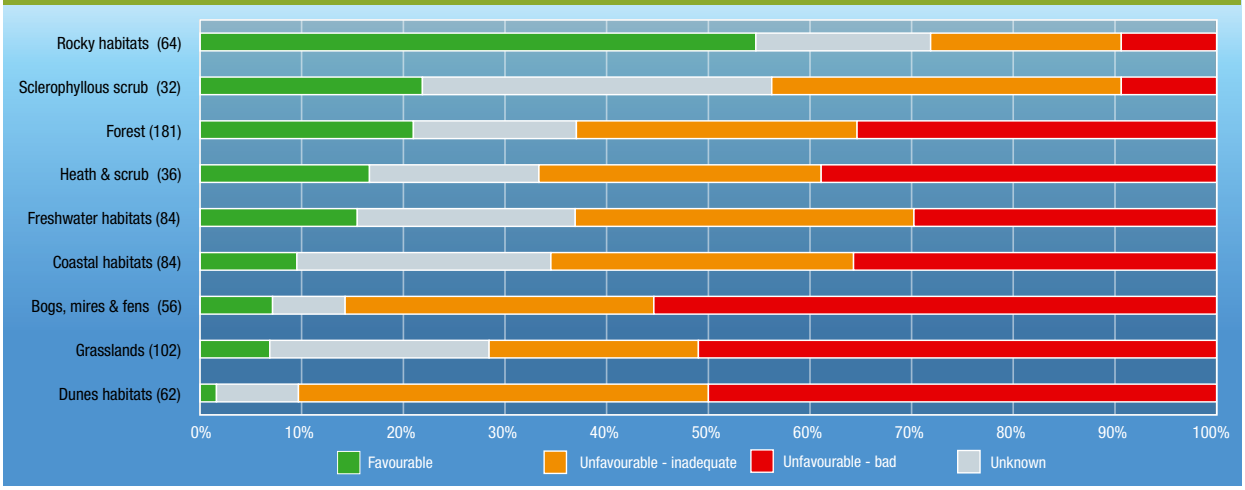
There is less variation between the biogeographical and marine regions for species than for habitats. Of the terrestrial biogeographical regions, the Boreal has the highest proportion of species assessments indicating 'favourable' and the Atlantic the lowest. Molluscs and arthropods are among the most threatened groups in most regions. In the Macaronesian region, the highest percentage of 'unfavourable-bad' assessments is in the mammal group, whereas in the Pannonian region the highest are vascular and non-vascular plants. The proportion of 'unknowns' is higher for species than for habitats, notably in the Mediterranean and marine biogeographical regions. For the parameter 'future prospects' and analysis of trends of species assessments, the relatively high proportion of 'unknown' assessments limits evaluation at the biogeographical level.

See *http://biodiversity.eionet.europa.eu/article17/speciesreport*

MARINE ASSESSMENTS

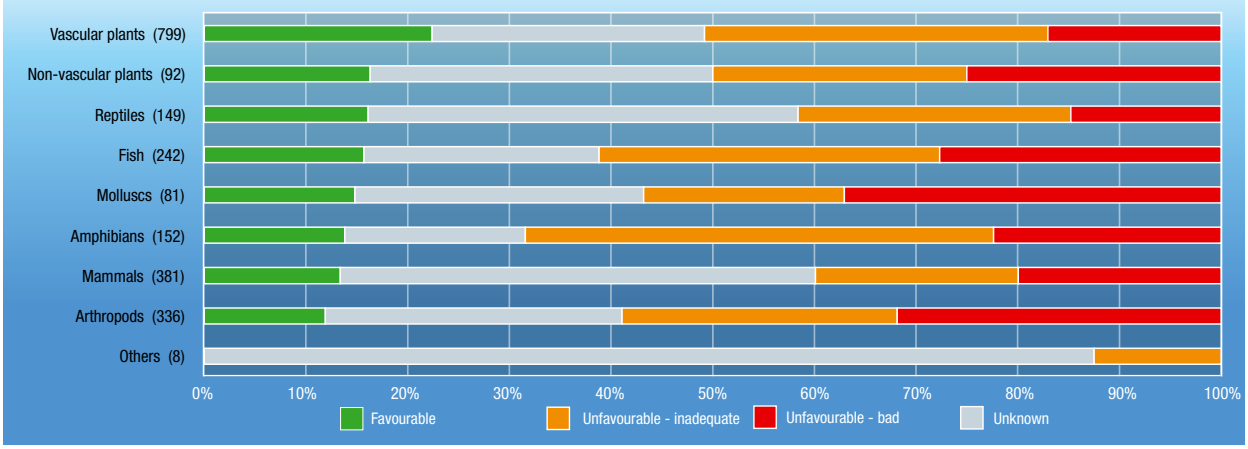
Marine conservation is still very much a developing area. According to the ETC/BD, the lack of data on marine habitats and species has lead to a much higher percentage of 'unknowns' for their assessments than for the terrestrial assessments. (For terrestrial species there are 27% compared with 57% for marine species.) In addition, data quality for marine populations is noted as poor almost twice as often as for marine species (60% for marine species, 35% for terrestrial species).

Figure 4: **Assessment of conservation status of habitats by habitat group (the number in brackets indicates the number of assessments in each group)**



Source: ETC/BD, Paris 2009

Figure 5: **Assessment of conservation status of species by species group (the number in brackets indicates the number of assessments in each group)**



Source: ETC/BD, Paris 2009

LIFE: **improving conservation status**

Across the EU, the positive contribution of the LIFE Nature programme to nature conservation has been demonstrated in different types of habitats and species, under different pressures and threats. The conservation status assessment reports confirm the contribution of dedicated conservation and restoration projects funded by LIFE.

Since 1992, 1107 nature conservation projects have been funded by the LIFE programme, with a total budget of more than €1700 million. These projects have targeted a wide range of species and habitats included in the annexes of the Birds and Habitats Directives.

Forest, grasslands and freshwater habitats were the habitat types most often targeted by LIFE, and dune and coastal, and rocky habitats the least targeted.

The habitat most often targeted by LIFE projects has been the 91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae), which has been targeted directly or indirectly by a total of 191 LIFE projects. This is followed by the Hydrophilous tall herb fringe communities of plains (6430) and the montane to alpine level habitats, with 120 projects.

Birds are the species most targeted by LIFE projects. More than one-third of the projects funded since 1992 had some bird conservation actions. However, the scope of the Article 17 report is restricted to species and habitats included in the annexes of the Habitats directive. Therefore, bird species were not part of the Article 17 report exercise and are the subject of a separate reporting exercise, within the framework of the Birds Directive.

Mammals are the second most targeted species group, with 145 projects. Of the species included in the annexes of the Habitats Directive, the brown bear (*Ursus arctos*) is that most often targeted by LIFE projects since 1992, with 31 projects. Next come the otter (*Lutra lutra*) and the fire-bellied toad (*Bombina bombina*), with 21 and 20 projects respectively.

The following pages show a selection of habitats and species whose conservation status has benefited from LIFE project actions. However, this simple exercise shows that LIFE, because of its resource and mandate limitations, is not enough to improve by itself the conservation status of all species and habitats included in the annexes of the Habitats Directive, especially the habitats and species that are in need of recurring management (not eligible for co-financing under LIFE). However, LIFE has made a significant contribution to implementing Natura 2000 in the Member States. According to the ex post evaluation of the LIFE programme[1]. LIFE projects are estimated to have covered 8-9% of all Natura 2000 sites and a significant share of the habitats and species listed in the Annexes to the Birds and Habitats Directives. In terms of the area covered, it is estimated to be approximately 3-6% of the entire Natura 2000 network area of the EU-15.The findings indicate that an area of approximately 320,000 hectares in Natura 2000 sites was restored as a result of LIFE projects in the evaluation period. The projects focusing on

1 Ex-Post Evaluation of Projects and Activities Financed under the LIFE Programme, COWI (2009) http://ec.europa.eu/environment/life/publications/lifepublications/evaluation/documents/lifeval_nature.pdf

Figure 6: **Habitats types targeted by LIFE projects (1992-2008)**

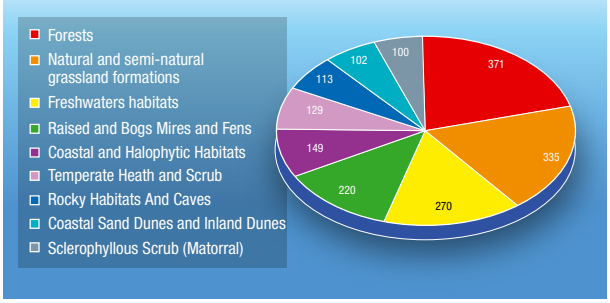
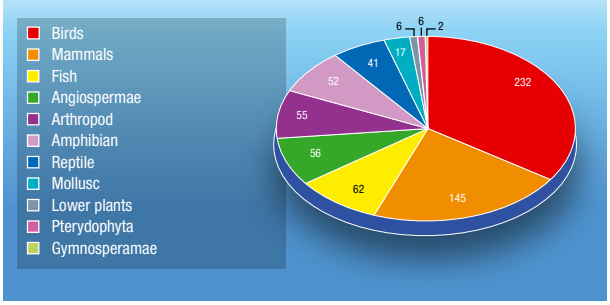
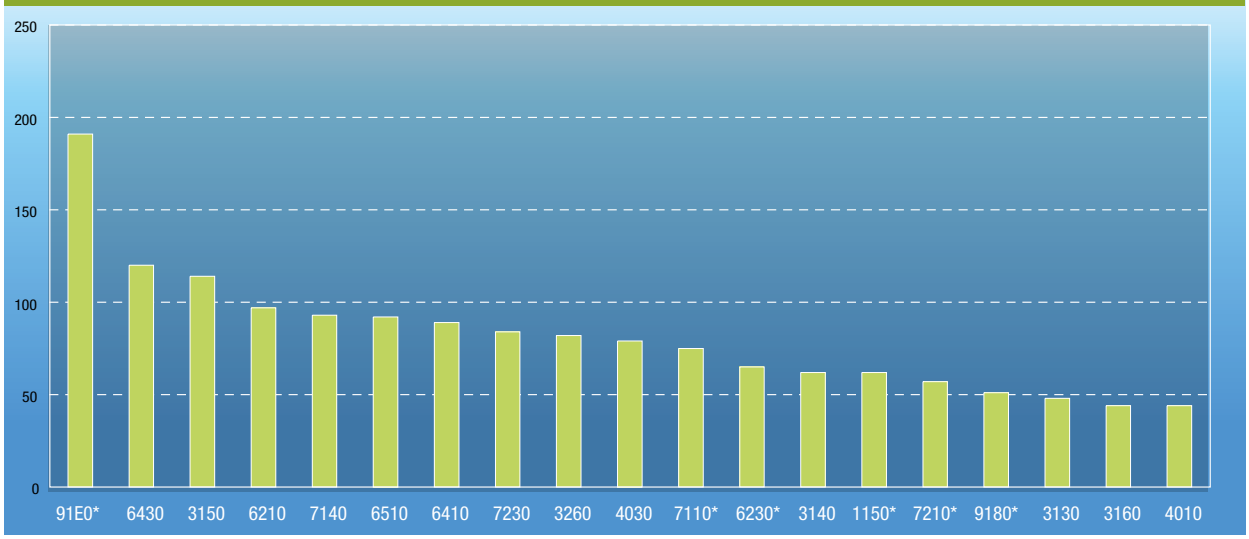


Figure 7: **Species groups targeted by LIFE projects (1992-2008)**



Source: LIFE projects database

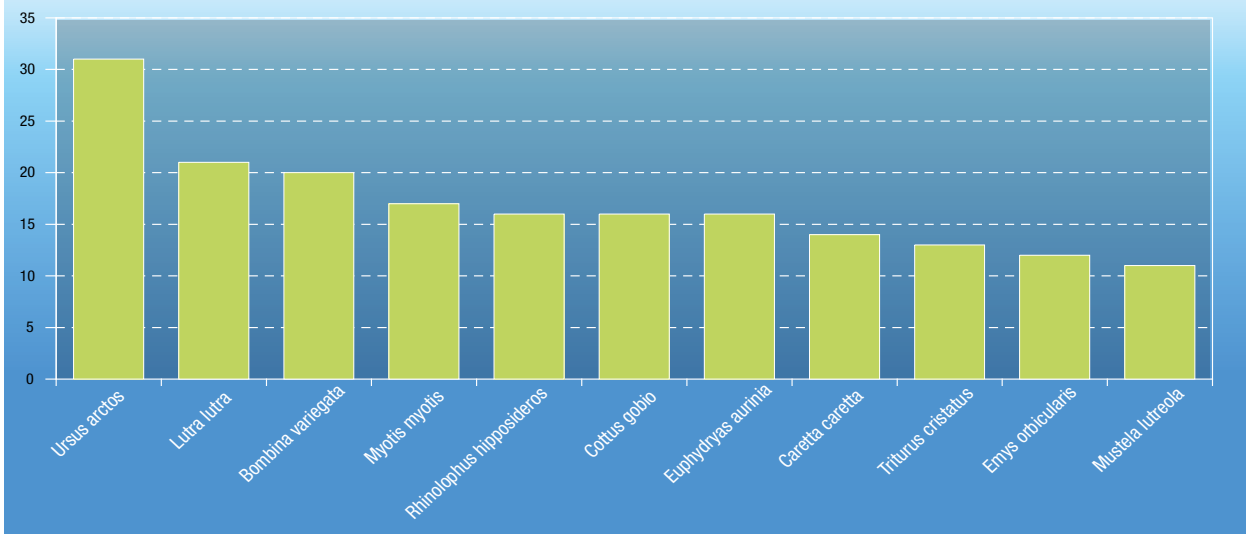
Figure 8: **Habitats included in Annex I of the Habitats Directive targeted by LIFE**



Source: LIFE projects database

** denotes priority for conservation*

Figure 9: **Species most targeted by LIFE**



Source: LIFE projects database

habitat restoration most often resulted in achieving favourable conservation status and ensured the continued management of the sites' area. Thus, following the projects, the areas targeted remained in restored condition in the long term, or the restored area was enlarged. Regarding coverage of species listed in Annex II of the Habitats Directive, about half of the animals species (especially mammals) have been targeted by LIFE projects, whereas the coverage for plants is lower. The evaluation shows that approximately half of the projects aiming at species protection or reintroduction achieved favourable conservation status at local and regional level for one or more species in the long term.

LIFE AND ARTICLE 17 REPORTING

Several countries have reported that the conservation status of particular habitats or species, although unfavourable, is improving. This includes several habitats and species targeted by LIFE Nature projects. Not only do LIFE projects have a direct impact via the measures they implement, but dedicated project managers (and beneficiaries in general) have shown that best practices in species/habitat conservation can be successfully applied in other European regions with similar problems.

Importantly, the results of the first assessment of the conservation status of species and habitats (the Article 17 report) highlight the importance of the LIFE programme, and in particular LIFE Nature projects, as the sole source of funding for the conservation, restoration and management of certain species and habitats at EU level.

This brochure is a first attempt to better understand the contribution of LIFE projects to improving the conservation status of species and habitats included

in the annexes of the Habitats Directive. This exercise is not intended to be exhaustive. The primary objective is to identify examples of LIFE projects that have made a contribution and to examine the lessons, if any, that can be learned from the project actions.

At this stage, it is impossible to assess the overall impact of LIFE on the conservation status of species and habitats at EU level. Moreover, LIFE project actions, although often successful in achieving their objectives, generally only cover a very restricted area of the species or habitat's EU range and, in many cases, it is often only after the project finishes that the real benefits can be identified and measured. Such results are therefore not reflected in the LIFE reporting process.

However, for some species LIFE has provided funding for conservation actions covering the entire distribution range, as has been the case with a few endemic species with restricted distribution, such as some species of fish (see pages 35-37), plants (see pages 38-40) and amphibians and reptiles (see pages 24-26). To a lesser extent, LIFE has also funded actions covering the entire distribution range of certain habitats. Examples include the Vai Palm forests in Crete, the Trodos grasslands in Cyprus, and more recently, the machairs habitats in Scotland. In these cases, some conclusions can indeed be drawn in relation to the contribution at EU level.

Therefore, this publication cannot and does not attempt to show that improvements in conservation status reported under Article 17 are a direct result of LIFE projects. It merely provides examples of LIFE projects that have helped improve the conservation status of habitats and species referred to in the report. While this may indicate that LIFE projects did contribute to reported improvements, the ETC/BD concise report on Article 17 concludes that further analysis is required to determine to what extent such reported improvements in conservation status are a direct result of the work funded by LIFE.

LIFE: CREATING THE CONDITIONS FOR CONSERVATION

Some LIFE projects have contributed in a more indirect way to conserving habitats and species. For example, the redefinition or delimitation of Natura 2000 sites (thus helping set up the Natura 2000 network), preparing species actions plans and site management plans, awareness campaigns, stakeholder meetings and conservation training for stakeholders such as farmers and fishermen.

HELPING TO DEFINE THE NATURA 2000 NETWORK

LIFE, and especially LIFE I and II, had a significant impact on Natura 2000 site proposal and/or delimitation, site management plans, species conservation plans, new regional/national legislation etc; these kinds of actions, although they do not contribute directly to the improvement of conservation status, create a basis and framework for future conservation actions. For example, on request from the Estonian Ministry of the Environment, the project **LIFE00 NAT/EE/007081** presented a proposal for ten core Natura 2000 sites for the European mink on Hiiumaa Island. In this way, the project had a clear impact on the Natura 2000 process in Estonia, with reference to the proposal of pSCI sites for the target species.

Further project actions and outcomes concerning Natura 2000 and LIFE can be found in the publication, 'LIFE for Natura 2000 – 10 years implementing the regulation'. (*http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/lifefornatura_en.pdf*)

LIFE has contributed to the Natura 2000 network of protected sites as a means of improving habitat conservation.

Photo: LIFE05 NAT/IRL/000182

Photo: LIFE04 NAT/GB/000245

Caught on camera: project actions have commonly included surveys and monitoring activities that have greatly added to our knowledge of certain species.

IMPROVING KNOWLEDGE OF SPECIES AND HABITATS

LIFE has also made an important contribution to improving knowledge of species and habitats. These actions are normally included in LIFE projects as preparatory actions, which establish the conditions for and help to define the subsequent project actions. These include surveys, monitoring and some genetic studies, which, while not improving the conservation status directly, help to improve knowledge of the targeted species and habitats. For example, as a key part of the sustainability of the project 'Regeneration and preservation of dry grassland in Germany' (**LIFE00 NAT/D/007058**), the project developed management plans for each of the 14 project Natura 2000 sub-sites. These were drafted after initial status surveys and vegetation mapping.

LIFE has highlighted best practices in habitat management.

Photo: LIFE03 NAT/FIN/000039

For less known species of invertebrates such as some dragonflies species, the project 'Conservation of endangered arthropods of Extremadura' (**LIFE03 NAT/E/000057**) conducted by far the largest and most comprehensive survey ever undertaken in the region, and as a result, there are now sufficient management tools to protect and monitor the target species. Management, conservation or recovery plans were also drafted and approved for the four species of odonates (dragonflies and damselflies).

LIFE contributions to collecting data has also been important for the marine environment, where a lack information and knowledge was highlighted in the Article 17 report. A wealth of experience and knowledge is being built up through the implementation of EU marine projects co-funded by LIFE (for example, the LIFE SCANS projects (**LIFE92 ENV/UK/000065** and **LIFE04 NAT/GB/000245**) to assess the population of small cetaceans in the North Sea and European Atlantic continental shelf waters). Such projects encourage international co-operation and provide valuable data and know-how on which to base future policy recommendations.

Several management models implemented by LIFE projects have been highlighted as best practice examples for habitats. For more information see: http://ec.europa.eu/environment/nature/natura2000/management/habitats/models_en.htm. The aim of these management models, based on LIFE project best practices, is to enable Natura 2000 site managers to apply them to similar habitat types in different biogeographical regions.

LIFE CHALLENGES

This brochure highlights some best practice examples that have made an important contribution to improving the conservation status of species and habitats. However, the impact of LIFE is sometimes difficult to measure and is limited by the resources and mandate assigned to the programme. To further enhance its role in nature conservation and biodiversity at EU level, some key challenges for the LIFE programme are to:

- Further develop the link between the LIFE programme and other sources of funding on nature conservation and biodiversity. For example, the use of the European Agricultural Fund for Rural Development in recurring habitat management actions;
- Develop new tools to measure the impact of the programme at EU level, including through the dissemination and take-up of good practices or approaches developed by LIFE projects;
- Prioritise species and habitats that are reported as having an 'unfavourable bad' conservation status;
- Better link the LIFE programme with applied nature conservation research programmes, such as the Seventh Framework Programme, and research institutions in order to establish methodologies for the implementation of nature conservation best practices;
- Monitor the status of targeted species and habitats after LIFE projects end, in order to assess the success and long-term effects of project actions;
- Further promote networking at EU level to facilitate the transfer of best nature conservation practices for species and habitats.

For further information on this, and on other LIFE case studies covering EU forest, plants, wetlands and marine habitats/ species types see the publications section of the LIFE website:
http://ec.europa.eu/environment/life

SPECIES

LIFE promotes **bat conservation**

Many of the species of bat found in Europe are endangered. Their continued survival is threatened by human disturbance and changes to their habitats that reduce the availability of food. As a result, LIFE projects have focused on securing hibernation sites and conserving habitats as well as increasing knowledge of species that are commonly not well understood.

Almost all bats hibernate during most of the winter. If they are disturbed during this time – by cave explorers for example – then they are often too weak to survive the winter. One of the main conservation actions is therefore to fence off entrances to caves and other sites where bats hibernate. Changes in agricultural practice, such as the use of pesticides and intensive farming have also altered the food supply of many bat species. Management of land that takes into account local wildlife is therefore a main priority of conservation initiatives for bat species. In spite of such activities, the conservation status of many species remains unfavourable.

LIFE ACTIONS

Protection of roosts:
One of the most effective ways to ensure that bats are not disturbed, particularly during hibernation, is to construct fences around sites and to block off the entrances using horizontal bars that allow the bats to fly between them. This action was successfully taken at several sites in the south of France as part of a LIFE project aimed at conserving three species of bat (**LIFE04NAT/FR/000080**). Its target species, the Mediterranean horseshoe bat (*Rhinolophus euryale*), the long-fingered bat (*Myotis capaccinii*) and the Schreiber's bat (*Miniopterus schreibersii*), have all experienced a decline in their population numbers. Urbanisation, caving and modern agricultural practices have disturbed their roosts and adversely affected their natural habitats. Moreover, there was a lack of basic scientific knowledge and public awareness of bat ecological requirements.

The project covered 13 Sites of Community Importance (pSCI) across five regions of southern France, which are home to more than 56% of the breeding Mediterranean horseshoe bats and 45% of the hibernating individuals; about 30% of the breeding long-fingered bats and 38% of the hibernating individuals; and about 15% of the Schreiber's bat breeders and 2% of the hibernating individuals in France. A total of 19 roosts were permanently protected in some form during the four-year project: 12 were either permanently blocked or blocked at certain key times of the

Species	Conservation status at Biogeographical region level (main regions)	Projects
Barbastella barbastellus	Unfavourable-inadequate (Atlantic, Continental, Macaronesian) unfavourable bad (Mediterranean and Boreal)	LIFE98 NAT/B/005167
Miniopterus schreibersii	Unfavourable bad (all regions)	LIFE00 NAT/IT/007139 LIFE04 NAT/FR/000080
Myotis bechsteini	Unknown	LIFE98 NAT/B/005167 LIFE00 NAT/IT/007139 LIFE04 NAT/ES/000043 LIFE06 NAT/B/000095
Myotis capaccinii	Unfavourable bad (all regions)	LIFE00 NAT/IT/007139 LIFE04 NAT/FR/000080
Myotis emarginatus	Favourable (Atlantic and Pannonnian) Unfavourable inadequate (Continental)	LIFE98 NAT/B/005167 LIFE00 NAT/IT/007139 LIFE04 NAT/ES/000043 LIFE05 NAT/IT/000037 LIFE06 NAT/B/000095
Rhinolophus euryale	Unfavourable bad (all regions, expect Pannonian - inadequate)	LIFE04 NAT/FR/000080 LIFE04 NAT/ES/000043
Rhinolophus mehelyi	Unfavourable bad (Mediterranean)	LIFE00 NAT/E/007337 LIFE04 NAT/ES/000043
Rhinolophus ferromequinum		LIFE04 NAT/ES/000043 LIFE05 NAT/IT/000037

year, and another nine were protected by long-term management agreements among local representatives, landowners, associations and the municipalities. In addition, successful long-term partnerships were established between conservation and caving associations.

The effect on bat populations of the project actions was significant: a record number of Mediterranean horseshoe bats (2 238) were observed in hibernation in 2005 at one site in Aquitaine. Other sites saw the return of bats to previously abandoned roosts, such as a cave in Languedoc-Roussillon, which had been unused by bats for 15 years, but had a population of 80 long-fingered bats by 2007. The project also created a new roost by reopening an abandoned mine and securing it from public access. Around 650 Schreiber's bats were observed there in late 2007.

Moreover, the project is continuing to have an important role to play in conserving bat populations throughout France and in other countries of Europe, where the project beneficiary, Société Française pour l'Etude et la Protection des Mammifères, has presented its results. According to Mélanie Némoz, the project manager, the guidelines that the project produced are being used across France in similar conservation initiatives. "The classic way to protect a cave is to put up horizontal bars," she says, "but for some sites – particularly for small sites – it was first necessary to put up a false grid, using plastic bars, to see how the bats would react."

An ambitious project carried out in Spain by the regional administration of Extremadura (**LIFE04 NAT/ES/000043**) also made a big effort in roost site protection. Apart from similar fencing measures in 13 roosts across the region, the project undertook actions for stabilising abandoned mines and constructed new refuges for a colony that is to be relocated from the Yuste Monastery (former residence of the emperor Charles V), as this building now forms part of the European Heritage network. This building hosted a major breeding colony of the greater horseshoe bat (*Rhinolophus ferromequinum*) in Europe. Bats are now gradually taking up the new places prepared for them.

Information gathering:

LIFE projects have also aimed to improve our knowledge of bat species. The French project used radio tracking with electronic tags to monitor its target species. It discovered that the horseshoe bat can travel up to 12 km away from its roosting site, far greater that the 3-4 km previously thought to be normal. The Schreiber's bat has a much larger terrain of 50 km^2. Némoz says that such a wide area is impossible to protect, and as a result, for this species, conservation activities focused on safeguarding roosts. "It was important to protect all the sites, because there are not many and they are heavily populated" she says. Greater understanding of the

BAT BOXES

The Valencia project is good example of a LIFE project that has introduced bat boxes to complement the natural bat habitat. This action was carried out in five forest pSCIs. Two years after installation, 26% of the boxes were occupied, a promising result despite the lack of actual breeding in them during the project timeframe. Bat boxes were also installed – more than 200 in total – as part of the Brussels project to provide extra roosting sites. This project additionally renovated several buildings as possible shelters.

Constructing boxes in trees is an effective way of facilitating roosting.

different species of bat allows for targeted use of resources and management plans that are regionally adapted.

Several other LIFE projects that have focused on bats have taken a similar approach. The Valencia project (**LIFE00 NAT/E/007337**) aimed to provide valuable information on two vulnerable species: the long-fingered bat (*Myotis capaccinii*) and Mehely's horseshoe bat (*Rhinolophus mehelyi*). Forest-dwelling bat species were monitored over a period of two years and cave-dwelling species were monitored over three years. The research provided updated census data for both the long-fingered and Mehely's horseshoe bat in the project area (2 700 and 70 individuals respectively), and new data for some forest species was obtained.

Such data led to the enlargement of the pSCI network: 18 new pSCIs for bats were designated, and the project area was enlarged to cover 29 pSCIs. Five new refuges, two of them hosting important colonies of long-fingered bat, were identified. The research also identified feeding preferences and patterns, including knowledge of fishing techniques, with a view to identifying the most likely causes of the sharp decline in numbers: the intensification of citrus orchards has adversely affected the Mehely's horseshoe bat and inadequate management of riparian habitats has harmed the long-fingered bat. The project's approach was followed by a similar initiative in Extremadura (**LIFE04 NAT/ES/000043**) where the presence of forest-dwelling bats was confirmed by intensive surveys. The information gained in general for all the species targeted now allows for a suitable management of this species group. As a result of these projects, recovery plans were officially endorsed for *Rhinolophus mehelyi, Rhinolophus euryale* and *Myotis beschteinii*

Information gathered as part of the Brussels project (**LIFE98 NAT/B/005167**) had a direct impact on conservation measures. The project made an inventory of all trees with potential bat-hosting interest in the Brussels Natura 2000 network and an agreement was reached with the services responsible for these public owned areas not to cut these trees.

LIFE projects have yielded valuable information about the bahaviour of several lesser known species of bat.

Photo: Yoann Peyrard/LIFE04NAT/FR/000080

An inventory and distribution atlas of bats in the region of Castilla y León was one of the main results of the Spanish project (**LIFE96 NAT/E/003081**). Such information enabled important refuges for bats in the region to be designated as pSCIs, with their exact location, threats and protection needs identified.

Awareness raising:

Many of the projects highlighted the need for conservation measures to be taken with the full support of the local community. The Brussels project responded to this need by publishing a management handbook for the managers of the public forests and parks covered by the project. It also produced an information brochure for owners of houses and other buildings, giving simple techniques to improve survival of bats, and installed 30 information panels. Awareness-raising tools are also useful for helping disseminate the project to a wider audience. The south of France project produced a 31-minute film that won the nature conservation prize at the 2007 International Ornithological Film Festival.

As well as carrying out numerous general awareness-raising activities, the Extremadura project targeted environmental agents in the region and encouraged them to implement the project's actions. Co-operation with volunteers has greatly helped to continue the work of the project and will guarantee future monitoring.

CONCLUSIONS

LIFE projects have demonstrated that introducing the above conservation actions can help stabilise and increase populations of endangered bat species on a local level. For the conservation status of such species to improve on a Europe-wide level, such actions must be adapted and replicated in other regions.

While gaps remain, the knowledge gained through LIFE projects has increased our understanding of key species and has helped inform conservation measures and priorities. Through continued monitoring and habitat protection, LIFE is improving the status of several target species.

Photo:Callisto

The LIFE programme has made a significant contribution to ensuring the long-term conservation of the brown bear in the EU through numerous projects in several countries. In particular, by promoting efforts to reconcile conflicts between human needs and those of bears, much progress has been made in reducing threats to the species.

LIFE's contribution to **brown bear conservation**

In the EU there are between 13 500 to 16 000 bears. The species was formerly widespread and abundant, but over the last few centuries it has become extinct in much of western and central Europe. The IUCN classifies the bear as near threatened in the EU, and not threatened across Europe as a whole if you add the 45 000 individuals from the Russian bear population. However, in the EU many populations are tiny and fragmented and, therefore, according to IUCN, critically endangered [the Alpine (35-40), Cantabrian (60-90), Apennines (40-50), Pyrenees (15-17)] and vulnerable [the Dinaric-Pindos (2,800), Carpathian (8,100) and Balkan (700) populations]. The Scandinavian (Sweden) and north-eastern European (Finland and Baltic countries) populations are not threatened as they are connected with the Russian population.

As a result, the Member States reported its status as 'unfavourable-bad' in the Continental region and 'unfavourable-inadequate' in the Atlantic and Mediterranean regions. However, this large carnivore, which lives mostly in forests, does have a favourable status in the Alpine region, thanks to the favourable status of the Slovenian and Slovakian populations. Its conservation status in the Boreal region is unknown since there is no available data from Sweden, although Finland and Estonia reported it as favourable. Nevertheless, it is worth noting that the brown bear's main populations at EU level are located in Romania (Carpathian) and thus fall outside of the scope of the current Article 17 report.

Low and fragmented populations mean that the brown bear is critically endangered in the EU.

Photo: FOP

Species	Conservation status at Member State / region level (main regions)	Relevant Projects	Population targeted by the projects
Ursus arctos	Austria	LIFE02 NAT/A/008519 LIFE00 NAT/A/007055	
	Italy (Bad but improving – Alpine; Bad but improving – Continental)	**Alps population** LIFE96 NAT/IT/003152 LIFE00 NAT/IT/007131 LIFE2003 NAT/CP/IT/000003 LIFE03 NAT/IT/000147 **Apennine population** LIFE99 NAT/IT/006244 LIFE97 NAT/IT/004141 LIFE98 NAT/IT/005114 LIFE03 NAT/IT/000151 LIFE04 NAT/IT/000190 LIFE04 NAT/IT/000144 LIFE07 NAT/IT/000502	All the Apennines populations and part of the Alpine was targeted by LIFE
	Greece (Inadequate but improving)	LIFE99 NAT/GR/006498 LIFE96 NAT/GR/003222 LIFE93 NAT/GR/010800 LIFE07 NAT/GR/000291	
	Slovenia	LIFE02 NAT/SLO/008585	
	Spain (Inadequate)	LIFE98 NAT/E/005305 LIFE98 NAT/E/005326 LIFE99 NAT/E/006371 LIFE00 NAT/E/007352 LIFE07 NAT/E/000735	100% of the Cantabrian population

The main threats to the bear come directly or indirectly from human activity. Direct threats include poaching, particularly by people looking to protect crops, livestock and human settlements. Indirect threats come principally from the degradation and fragmentation of important habitats. Bears can also be killed by traps and poison set for other predators. An increasing number of fatalities occur as a result of traffic accidents – for example, on the recently constructed Egnatia highway, which crosses through the bear habitat in Pindos, Greece. It is anticipated that new road infrastructure will cause similar problems to the Rhodope bear population in Greece and Bulgaria. Isolated populations can suffer from low genetic diversity, which increases risks to survival. The species is not helped by a low productivity rate of only one cub every three to four years.

LIFE ACTIONS

As can be seen from the above table, a significant number of LIFE projects dealt with conservation of the small and more endangered brown bear populations, mainly those in the Apennines, Alps, Cantabria, Dinaric-Pindos and the Balkans. These projects undertook a range of actions, which can nevertheless be seen to follow similar themes: reconciling human and ursine needs; restoring crucial habitats and food sources; and increasing genetic flow between populations by improving connectivity and reintroducing bears. Many projects monitored bears to improve knowledge and understanding of the species and its needs, and to implement bear-management plans.

All the projects looked to raise stakeholder (especially farmers, livestock producers and hunters) awareness of the brown bear. Bears are often disliked, feared and attacked because of the damage they cause to livestock, beehives and crops. The Slovenian project (**LIFE02 NAT/SLO/008585**) removed rubbish dumps that might attract bears to human settlements. Along with other projects (**LIFE96 NAT/IT/003152, LIFE93 NAT/GR/010800, LIFE96 NAT/GR/003222**, for example), it also provided compensation to those who had suffered damage or loss caused by bears to try to prevent the development of anti-bear sentiment.

A common intervention is to erect (electric) fencing around fields and beehives to protect them from bears (**LIFE00/NAT/IT/007131**). Another common action is to provide guard dogs to livestock owners (**LIFE04 NAT/IT/000144 and LIFE96 NAT/GR/003222**) and to create livestock

An effective focus of bear conservation has been measures to connect populations.

Photo: FOP

guarding dog breeding stations (**LIFE07 NAT/GR/000291**).

Other efforts to tackle poaching of bears included the use of wardens or patrols, notably in Spain. These sought to monitor and prevent poaching, while simultaneously having an important role in educating people about the brown bear (**LIFE00 NAT/E/007352 and LIFE98 NAT/E/005326**). A couple of Italian projects also aimed to capture stray dogs, which cause problems for the bears (bears are killed by poisoned bait used illegally by local farmers against stray dogs) (**LIFE97 NAT/IT/004141**).

Measures to restore important bear habitats have taken different approaches. The restoration of forests (**LIFE07 NAT/GR/000291, LIFE03 NAT/IT/000147** and **LIFE99 NAT/E/006371**), the planting of wild fruit trees (**LIFE96 NAT/GR/003222, LIFE03 NAT/IT/000151** and **LIFE07 NAT/GR/000291**) and the artificial supply of forage (**LIFE99 NAT/IT/006244**) were among the techniques used to improve food supply for the bear.

Other habitat protection measures included preventing or reducing tourist access to sensitive areas, such as wintering sites (**LIFE07 NAT/GR/000291** and **LIFE99 NAT/E/006371**) and the removal of dumped waste from potential bear habitats (**LIFE98 NAT/IT/005114**). Securing migration routes (**LIFE00 NAT/A/007055**) or corridors between zones of suitable habitat (**LIFE99 NAT/E/006371**) were other measures taken.

Two Italian projects aimed to capture bears in Slovenia and release them into sites in the Italian Alps to restore numbers and improve genetic diversity (**LIFE96 NAT/IT/003152 and LIFE00 NAT/IT/007131**). A Greek project (**LIFE93 NAT/GR/010800**) aimed to rehabilitate bears taken from travelling performers in a specially created bear sanctuary.

Several projects increased understanding of the bears and their movements through the use of radio tracking (**LIFE99 NAT/IT/006244** and **LIFE02 NAT/SLO/008585**). The wardens and other observers were sometimes used for this purpose and genetic fingerprinting was undertaken through the collection of fur samples in Italy (**LIFE03 NAT/IT/000151**).

Photo: Callisto

Awareness campaigns have attempted to reduce mortalities due to poaching.

Following awareness raised through two Greek projects (**LIFE93 NAT/GR/010800** and **LIFE96 NAT/GR/003222**) on the impending Egnatia highway construction, which cuts through bear habitat, the European Commission obliged the Greek government to take mitigation measures. This safeguarded the bears along the first stretch of the highway, but bears are being killed in the recently opened sections, which lack appropriate fencing and throughways for the bears. The Greek project (**LIFE07 NAT/GR/000291**), currently in progress, is pushing for the enforcement of the appropriate measures.

CONCLUSIONS

In Italy, there are two bear populations with distinct genetic characteristics: the brown bear (*Ursus arctos*) in the Alps and the Marsican brown bear (*Ursus arctos marsicanus*) in the Apennines. The introduction of new bears into the Alps has yielded positive results, while numerous projects in the Apennines have improved knowledge and protection of the bear. Nevertheless, this subspecies is still critically endangered.

In Greece, LIFE projects have led to crucial improvements in the conservation status of the species. The bear population is showing slight increases at all sites and recolonisation has been noted in at least four sites. Spanish LIFE projects have contributed to wider efforts to improve the conservation status of the brown bear in Cantabria, which has seen increases in the effective population. A new project (**LIFE07 NAT/E/000735**) is aiming to link this population with the one found in the Pyrenees.

Furthermore, the projects that have focused on improving cross-border capacity to protect bears have played an important role (**LIFE07 NAT/IT/000502, LIFE2003 NAT/CP/IT/000003, LIFE02 NAT/A/008519** and **LIFE99 NAT/GR/006498**). The protection of migration routes between countries (**LIFE00 NAT/A/007055**) is also essential.

Despite some improvements in the conservation status of the brown bear, however, much progress is still needed. A particular challenge lies in the expansion and linking of appropriate habitats and ensuring sustainable numbers and sufficient genetic diversity within individual populations.

MAMALS : ARTIC FOX

Securing **a future for the Arctic fox**

The Arctic fox (Alopex lagopus), which within the EU is found only in the northern parts of Sweden and Finland, is classified as critically endangered. Its populations are fragmented and isolated from the strongholds in western Siberia.

When the first LIFE project (SEFALO) started in 1998, about 40 adult arctic foxes were present in Sweden and only five litters were born. Towards the end of the second project (SEFALO+), during the summer of 2007, 24 Arctic fox litters were born in Sweden and 15 in Norway. Nevertheless, no litters were born in Finland, and the Finnish population (10 individuals) shows no reproduction.

The main threats to the Arctic fox are scarcity of food – it feeds on lemmings (among other small rodents) whose populations fluctuate – and competition and predation by the red fox (*Vulpes vulpes*), which has increased in numbers in the mountain areas. Also, young foxes have difficulty in finding a non-related partner because of their diminished numbers. In the past, hunting for fur has been a major threat to the species. The conservation status of the Swedish and Finnish populations is 'unfavourable-bad'.

Conservation of the critically endangered Arctic fox has focused on increasing reproduction and improving juvenile survival rates.

Photo: LIFE03 NAT/S/000073

The LIFE projects aimed to increase reproductive output and decrease mortality. The main conservation actions – supplementary feeding and control of the red fox – helped achieve this aim and demonstrated the possibility of reviving a population threatened with extinction.

LIFE ACTIONS

The first SEFALO project (**LIFE98 NAT/S/005371**), which was carried out in Sweden and Finland, helped stabilise the population, but it was unable to increase numbers and a second project (**LIFE03 NAT/S/000073**), also including Norway, was considered necessary to build on the experience learned during the first one. The most important change was that the project would now take an individual-oriented approach rather than an area approach to conservation measures. Such a shift in focus was made possible as a result of the monitoring programme launched by the first project that tracked individuals with radio-transmitters.

The dens with litters were provided with extra food (commercial dog pellets) during the project in order to increase the survival rates of the juveniles. During wintertime, carcasses were hidden under the snow as a complement to the dog pellets. This extra food during wintertime helped to increase the number of breeding arctic fox pairs, increase the litter size and improve juvenile survival rates, contributing to a faster population growth.

Another measure that LIFE projects have highlighted is the need to inform the local population about the plight of the fox. The first project emphasised that sites with breeding dens should also be protected from hunting with dogs in early autumn.

Finally, a great many red foxes have been culled in strategically important sites for the Arctic fox.

CONCLUSIONS

There are currently about 200 individuals in Fennoscandia. The results of the projects demonstrate that conservation measures can halt population decline and even increase population size. In areas where intensive actions have been performed, the population has more than doubled over a four-year period. It is important to remember that it is the combination of actions that have resulted in the positive population development during the project period. However, as all actions are completed together it is also difficult to distinguish which contribute most. Information and protection around dens are difficult to evaluate in a quantitative way, but they are an important part of a concerted conservation effort. Saving an endangered carnivore is a long-term initiative spanning several years.

A viable **future for the monk seal**

Europe is home to the world's most endangered seal, the Mediterranean monk seal (*Monachus monachus*). Despite strenuous conservation efforts, its population is still declining. The species has been on the IUCN Red List since 1996, classified as critically endangered.

According to the IUCN, only about 350-450 individuals remain in the wild, with 150-200 in Greek waters and about 100 in Turkish waters. The remainder inhabit the western Mediterranean and there is a small Atlantic population (23 individuals) in the archipelago of Madeira (Desertas), Portugal.

The main threats to the monk seal are human activities, such as habitat destruction, uncontrolled tourism, marine pollution and depletion of fish stocks. The seals also suffer at the hands of fishermen, who are known to kill them because of their impact on fish stocks. Fatalities are also caused by entanglement in fishing nets. Lack of knowledge and lack of co-operation with fishermen on these issues has been a serious threat to the species. As a result, the conservation status of the species was reported by Greece as "unfavourable with bad prospects".

LIFE ACTIONS

To halt the decline of the monk seal, close to €4 million has been spent since 1992 through four different LIFE Nature projects in Greece. The first beneficiary was the WWF, which carried out a project that also aimed to improve the conservation status of the loggerhead turtle. Since then, three consecutive projects have been run by the non-profit, non-governmental environmental organisation, The Hellenic Society for the Study and Protection of Monk Seal (known as MOm).

MOm's efforts in Greece over several years have led to the establishment of a strictly protected National Marine Park, 35 special areas of conservation

Photo: MOm/LIFE00 NAT/GR/007248

Habitat destruction, pollution, human interference and depletion of fish stocks have led to the decline of monk seal populations.

(SACs), a national action plan and the establishment of management bodies for two of the areas most frequented by monk seals.

LIFE project actions have included monitoring and documentation of the distribution of the Greek population of the monk seal, collection of data on its marine environment, establishment of a rescue and rehabilitation centre, surveillance activities, lobbying of local, regional and national authorities, presentation of management proposals and information campaigns, and education programmes to increase public awareness of the significance of the rare seal.

During the projects, an improvement in the birth rate was noticed in some areas, but mortality rates have continued to be high. To address this problem, MOm started a four-year project in 2005 focused solely on defusing the conflict between monk seals and fishermen. In the two most important breeding sites at Alonnisos and Kimolos, fishing boat activities were tracked. From 29 examinations of monk seal fatalities, it was evident that the main cause of death for adult seals was deliberate killing (44%), and for younger seals, entanglement in fishing gear (56%).

The Portuguese LIFE project achieved its aim of protecting the Atlantic monk seal and its habitat: the population increased from 6-8 animals in 1988 to 23 in 2000. All planned measures were implemented successfully. The integral reserve status of the southwest area of Deserta Grande – confirmed during the project's lifetime as an important breeding and resting ground – proved adequate.

CONCLUSIONS

LIFE projects in Greece have led to action plans with specific and feasible proposals. The hope is that these proposals will be adopted and implemented by the relevant Greek ministries, thus becoming a basic national policy tool for protecting the monk seal in fishing areas.

LIFE projects have led to the establishment of a strictly protected National Marine Park, 35 Natura 2000 Special Areas of Conservation, a National Action Plan, and the establishment of management bodies for two of the monk seal's most frequented areas.

The last project revised the national conservation strategy for the species and introduced a national action plan to mitigate seal-fishery interactions. The population is being monitored systematically in only three of the sites (Alonnisos, Kimolos, Karpathos) and is reported by the beneficiary to be stable. Although the monk seal remains in an unfavourable status, the situation would have been much worse without the LIFE projects.

Species	Conservation status at Biogeographical region level (main regions)	Relevant Projects	Percentage of the species range targeted by the project(s)
Mediterranean monk seal (*Monachus monachus*)	Unfavourable-bad (Marine Mediterranen) Unknown* (Marine Macaronesian)	LIFE95 NAT/GR/003225 LIFE92 NAT/GR/013800 LIFE98 NAT/P/005236 LIFE00 NAT/GR/007248 LIFE05 NAT/GR/000083	90 %

** even though Portugal provided information on estimated increasing population and habitat trends*

LIFE projects have succeeded in halting the decline of the rare Iberian lynx in the key region of Andalusia, mainly by restoring numbers of its principal prey, the rabbit. Ongoing measures are now seeking to improve links between sub-populations, increase their genetic diversity and reintroduce animals bred in captivity into the wild.

LIFE boost **for critically endangered Iberian lynx**

The Iberian lynx (*Lynx pardinus*) was once common all across Spain and Portugal. However, over recent centuries and particularly in the past few decades of the 20th century, its population and range declined dramatically. In 2009 it was estimated that around 250 lynxes survived (plus 74 in captivity centres) in the south-western corner of the Iberian Peninsula.

This medium-sized feline (8-14 kg) thrives in areas characterised by Mediterranean woodland and maquis. It favours a mosaic of dense scrub for shelter and open pasture for hunting rabbits. Rabbits make up 95% of its diet. The main causes of the decrease in population have been damage and fragmentation of these habitats and the wiping out of rabbit populations, first through epidemics of myxomatosis and then of viral haemorrhagic pneumonia.

Populations are now clustered in small groups that have limited opportunities to mix genetically. Only two areas containing sub-populations with chances of long-term viability survive in Doñana and Andújar-Cardeña (Sierra Morena). Its overall conservation status for the Mediterranean region is 'unfavourable-bad'. With a total population of less than 150 adults, the Iberian lynx is the most threatened feline in the world, assessed as a 'critically endangered' species on the IUCN Red list and described by IUCN in 2007 as "on the brink of extinction".

LIFE ACTIONS

Since 1992, LIFE has co-funded most of the conservation initiatives in Portugal and Spain that target directly or indirectly the species. The main actions have been

Most conservations initiatives aimed at the Iberian lynx have been co-funded by LIFE.

Photo: J. Andalucía/ M. Medio Ambiente

Photo: J. Andalucia/ M. Medio Ambiente

Restoring rabbit populations has been an major part of lynx conservation.

habitat restoration (in particular rabbit habitats), the involvement of stakeholders (mainly farmers and hunters) and awareness campaigns. For this type of project, collaboration with private owners has been essential as 75% of the current lynx territories are located on private lands (mainly game hunting estates).

Two LIFE projects co-ordinated by the Andalusian Regional Authority have been central to the protection and enhancement of the existing lynx populations. The first project, 'Population recovery of Iberian Lynx in Andalusia' (**LIFE02 NAT/E/008609**), succeeded in stemming the decline, stabilising populations in Doñana and increasing the number of individuals and breeding territories in Sierra Morena. The follow-up project, 'Conservation and reintroduction of the Iberian lynx in Andalusia' (**LIFE06 NAT/E/000209**), is attempting to increase the genetic diversity of the populations, both by improving connectivity between isolated sub-populations and by reinforcements – it is continuing to extend their territories by enhancing the existing populations and by undertaking the first reintroduction of captive-bred animals in territories where the lynx previously was found.

The key action for maintaining and restoring population numbers of the Iberian lynx has been to increase the population of rabbits. Sustainable populations of their main prey in their distribution areas and diminution of threats caused by poaching or road kills allow lynx populations to expand naturally. Rabbit restoration was mainly achieved through artificial, protected breeding areas for new populations, which naturally grew and spread.

Important management actions were agreed with landowners. These were aimed at conserving key habitats, particularly in areas linking sub-populations of lynx. They have restricted land-use and hunting practices such as snares and rabbit hunting, which may directly or indirectly affect the lynx. Temporary feeding actions were carried out when prey was scarce.

LIFE projects have also taken steps to make roads safe for animals by installing fences, underpasses and overpasses to reduce fatalities. They have also repaired or covered dangerous wells to prevent accidents.

A campaign, including numerous warning signs for drivers and specifically addressed campaigns for hunters, raised public awareness of the plight of the lynx and its needs.

Apart from these Andalucian LIFE projects, other LIFE projects in adjacent regions such as Castilla-La Mancha, Extremadura and Madrid in Spain, and several ongoing LIFE projects in Portugal are paving the way for the expansion of the lynx in its former territories. Similar management actions to those mentioned are creating suitable habitats with good rabbit densities that will allow the reintroduction of animals bred in captivity in the years ahead.

CONCLUSIONS

Many LIFE projects have targeted this critically endangered species. LIFE projects have succeeded in stopping the rapid downward spiral that had brought the Iberian lynx to the verge of extinction. The lynx population in Doñana has been consolidated, while lynx numbers and territories are increasing in the other viable population area of Sierra Morena. The experience gained in habitat management and the preparation of good habitats in Andalucia and other Spanish and Portuguese regions allows for some moderate optimism about future recolonisation of part of the former distribution area by this extremely endangered animal.

Captive-bred animals have been reintroduced to territories where the lynx was previously found.

Photo: J. Andalucia/ M. Medio Ambiente

LIFE support for **critically endangered European mink**

LIFE has aimed to protect the highly endangered European mink. Projects have explored how to make breeding and release of the species more successful, improved riverside habitats and tackled key threats, notably the invasive American mink.

The European mink (*Mustela lutreola*) was once found along riverbanks, streams and in wetlands across Europe. Today, this small mammal, which has a typical body length of around 30-40 cm, occupies less than 10% of the area it once covered and has disappeared in more than 20 countries.

Within the EU, less than 2 000 adult individuals survive in the wild – found mainly in southern France and northern Spain, but also in Romania and Estonia. In only a few decades, their EU distribution area has reduced by 70% to around 40 000 km^2, making the mink one of the most endangered mammals in Europe along with the Iberian lynx. Outside the EU, the main population is a rapidly declining sub-population in northeast Russia.

Habitat degradation and fragmentation have been important threats, isolating and reducing the genetic viability of sub-populations. However, the main cause of its decline in many areas has been the invasion of American mink (*Mustela vison*), which has managed to populate Europe after escaping or being released from fur farms.

LIFE ACTIONS

Three of the first LIFE projects focusing on the European mink implemented a co-ordinated European mink action plan for Spain. The projects in Castilla y Léon (**LIFE00 NAT/E/007299**), La Rioja (**LIFE00 NAT/E/007331**) and Álava (**LIFE00 NAT/E/007335**) worked to enhance European mink populations, control the spread of the American mink, limit the occurrence of disease and pollution, and restore natural habitats. Many new habitats for the European mink were proposed as Natura 2000 sites. Prior to these projects, knowledge of this species was scarce and no specific actions were being carried out. Therefore, LIFE represented a turning point for the conservation of this species in Spain.

A subsequent Spanish project in Catalonia (**LIFE02 NAT/E/008604**) pursued similar goals, while also including a captive-breeding programme and establishing a reserve of individuals with which to start a recovery programme.

An Estonian project (**LIFE00 NAT/EE/007081**) tried to increase European mink numbers in an island's sub-population by releasing animals, which were bred in captivity under an existing programme. Although this process was not a total success, it helped highlight some of the challenges for future reintroduction programmes in Europe. The project, however, did help to extend the new Natura 2000 network for the species.

An ambitious Spanish project (**LIFE05 NAT/E/000073**) focused on restoring and improving the connectivity between riparian forest habitats, such as the 91E0, crucial to European mink populations. It created favourable habitat features for the target species, such as gullies and breeding areas and tackled 33 danger spots – mainly on roads – to reduce mink mortality rates. The project also monitored European mink dynamics and genetics, and ensured the absence of the American mink from target areas. A broad and intensive awareness campaign successfully engaged the public.

Finally, a co-operation project run from Barcelona (**LIFE03 NAT/CP/E/000002**) brought together different projects and experts to draw up and update European protocols for breeding and release of the animal.

CONCLUSIONS

The European mink remains one of Europe's most endangered mammals, but LIFE projects have started to explore the means for saving it. This is especially notable in Spain where population declines were reversed by LIFE projects. The European Mink has become in just a few decades a flagship species for riverine habitats. The challenge of successfully introducing mink bred in captivity into the wild is one that LIFE projects have not yet overcome. Finding effective and viable introduction methods, controlling American mink populations and ensuring healthy, well-connected riparian habitats are key to the survival of the species. The collaborative approach encouraged by LIFE projects represents a clear way in which this goal can be achieved.

The European mink is threatened by habitat degradation and fragmentation.

Photo: LIFE05 NAT/E/000073

Despite a limited number of projects, LIFE Nature has had a major impact on some of Europe's amphibians and reptiles species.

LIFE helps **Europe's herpetofauna**

Amphibians and reptiles (collectively known as herpetofauna) are one of the most endangered groups of vertebrates in Europe. Nearly a quarter of amphibians and almost a fifth of reptiles species are considered threatened in Europe (IUCN, 2009).

Reptiles and amphibians are found in a range of habitats in Europe. Although amphibians are linked to wet habitats, they can also be found in drier places, particularly in the Mediterranean, or in special habitats, such as the cold, dark caves in the Dinaric area that are home to the endangered olm (*Proteus anguinus*). Conversely, while reptiles are associated with warm and sunny locations, they can also be found in wet and cold habitats – the European common lizard (*Lacerta vivipara*) is able to survive freezing conditions over winter in the Arctic parts of Finland and Sweden, making it the most northerly lizard species in the world. Reptiles also thrive in open seas as shown by marine turtles.

A number of factors have led to the decline in numbers and range of reptiles and amphibians. Threats to herpetofauna include:

- Direct killing (out of fear and superstition or for trade);
- Habitat change and destruction;
- Invasive alien species (IAS);
- Climate change;
- Disease (e.g. the chytrid fungus, a virulent pathogen that affects many amphibian species).

More than 40% of the reptile species assessments were classified on the Article 17 report as being unfavourable. Nevertheless, for reptiles, there is a high percentage of 'unknown' (around 40%), particularly in the Mediterranean biogeographical region. For amphibians the scenario is much worse with almost 70% of the assessments being reported as 'unfavourable' and more than 20% of them 'unfavourable-bad'.

Between 1992 and 2006, 59 LIFE projects directly targeted the conservation of herpetofauna listed under the annexes of the Habitats Directive, while additional projects indirectly benefitted amphibian or reptile species when carrying out conservation actions in a broader context – for example, under habitat actions, Natura 2000 network site management plans, or more general actions.

More than two-thirds of the projects that have targeted amphibians and reptiles have been concentrated in Italy, Spain and Greece, which is to be expected since the largest number of reptiles and amphibians are located in the Mediterranean biogeographical region.

The majority of LIFE projects targeting amphibian species included actions focused on habitat restoration. The common factor in all these habitats is water. Typical restoration actions include encouraging an increase in habitat-specific vegetation by the propagation of water or grasslands plants; eradication of IAS; erosion control; restoration of hydrological features and water quality; and provision of ecological corridors between populations.

LIFE projects targeting reptiles have included many of the same types of actions and have normally targeted either highly endangered reptile species with very small populations in restricted areas or species with very specific requirements

Almost a fifth of reptile species are considered threatened in Europe, according to the IUCN.

Photo: Halpren Bálint

such as sea turtles. Common features of the projects have included preparatory actions – monitoring and assessment of the status of the wild populations; habitat restoration; construction of captive breeding facilities; networking with other projects; and awareness campaigns.

LIFE AND THE FIRE-BELLIED TOADS

Since 1996, more than 40 LIFE projects have included actions targeting either directly or indirectly the conservation of two rare species of fire-bellied toads: *Bombina bombina* and *Bombina variegata*.

Fire-bellied toads (especially *Bombina bombina*) are strongly bound to water, spending the whole summer in ponds. The species are under threat from a decline in their optimal habitats caused by drainage and filling in of ponds, and a decline in grazing together with increased use of fertilisers and pesticides.

Typical LIFE project actions to improve the habitat and/or populations of Bombina include: habitat management actions aimed at creating optimum conditions for the reproduction and survival of fire-bellied toads – the creation of shallow ponds with abundant aquatic weeds, the removal of drainage systems and the re-instatement of extensive year-round grazing with cattle and horses, and the creation of hibernation sites close to the ponds; genetic analysis; and population management (breeding programmes).

One of the most ambitious LIFE Nature projects to date has been 'LIFE-Bombina' (**LIFE04 NAT/DE/000028**), an international project targeting the northernmost populations of the fire-bellied toad *Bombina bombina* in the Baltic regions of Denmark, Sweden, Latvia and Germany. This project, which built on the work of an earlier project (**LIFE99 NAT/DK/006454**), implemented a range of habitat improvement actions – digging and restoration of ponds and hibernation sites; encouraging more conservation-oriented farming (hardy whole-year grazing animals are being used to secure and maintain pools for the toads in grassland habitats); genetic analysis; and population management – that have seen more than 120 ponds dug or restored, more than 21 000 eggs collected and more than 23 000 young toads released into the wild at project sites in Denmark, Germany and Latvia. The 'LIFE-Bombina' project also attracted widespread media coverage for its European Bombina Song Contest, which has been held on two occasions.

Photo: LIFE06 NAT/E/00019

LIFE SUPPORT FOR CRITICALLY ENDANGERED LIZARDS

The Canary Islands are home to a genus of lizards found nowhere else: the Gallotia of the Lacertidae family of wall lizards, which includes eight endemic species and two recently rediscovered giant lizards, the El Hierro giant lizard (*Gallotia simonyi* – rediscovered in 1974) and the La Gomera giant lizard (*Gallotia bravoana* –1999). These critically endangered giants show very reduced genetic variability and are under threat from predation by introduced species (particularly feral cats and rats) and human activities (tourism and agriculture). A series of LIFE projects have targeted the conservation of the giant lizard species. The first of these (**LIFE94 NAT/E/001238** and **LIFE97 NAT/E/004190**) have developed a management plan and captive breeding programme that are crucial to the El Hierro giant lizard's chances of mid-term recovery and survival. Aside from the implementation of the recovery plan through the captive breeding programme and the release of individuals in suitably prepared habitats, the main management actions for both projects consisted of the control of possible predators (mainly cats and rats) and competitors for food (goats and other lizards). As a result, there are currently five nuclei of giant lizards on the island, compared with a single population of some 200 individuals at the beginning of the project.

Drawing on the lessons of these projects, in 2002, LIFE co-funding was secured for the 'Recovery plan for the giant lizard of La Gomera' project (**LIFE02 NAT/E/008614**). A captive breeding centre set up on La Gomera had bred more than 50 individuals by the end of the project, which has been followed up by a second project (**LIFE06 NAT/E/000199**) whose main objectives are to continue the conservation strategy the first project established and to release into the wild some of the lizards bred in captivity.

Photo: LIFE04 NAT/DE/000028

Populations of the loggerhead turtle (*Caretta caretta*) in the Atlantic and Mediterranean Sea have declined dramatically in recent decades, and its conservation status in these regions is unfavourable. Its main threats are interaction with fisheries – it is often the victim of by-catch – habitat loss and direct killing.

Loggerhead turtles' long-term survival through LIFE

LIFE projects have addressed threats in order to improve the status of this endangered species (it is listed in Annex II and Annex IV of the Habitats Directive). Through information and awareness campaigns as well as habitat conservation and the establishment of rehabilitation centres, projects have demonstrated a range of effective measures for combating the species decline.

LIFE ACTIONS

Reducing the high mortality rate of the loggerhead turtle was the main focus of the most recent project carried out by ARCHELON in Greece (**LIFE02 NAT/GR/008500**). One of the key aims was to encourage turtle-friendly fishing practices through dialogue with fishing organisations. Memoranda of understanding were signed and information on good practice (i.e. what to do should a turtle become entangled in a fishing net) was circulated.

Exact numbers of turtle mortalities resulting from by-catch are difficult to calculate, but ARCHELON has identified hot-spots, where it has set up first-aid centres for injured turtles. Similar centres have also been established, in part funded by LIFE, in the Pelagic Islands, the Canary Islands and Madeira. The last ARCHELON project equipped the rescue centre at Glyfada, Athens, with large outdoor tanks that ease the turtles' adaption back into the sea. The beneficiary tracked released individuals using satellite telemetry and tagging. The monitoring of tagged turtles (a group of 13) was also undertaken by a Spanish project (**LIFE97 NAT/E/004151**). It obtained valuable information on the species' behaviour, habitat use and movements.

Protecting nesting sites has been a common LIFE action.

The previous ARCHELON LIFE projects (**LIFE98 NAT/GR/005262, LIFE97 NAT/GR/004247**, **LIFE95 NAT/GR/001115**) protected nesting beaches in Kyparisia Bay, Crete, and Lakonikos Bay. In all but Rethymnon (Crete) the populations are stable; the Rethymnon one is declining but after 19 years of monitoring and nest protection, many hatchlings have returned which would otherwise have been lost, providing hope for a reversal in numbers.

The Tartanet project (**LIFE04 NAT/IT/000187**) focused on creating a conservation network of five new rescue centres in national parks and marine reserves, identified on the basis of their importance for the presence of the turtle along the Italian coasts. A turtle first-aid service was established, with a nationwide toll-free number for reporting accidental catches and for co-ordinating recovery efforts. This project also demonstrated that actions taken to improve the conservation status of bottlenose dolphins (*Tursiops truncatus*) can also benefit turtles.

Finally, LIFE projects have directly addressed habitat loss. In the province of Agrigento, on the south coast of Sicily, a LIFE project (**LIFE03 NAT/IT/000163**) targeted two Natura 2000 sites in the Pelagian Islands, Lampedusa and Linosa – the last known nesting sites in Italy. The project continued an information campaign, which was launched in an earlier project (**LIFE99 NAT/IT/006271**) and aimed to restrict access by tourists and the local population to the beaches used by turtles during the nesting season. It also advised local fisherman on how to reduce by-catch by modifying fishing gear.

CONCLUSIONS

On a local level, LIFE projects have had a direct impact on the conservation status of loggerhead turtles. The challenge is for local and regional authorities, in co-operation with fishing associations and the tourist industry, to implement best practices and conservation measures on a wider scale in order to improve the overall status of the species. Monitoring is one area in which different organisations could work together. The Tartanet project showed that such networking can produce demonstrable results.

Freshwater pearl mussels in the EU have benefitted from LIFE. Several habitat restoration and species reintroduction techniques and integrated water management of river basins have been securing the survival of this species.

LIFE benefit for **freshwater pearl mussels**

The freshwater pearl mussel (*Margaritifera margaritifera*), which only occurs in the EU and neighbouring countries such as Norway and Russia, lives in fresh, running water streams or rivers with clean bottoms, bordered with alluvial forest. It is a good indicator of clean water. The mussels have a very peculiar biology; they have a parasitic lifecycle stage dependent on a host fish (normally brown trout or salmon) before they develop into fully grown mussels.

The species is highly threatened throughout its distribution area. In central Europe, the population has decreased by more than 95% in its range and abundance, and it is extinct in several countries. As a result, it is classified by the IUCN Red list as 'endangered' and listed in Annex II and V of the Habitat Directive. The reasons behind the mussel's decline include water acidification, pollution and siltation, irregular water flow and river regulation, and agriculture and commercial forestry on the river shores that enhances siltation. Moreover, in the past mussels were widely exploited for their pearls. Nearly all remaining mussel populations are characterised by very low recruitment and low juvenile densities. Some populations have only individuals that are more than 60-years-old.

The conservation status of this species differs according to geographical region: 'unfavourable-bad' in the Atlantic, Continental and Mediterranean regions and 'favourable' in the Alpine and Boreal regions. However, the general trend seems to be that this species is declining. In Poland it is even believed to be already extinct.

LIFE ACTIONS

Since 1992, seven LIFE projects have directly targeted the species. Several other projects have tried to improve the conservation status of the species habitat with indirect river restoration actions.

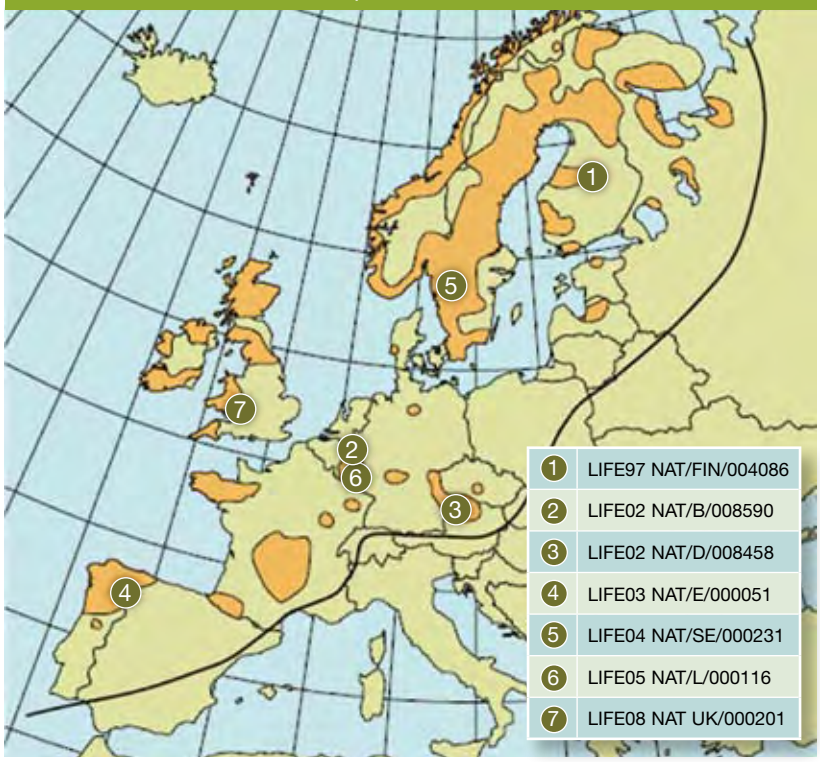
All of these projects aimed to improve the riverine ecological conditions, in particular, its water quality and riverbed and shore structure. These were done by restoring riverbanks, removing commercial forestry plantations from river valleys and planting deciduous riverine woodlands. Moreover, the projects aimed to improve the habitat for the host fish (normally Salmonids) that the mussels' parasitic larvae, the small glochidia, depend upon during its reproductive cycle. This was done by creating fish passages, removing artificial blocking structures and improving the fish spawning areas. All the projects included the monitoring of populations in order to assess their structure and viability.

Sweden is one of Europe´s strongholds for mussels; nevertheless populations are as threatened as other remaining populations in Europe. A Swedish project "Freshwater Pearl Mussel and its habitats in Sweden" (**LIFE04 NAT/SE/000231**) aimed to secure these remaining important EU populations in 21 Natura 2000 sites watercourses. The project implemented several actions targeting the riverbeds and host fish, such as creating migration opportunities for host fish in ten sites by removing obstacles, fixing incorrectly placed road culverts and building bypasses around migration barriers. In order to restore more natural buffer stream zones, the project removed spruce plantations along two streams to benefit the deciduous trees. These actions have resulted in a more ecologically functional buffer stream zone, and thus reduced disturbance and siltation. Moreover, the

Improving the river quality and the structures of the riverbeds and shores are critical for mussel conservation.

Photo: LIFE02 NAT/D/008458

Freshwater pearl mussel distribution in Europe and LIFE project locations (adapted from Larsen 2005)



project replaced stones on the riverbed that had been removed to facilitate timber floating. This helped recreate a more natural habitat for the host fish.

However, the Swedish project had also direct actions on the river bed, such as placing gravel and stones at appropriate locations in the watercourse, thus helping small juvenile mussels to find suitable substrate in areas where siltation may have caused decline in recruitment. This action also benefited spawning grounds for brown trout.

New riverbeds were created in nine of the project's watercourses. Several restored locations were difficult to reach due to the presence of bogs and dense riverside forests. The action was therefore carried out with the help of a helicopter, thus preventing damages to the riverside zone. Before restoration measures were carried out, landowners and forestry stakeholders were advised and informed in order to minimise any future impacts on the watercourse.

The sources of siltation (dredging, clearing of ditches, vehicle damage in the watercourse and poor buffer zones) were addressed first, and the project blocked several riverside ditches to prevent leakages of sediments from the source zones, so that the new gravel riverbeds do not become clogged again by new sediment. In addition, a new method to improve riverbeds was tested in the stream Bratteforsån. A pump and hose were used to rinse away sediment through a screen frame, leaving a clean, oxygen-rich bottom substrate. Conversely, a German project (**LIFE02 NAT/D/008458**) constructed eight silt traps.

The Swedish project also developed a comprehensive restoration and management handbook on freshwater pearl mussels, compiling all the projects outcomes and techniques used as well as all available information produced by several LIFE projects around the EU.

REINTRODUCTION OF FRESHWATER PEARL MUSSELS

Some projects established the release of infected host fish and juvenile mussels. The German project 'Large freshwater mussels Unionoidea in the border area of Bavaria, Saxony and the Czech Republic' (**LIFE02 NAT/D/008458**) released five bathes of young freshwater pearl mussels into the Südliche Regnitz and Zinnbach creeks and two batches into the Höllbach and Mähringsbach creeks. The project used the following technique: brown trout were infected with mussel larvae in a fish farm. After nine months the young mussels came off the fish gills and were collected from the fish tanks using fine sieves and were infiltrated into the cleaned bottom of the brook via a tube. Around 342 000 individuals were released in total. This technique was also used for another mussels species, *Unio crassus,* listed in Annex II and V, with the release of 115 000 young mussels at the project sites. Also, the Finnish and Swedish projects, after the restoration work was completed, reintroduced pearl mussels to selected streams at other locations – 116 and 1000 individuals respectively. The recent UK project (**LIFE08 NAT/UK/000201**) will develop an assisted breeding programme to reintroduce the species to the Irfon catchment area.

CONCLUSIONS

The conservation of the pearl mussel is complex, as it requires action be taken at various levels. Mussel survival and reintroduction success depends not only on habitat conservation (e.g. adequate water quality and substrate) but also on the availability of host fish populations, such as salmonids. The outcome of the conservation and reintroduction actions taken across the EU are difficult to assess at this early stage. Though the projects reported in their monitoring surveys that no glochidia have been found in trout gills and that no juveniles had been found yet in the rivers surveyed, recruitment is expected within the coming 10–20 years. LIFE projects have developed and demonstrated techniques of site restoration and ex-situ reproduction of the target species that potentially contribute to the strengthening of pearl mussels within their natural habitats and that are transferable at EU level in order to improve the conservation status of this endangered species.

Bolstering butterfly populations through LIFE

Most butterfly populations and numbers are in decline throughout Europe, with Member States reporting the conservation status of species in their countries is 'inadequate', or 'unfavourable-bad' (see table). However, by actions targeting the conservation of habitats, LIFE projects should have a positive long-term impact on populations of especially vulnerable European butterfly species at a local level.

The decline of European butterflies has been long recognised, but it was not until the publication of the Red Data Book of European Butterflies in 1999 that the full extent of the problem became clear. The study showed that 71 of the 576 species known in Europe were threatened (12% of the total), and a further 43 species were classed as near threatened.

Over half of European butterfly species are linked to grassland habitat types, with the highest number of species occurring in farmland habitat – typically open grassy areas such as extensively farmed areas, grasslands, meadows and pastures. Their very substantial decline in recent years is attributed to loss of extensive farmland to agricultural intensification, leading among other things to a loss of marginal habitats and hedgerows and a higher input of fertiliser, herbicides and insecticides.

Protecting their natural breeding habitats is crucial, not only to avoid a further decrease in their numbers, but also to protect other animal and plant species and areas with high ecological value.

Photo: LIFE03 NAT/UK/000042

Populations of the marsh fritillary butterfly have declined dramatically in Europe and the species is assessed as 'unfavourable-bad'.

LIFE ACTIONS

Since 2000, LIFE projects have indirectly targeted populations of ten rare or highly endangered butterfly species in Europe. These locally based actions involve, for the most part, restoration of the grassland habitat types on which the species depend. Typically, they include mechanical clearing of overgrowth, including scrub and trees, controlled burning, mowing, introduction or reintroduction of extensive grazing with hardy breeds of sheep, cattle, or horses, and in some cases drainage and restoration of natural hydrology.

Among these, the projects focused in particular on actions for the protection and conservation of breeding habitats associated with the marsh fritillary butterfly (*Euphydryas aurinia*). Listed as a priority species in Annex II of the Habitats Directive, numbers have declined dramatically in Europe. The species is assessed as 'unfavourable-bad' across most of its European range.

LIFE projects in the UK, Denmark and Poland have focused mainly on long-term conservation measures to bring the most threatened and isolated populations into an improved conservation status. The main actions involved the establishment of mechanisms for the legal protection of the species and, on Natura 2000 sites, the introduction of legally binding management plans together with national conservation or biodiversity plans.

Although populations of marsh fritillaries may occur occasionally on wet heath, bog margins and woodland clearings, most colonies are found in damp acidic or dry calcareous grasslands. Therefore, there has been a great deal of LIFE work on-site to ensure good conditions for the species' preferred larval food plant, devil's bit scabious (*Succisa pratensis*). The plant benefits from measures that prevent overgrowing, and clearance work is also of value to many other listed species and habitat types. LIFE

Species	Conservation status at Member State / region level (main regions)	Projects
Coenonympha oedippus	Unfavourable-bad (Alpine) and Unfavourable - Inadequate (Continental)	LIFE06 NAT/PL/000100
Colias myrmidone	Unfavourable - Inadequate (Continental)	LIFE02 NAT/IT/008574
Erebia christi	Unfavourable bad (Alpine)	LIFE99 NAT/GR/006498 LIFE96 NAT/GR/003222 LIFE93 NAT/GR/010800 LIFE07 NAT/GR/000291
Euphydryas aurinia	Unfavourable bad (Atlantic and Continental)	LIFE03NAT/UK/000042 LIFE05 NAT/DK/000151 LIFE06 NAT/SK/000115 LIFE06 NAT/PL/000100 LIFE07 NAT/B/000039
Graellsia isabelae	Unknown	LIFE03 NAT/E/000057
Lycaena dispar	Favourable (Boreal) Unfavourable - Inadequate (Continental)	LIFE05 NAT/SK/000112 LIFE06 NAT/PL/000100 LIFE07 NAT/B/000039
Lycaena helle	Unfavourable-bad (Continental and Boreal)	LIFE06 NAT/PL/000100 LIFE07 NAT/B/000039
Maculinea arion	Unfavourable-bad (Continental and Alpine)	LIFE06 NAT/SK/000115 LIFE04 NAT/DK/000020
Maculinea nausithous	Unfavourable-bad (Continental)	LIFE05 NAT/SK/000112 LIFE06 NAT/PL/000100
Maculinea teleius	Unfavourable-bad (Continental)	LIFE05 NAT/SK/000112 LIFE06 NAT/PL/000100

has also funded a range of awareness-raising campaigns.

In the UK, one of the species' main strongholds in Europe, the marsh fritillary has undergone a dramatic decline in recent years, with a 66% loss in populations nationally since 1990. The project that was carried out on the mid-Cornwall moors, (**LIFE03 NAT/UK/000042**), demonstrated best practices for supporting habitats associated with some of the larger populations of the species in England. Project work has successfully targeted habitat management over several sites, using a metapopulation[1] strategy deemed necessary for the long-term maintenance of populations (see box).

1 A metapopulation consists of a group of geographically separated populations of the same species which interact at some level.

The marsh fritillary has also suffered rapid decline in Denmark, due to fragmentation of habitats and populations. Together with a continuing decline in the quality of existing and potentially suitable habitats, this has caused the conservation status of the marsh fritillary today to be highly unfavourable. Only eight small sub-populations remain, and thus the actions of the Danish project (**LIFE05 NAT/DK/000151**) were crucial to reverse this negative trend and to ensure the butterfly species continues to exist there. As well as habitats for *Euphydryas aurinia*, a Polish project also targeted the conservation and improvement of habitats for five other rare butterflies of wet, semi-natural meadows (**LIFE06 NAT/PL/000100**).

Meanwhile, LIFE actions have also indirectly benefited another of Europe's rarest butterfly species: Raetzer's ringlet (*Erebia Christi*) – found almost exclusively in a small SCI area of the Ossola valley (*Val d'Ossola*) on the Italian-Swiss border. Here, the project's valuable monitoring work has greatly added to the knowledge of this species, first sighted in the area in the 1970s. During the three years of the LIFE project (**LIFE02 NAT/IT/008574**), the presence of the species was confirmed (22 individuals were recorded in 2004) and, apart from its very limited distribution, the researchers found no other threats to its survival.

CONCLUSIONS

While many European butterfly species still have an 'unfavourable-bad' conservation status, the habitat conservation actions undertaken by LIFE projects should have a positive long-term impact on individual populations of highly endangered species. Through surveys and demonstration of best practice approaches to habitat improvement, LIFE has also added significantly to our understanding of the ecology and conservation of some of Europe's rarest butterflies.

'METAPOPULATION' APPROACH BENEFITS MARSH FRITILLARY

Between 2003-07 the mid-Cornwall moors project focused on increasing the extent and improving the quality of marsh fritillary breeding habitats at nine sites. A key objective was to restore the connectivity between breeding patches on the sites where marsh fritillaries already occurred. Making connections between marsh fritillary breeding places is considered particularly important because the insects thrive as a collection of colonies, and the adults need to be able to fly between different sites. A major achievement was the redirection of a section of a busy road that intersected these butterfly colonies. Useful 'information sheets' can be downloaded from the project website: http://www.midcornwallmoors.org.uk/. These cover the background to the project, the science underpinning it and conservation grazing.

Photo: Graia srl

The reintroduction of **the white-clawed crayfish**

Many LIFE projects have undertaken habitat-restoration measures that include the white-clawed crayfish as a target species. Six Italian projects, however, have focused directly on breeding and reintroducing this species to identified target areas.

The white-clawed crayfish (*Austropotamobius pallipes*) is a freshwater species mainly found in mineral-rich waters, notably in small, fast-moving mountain streams. The animal is particularly susceptible to water pollution and requires high oxygen levels. Its presence is considered an indicator of good water quality. It is included in Annexes II and V of the Habitats Directive and is classified as vulnerable in the IUCN Red List.

European populations, however, are increasingly sporadic, mainly due to habitat degradation, water removal, pollution – including sewage, insecticides and farm waste effluent, poaching and crayfish plague. Moreover, the plague resistant invasive North American signal crayfish (*Pacifastacus leniusculus and Procambarus clarkii*) competes directly with the native crayfish for habitat and resources. In all geographical regions where white-clawed crayfish occur (Alpine, Atlantic, Continental and Mediterranean) its conservation status was assessed as 'bad'. Germany is the only country where it is performing well.

Photo: LIFE03 NAT/IT/000147

LIFE has contributed to the development of captive breeding techniques for the white-clawed crayfish.

LIFE ACTIONS

Since 1992, LIFE has co-funded 17 projects that directly or indirectly targeted the species. Most of the project actions included improving water quality and stream habitats, but just eight have focused specifically on the white-clawed crayfish - most of them taking place in Italy, one in France and the other in the UK. Although the species is still found across the Italian peninsula, numbers have fallen sharply and many local populations have been eliminated. This vulnerable crustacean is now confined to isolated groups in the least polluted watercourses and faces a high risk of local extinction and loss of genetic diversity.

All projects focused significant efforts on the breeding and reintroduction of crayfish into carefully targeted areas of appropriate habitat. This involved capturing healthy specimens and breeding them in captivity before releasing the offspring into the wild to recolonise habitats and add genetic diversity to weak sub-populations. The released specimens and their habitats were carefully monitored and awareness-raising activities carried out.

One Italian project (**LIFE03 NAT/IT/000137**) prepared and adopted an action plan for the species with seven Italian provinces in central Italy and gave technical training courses. This project also restored two breeding facilities in order to raise juvenile crayfish to release into the wild and to improve breeding techniques. After a preliminary study of the distribution and ecological conditions of the local crayfish populations, more than 4 400 juvenile crayfish, born by captive breeding, and 270 adult crayfish were released in 18 selected sites in three different regions of central Italy (at least 250 crayfish were released in each site). Surveillance and scientific monitoring activities were also carried out to reduce poaching.

Another Italian project (**LIFE03 NAT/IT/000147**) aimed to prevent the extinction of the white-clawed crayfish in the Valvestino and Corno della Marogna Natura 2000 sites. First, a survey was conducted to assess the ecological conditions and the local crayfish population. The resulting data showed that it was possible to reinforce the existing populations with new individuals in the Valvestino, where the species had natural reproduction, and to reintroduce the species in a selected water course in the Corno della Marogna, where no crayfish were found in the survey. In order to achieve this goal a crayfish breeding facility was built with ten tanks and an artificial pond. The project improved the breeding techniques and 610 juvenile crayfish were released in the predefined locations. Juveniles were bred from reproductive crayfish that were captured in rivers and water courses within the two sites and then released after the reproduction period.

Using the experience gathered by these two Italian projects, an ongoing project (**LIFE08 NAT/IT/000352**) aims to reintroduce crayfish in 47 Natura 2000 sites by breeding 23 200 juvenile crayfish in newly established/restored breeding centres.

Elsewhere in the EU, a French project (**LIFE04 NAT/FR/000082**) and a recent UK project (**LIFE08 NAT/UK/000201**) are also aiming to reintroduce the white-clawed crayfish in two Natura 2000 sites.

Species	Conservation status at Biogeographical region level (main regions)	Projects
Austropotamobius pallipes	Unfavourable-bad (Alpine, Atlantic, Continental and Mediterranean)	LIFE00 NAT/IT/007159 LIFE03 NAT/IT/000137 LIFE03 NAT/IT/000147 LIFE04 NAT/FR/000082 LIFE08 NAT/IT/000352 LIFE04 NAT/IT/000159 LIFE08 NAT/UK/000201 LIFE99 NAT/IT/006229

CONCLUSIONS

Though LIFE project actions have been taken at a local level, they have improved the conservation status of white-tailed crayfish in certain areas, such as central Italy. Nevertheless, the conservation status throughout EU is not favourable, and the actions demonstrated by LIFE projects must be adopted on a wider scale to ensure the long-term survival of this species.

LIFE support for Italy's **endangered Cobice sturgeon**

Fish protection bodies in northern Italy have made good use of LIFE co-financing to help improve the conservation status of one of Europe's most endangered species, the Cobice sturgeon.

Europe's last remaining populations of the Cobice or Adriatic sturgeon (*Acipenser naccarii*) are found in Italy, the Former Yugoslav Republic of Macedonia and Albania. In Italy it is located only in the northern Veneto, Lombardy and Emilia Romagna regions. It is included in Annex II of the Habitats Directive, and is classified as vulnerable in the IUCN Red List. The limited distribution of the species, combined with its particularly long reproductive cycle (females only reach reproductive maturity at around 12-14 years of age with a low productivity rate), represent particular natural challenges to its conservation.

The conservation status is 'unfavourable-bad' in the Continental region, where a large decline has occurred in the Italian rivers during the past few decades due to intensive overfishing, construction of dams that block the rivers where sturgeons spawn, water pollution and habitat destruction.

LIFE INVOLVEMENT

One LIFE Nature project (**LIFE04 NAT/IT/000126**) has addressed sturgeon stocks in the Po, Adige, Piave and Brenta river basins. These sites cover the majority of the sturgeon's remaining population range and provide the main reproductive locations. LIFE support here included a large-scale restocking programme. A parallel LIFE project (**LIFE03 NAT/IT/000113**), which has benefited the conservation status of the Cobice, targeted the fish's last remaining land-locked population in the lower Ticino River.

Cobice individuals ready for restocking – incubating cobice eggs.

Photo: LIFE 04NAT/IT/000126

Photo: LIFE 04NAT/IT/000126

Captured cobice at the breeding centre.

With the aim of restoring viable populations of the priority species, LIFE co-financed the release of more than 162 000 captive-bred Cobice sturgeon in 12 different rivers (**LIFE04 NAT/IT/000126**). Around 23 500 of these were grown to an average length of 50 cm, and 12 000 were fitted with microchips, in order to monitor their movement and track the LIFE project's overall impacts.

A wide network of stakeholders (fishermen, rangers and volunteers) was created to monitor the released sturgeons. Results from the still ongoing monitoring are expected to confirm the long-term survival and reproduction of more than 2 000 sturgeon.

POLICY IN PRACTICE

A programme of practical policy-driven conservation work was carried out to help reinforce the effectiveness of LIFE's restocking efforts. New facilities were provided at two hatcheries to expand the LIFE project's potential and increase the hatcheries' efficiency. These capital investments were complemented by improved scientific knowledge of the sturgeon's favoured habitat features and its captive breeding. Hydrological studies were completed and data was mapped using a GIS system to identify optimum release points. This informed the content of an action plan, which also included river management recommendations supporting the survival of sturgeon populations.

Studies also focused on genetic analysis of fish stocks, and findings underscored the importance of expanding gene pool diversity in captive breeding systems.

CONCLUSIONS

The LIFE-funded action plan has been widely welcomed by Cobice sturgeon stakeholders. It takes a holistic approach, also incorporating actions on Natura 2000 sites, and has been adopted by environmental management authorities from three different regions. LIFE's interventions have played a significant role in meeting the Habitat Directive's requirements by strengthening the conservation status of this protected European species.

Species	Conservation status at Biogeographical region level (main regions)	Projects	Percentage of the species range targeted by the project(s)
Acipenser naccarii, (known as the Cobice or Adriatic sturgeon)	Unfavourable-bad (Continental)	LIFE03 NAT/IT/000113 LIFE04 NAT/IT/000126	About 100 %

Better rivers for healthier fish: **salmon conservation in Scotland**

The Atlantic salmon (*Salmo salar*), the so-called 'king of fish', is widely distributed throughout the North Atlantic, including Europe. However, it has declined because of pollution, acidification, introduction of non-native salmon stocks, overfishing, physical barriers to migration and degradation of spawning and nursery habitats.

In all geographical regions the status of this species is assessed as 'bad' in the Article 17 report. In Finland and Latvia, however, the Atlantic salmon is bucking the overall trend (assessed as 'favourable').

Scottish rivers are a European stronghold for the species, where the salmon is an indicator species for habitat quality. The salmon is also economically important to Scotland. Therefore, Scottish Natural Heritage, the government conservation agency, with support from the LIFE programme, carried out the wide-ranging 'Conservation of Atlantic salmon in Scotland' (**LIFE04 NAT/GB/000250**) project, one of the most significant initiatives of this kind ever undertaken.

LIFE ACTIONS

The project encompassed various subprojects, starting in 2004 and running until 2008. They took place in eight Scottish rivers, aiming to improve freshwater habitats for salmon and bypassing, removing or mitigating 25 man-made obstacles to the passage of salmon. The project also planned to improve the extent and quality of spawning-grounds and habitats for juvenile fish through in-stream works.

Other aims of the project were to prevent the erosion of riverbank habitats due to livestock; to reduce the amount of agricultural sediment going into one river; to improve riverbank woodland habitats; to stimulate natural recolonisation and spawning in newly restored areas; to encourage sustainable use of gravel in salmon rivers, and to purchase netting rights on two rivers.

The project benefited from having a wide range of high-profile participants. Scottish Natural Heritage was joined by the District Salmon Fisheries Boards, Fisheries Trusts, the Scottish Executive, the Forestry Commission, the Crown Estate and companies such as Scottish Hydro Electric. This showed the importance placed on restoring salmon habitats. The project enabled partners to develop expertise and technical understanding in a number of areas, such as fish-passage installation, riparian work and in-stream work.

Removing salmon migration obstacles has improved the status of the salmon.

Photo: LIFE04 NAT/GB/000250

The project's results were impressive, and in some areas performed better than expected. For example, the project aimed to improve 40 000 m^2 of degraded streams, but in fact restored more than 70 000 m^2. It aimed to fence 52 km of riverbank to prevent uncontrolled grazing, but a total of 80 km was fenced. Other goals such as easing the 25 man-made obstacles, managing riverbank forest and restocking of rivers were comfortably achieved.

Communication activities were also highly effective. The team produced a DVD showing completed actions at various locations on the river and organised a «Salmon in the Classroom» programme at local primary schools. The final conference, which was held in June 2008, attracted more than 80 delegates.

Several other LIFE projects have also indirectly benefitted the salmon. For example, two projects (**LIFE06 NAT/NL/000078** and **LIFE05 NAT/S/000109**) aimed to remove the barriers for migrating fish in Netherlands and Sweden, an action that might also benefit salmon among other migrating fish.

CONCLUSIONS

The project showed the benefits that can arise from concerted conservation actions, involving a wide range of stakeholders undertaking a broad range of actions. In this respect, the project could be a model for future activities in areas affected by conservation problems that require a joined-up approach.

Through in *situ* habitat-management actions, *ex situ* captive breeding programmes and management-capacity development, LIFE projects have helped improve the conservation status of some of the most endangered freshwater fish in Europe.

LIFE and **Mediterranean freshwater fish**

Photo: E. C. vertebrados acuáticos - U. Murcia

Mediterranean biogeographical region freshwater fish are those found in any river basin flowing into the Mediterranean Sea. The principal European waterways are the Rhone, Ebro and Po rivers – in which a total of 253 endemic fish species can be found. Areas of species richness include the Po river basin in northern Italy, the lower Guadiana in southern Spain and Portugal, several parts of the Mediterranean Spanish coastline, and the Acheloos, Axios and the lower Pinios river basins in Greece.

IUCN carried out a Freshwater Biodiversity Assessment Programme, which reported in 2006 on the 'Status and Distribution of Freshwater Fish Endemic to the Mediterranean Basin'[1]. It found that 18% of these endemic species are 'critically endangered', 18% 'endangered' and 20% 'vulnerable'. Thus a total of 56% of these species are threatened.

The main threat to their survival is the lack of water. Rainfall in the region is relatively low and a significant amount of water is extracted for domestic consumption, notably during peak tourism periods, and for agriculture. The construction of dams and the pollution of water sources exacerbate this problem, while bank alterations, the collection of gravel and sand, and the release of non-native fish can negatively affect the delicate ecosystems in which the fish survive.

LIFE ACTIONS

LIFE projects have for the most part aimed to protect specific species in targeted areas. This is partly because many of the endangered freshwater fish have a very restricted distribution, often limited to one country or one area. Habitat management was an important feature of all these projects.

1 http://www.uicnmed.org/web2007/cd_fwfish/index.html

A Greek project created a model biotope to act as a fish refuge. A Spanish project removed alien species (competing fish and crabs), restored important saltpan habitats and ponds and created new ponds to host the Iberian toothcarp. A Portuguese project sought to restore riparian habitats and participated in the drawing up of a hydrological plan for the Guadiana basin.

All the projects also undertook new *ex situ* captive breeding programmes to create stocks of the endangered fish for reintroduction and to prevent the possibility of total extinction.

Improving the understanding of the needs of these little-known fish was an important element of each project. Habitats, water quality, fish abundance and genetic diversity were explored. This in turn informed the development of management, conservation and recovery plans for the species, the revision of Natura 2000 sites to include the species, and the proposal of new SCIs. In most cases, beneficial dialogue and co-operation was established with the relevant administrations involved in river management. Finally, information sites were developed to engender public support for these species and to engage relevant stakeholders, including local authorities and private organisations in leisure and tourism.

Photo: Maria Th. Stoumboudi. Institute of Inland Waters, HCMR

Gizani in its natural habitat, feeding on the substrate.

Iberian toothcarp (Aphanius iberus)

Photo: Carlos Gonzalez Revelles

CONCLUSIONS

LIFE projects have increased understanding of endangered endemic Mediterranean freshwater fish (distribution, biology and ecology) and what is needed to ensure survival and restore their habitats. Very little was known previously in most cases. Habitat improvement and the establishment of protected areas together with effective reintroduction programmes and legal mechanisms to protect the species raise hope for a better future for these inconspicuous fish species.

Their conservation status has therefore been improved in the areas where LIFE projects were undertaken and increases in population numbers on a local level were recorded. As a result of the Greek project, the gizani is now generally stable and was assessed as 'favourable' thanks mostly to LIFE project actions. Another relevant contribution of these projects is that they help to protect streams that host the species and therefore contribute to the restoration of some very fragile habitats.

Country	Projects	Endangered Mediterranean fish	Where found	Project location	Conservation status
Greece	LIFE98 NAT/GR/005279	Gizani (*Ladigesocypris ghigii*)	Endemic to the Greek island of Rhodes.	Rhodes	Favourable
Spain*	LIFE04 NAT/ES/000035	Iberian toothcarp (*Aphanius iberus*)	Endemic to the Spanish coastline	Murcia region	Unfavourable-inadequate
Portugal	LIFE97 NAT/P/004075	*Anaecypris hispanica*	Endemic to Iberia	Guadiana basin	Unfavourable-bad

** In Spain many other projects have directly or indirectly contributed to the protection and enhancement of both Aphanius iberus and Valencia hispanica (LIFE96 NAT/E/003180, LIFE96 NAT/E/003118, LIFE98 NAT/E/005323, LIFE00 NAT/E/7339, LIFE04 NAT/E/0044), though it was generally not their main objective.*

LIFE innovations **benefit Europe's flora**

The status of many plant species has been improved by LIFE projects. The programme has helped foster important innovations such as the plant micro-reserve (PMR) concept.

Europe's varied geography and climate provides a vast range of habitats that support more than 12 500 vascular plants (flowering plants, conifers and ferns). Centres of particularly high plant diversity include the mountainous areas around the Mediterranean and the Black Sea. The floras of Spain, Greece, Italy, Bulgaria and Romania support the highest numbers of both endemic and endangered plant species.

Wild plants in Europe are under severe threat, however, and significant losses of plant species and habitat have taken place. According to the IUCN, some 21% of Europe's vascular plant species are classified as threatened and half of the continent's 4 700 vascular endemic species are in danger of extinction.

The highest percentage of the 'favourable' assessments in the Art 17 report is for vascular plants, where more than 20% of the assessments are favourable and less than 20% 'unfavourable bad'. However there are still more than 35% of 'unfavourable inadequate' assessments. This group includes a large number of endemic plants.

The main factors that have contributed to the progressive decline of European plant diversity are:

- Habitat loss and degradation;
- Introduction of invasive alien species;
- Pollution and disease;
- Climate change.

A particular characteristic of LIFE plant projects is that they typically have highly specific objectives (e.g. many target endemic or very rare species). Meeting these objectives often involves carrying out complex actions that differ considerably according to each individual plant species targeted by the project. The complexity of the projects means that many benefit from close collaboration with stakeholders and from national and international partnerships.

Photo: LIFE00 NAT/A/007069

The conservation status of the Lake Constance forget-me-not (Myosotis rehsteineri) *was improved thanks to two LIFE projects.*

LIFE projects focusing on plants commonly target several plant species – with different ecological requirements, habitats and locations (e.g. the project 'Conservation and restoration of calcareous fens in Friuli' (**LIFE06 NAT/IT/000060**), which targeted the species *Armeria helodes*, *Erucastrum palustre*, *Euphrasia marchesettii* and *Gladiolus palustris*). Projects also focus on very restricted populations – with few individuals in very small areas. Examples include those that focus on only one or a few Natura 2000 sites, such as the Austrian (**LIFE00 NAT/A/007069**) and German (**LIFE99 NAT/D/005940**) projects, targeting the Lake Constance forget-me-not (*Myosotis rehsteineri*), and the Italian project (**LIFE03 NAT/IT/000147**) targeting (*Saxifraga tombeanensis*).

When it comes to restricted species populations on a group of sites, LIFE has helped pioneer a new approach that has spread from Spain across the EU: the plant micro-reserve (see box).

To read more about LIFE's work in this area, download the publication 'LIFE and endangered plants – conserving Europe's threatened flora' from the LIFE website: *http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/nat.htm#plants*

LIFE and plant micro-reserves

A plant micro-reserve (PMR) is a small plot of land (up to 20 ha – there is no minimum size) that is of peak value in terms of plant richness endemism or rarity. The PMR is a permanent, statutory reserve given over to the long-term monitoring of plant species and vegetation types. As well as providing strong protection to plants and substrate, traditional activities compatible with plant conservation are allowed within the micro-reserve.

Since a PMR can be proclaimed for a single target species, it can pinpoint isolated areas of high botanical value. The aim is to provide a small-scale and flexible approach to plant conservation and to act as a complement to large Natural Protected Areas.

Europe's first PMRs were set up in 1994 by the Regional Wildlife Service of the Generalitat Valenciana, the autonomous government of the Valencia region of Spain, with the support of the LIFE programme. Valencia has a great diversity of plant species, many of which appear in micro-populations fragmented throughout the whole region. It was therefore an ideal location for Europe's first network of PMRs.

LIFE Nature supported a two-phase project to create a network of flora micro-reserves in Valencia. The first phase (**LIFE93 NAT/E/011100**) ran from 1994-96 and the second phase (**LIFE95 NAT/E/000856**) from 1997-99.

The projects succeeded in establishing a total of 158 micro-reserves, covering 286 ha, that are representative of the main endemic plant communities found in Valencia. The Valencia micro-reserve network has expanded significantly following the conclusion of the LIFE project in 1999. As of 2005, it consisted of 247 plots, with a total surface area of 1 684 ha (the densest network of protected sites for plant conservation in the world).

Planta Europa adopted the initial LIFE micro-reserves project in Valencia as a pilot scheme to evaluate the possible creation of a pan-European micro-reserves network. LIFE has done much to help establish such a network.

As part of a Spanish project (**LIFE00 NAT/E/007355**), which ran from 2001-4, the government of Minorca developed a set of comprehensive actions to recover the plant species and priority habitats protected by the Habitats Directive, including the creation of a network of 24 plant micro-reserves. The island and regional governments are now working on implementing this network of PMRs.

Slovenia was the first country outside Spain to go down the micro-reserve path. In the Slovenian project (**LIFE02 NAT/SLO/008587**), which ran from 2002-5, the Science and Research Centre at the University of Primorska set up a network of 30 micro-reserves for rare and endangered wild plants, as well as for priority habitats protected by the Habitats Directive, mainly focused on small ponds, calcareous screes, rocky slopes and grasslands.

In Greece, the "CRETAPLANT" project (**LIFE04 NAT/GR/000104**) has adapted the PMR concept to the province of Chania in Western Crete, where it has achieved good results in terms of guaranteeing the long-term conservation of seven threatened endemic plant species.

LIFE+ continues to support the growth of the PMR network. The latest batch of approved projects includes two on micro-reserves, one in Bulgaria (**LIFE08 NAT/BG/000279**) and one in Cyprus (**LIFE08 NAT/CY/000453**).

Successful LIFE support **for endangered Italian daisies**

LIFE project interventions have helped contribute to securing a favourable conservation status for *Aster sorrentinii*, a previously endangered plant species found only in Sicily.

Aster sorrentinii, a small plant from the daisy family (*Asteraceae*), is listed as a priority species for conservation under Annex II of the Habitats Directive. This rare and delicate daisy has a highly limited distribution, being found nowhere else in the world other than a small number of locations in Sicily.

Sites favoured by *Aster sorrentinii* include gas mud volcanic areas with and feature habitats, such as Mediterranean salt meadows, temporary ponds and steppe grasslands. Agriculture has had a major influence on the make-up of these types of habitats in recent decades, which saw Sicilian farmers introducing increasingly intensive patterns of land-use management.

Herbicides and artificial fertilisers have been used to boost the Island's potential for supporting larger numbers of livestock. However, increased grazing pressures, combined with habitat damage by fires or fragmentation, led to a significant decline in the size of the natural *Aster sorrentinii* population. By 2004 numbers of this protected plant species had dropped significantly. Urgent actions were thus required to prevent the species from completely disappearing.

Aster sorrentinii.

Photo: LIFE04 NAT/IT/000182

LIFE SUPPORT INTERVENTIONS

LIFE support was harnessed to help intervene in this species' conservation programme, which was actively pursued by the regional government's competent bodies. Their four-year LIFE project (**LIFE04 NAT/IT/000182**) began in 2004 and was carried out in the 'Maccalube di Aragona' Natura 2000 site, one of the few sites with *Aster sorrentinii*, and initially focused on maximising protection for the existing *Aster sorrentinii* population. Land covering some 66 ha was acquired and contractors installed 4 600 m of fencing to reduce grazing-related threats around plant locations. Fire breaks were also introduced and habitat support works were complemented by trials to identify optimal parameters for a proactive campaign of transplantation. The trials were carried out at a new acclimatisation station that stocks plants coming from a nearby nursery.

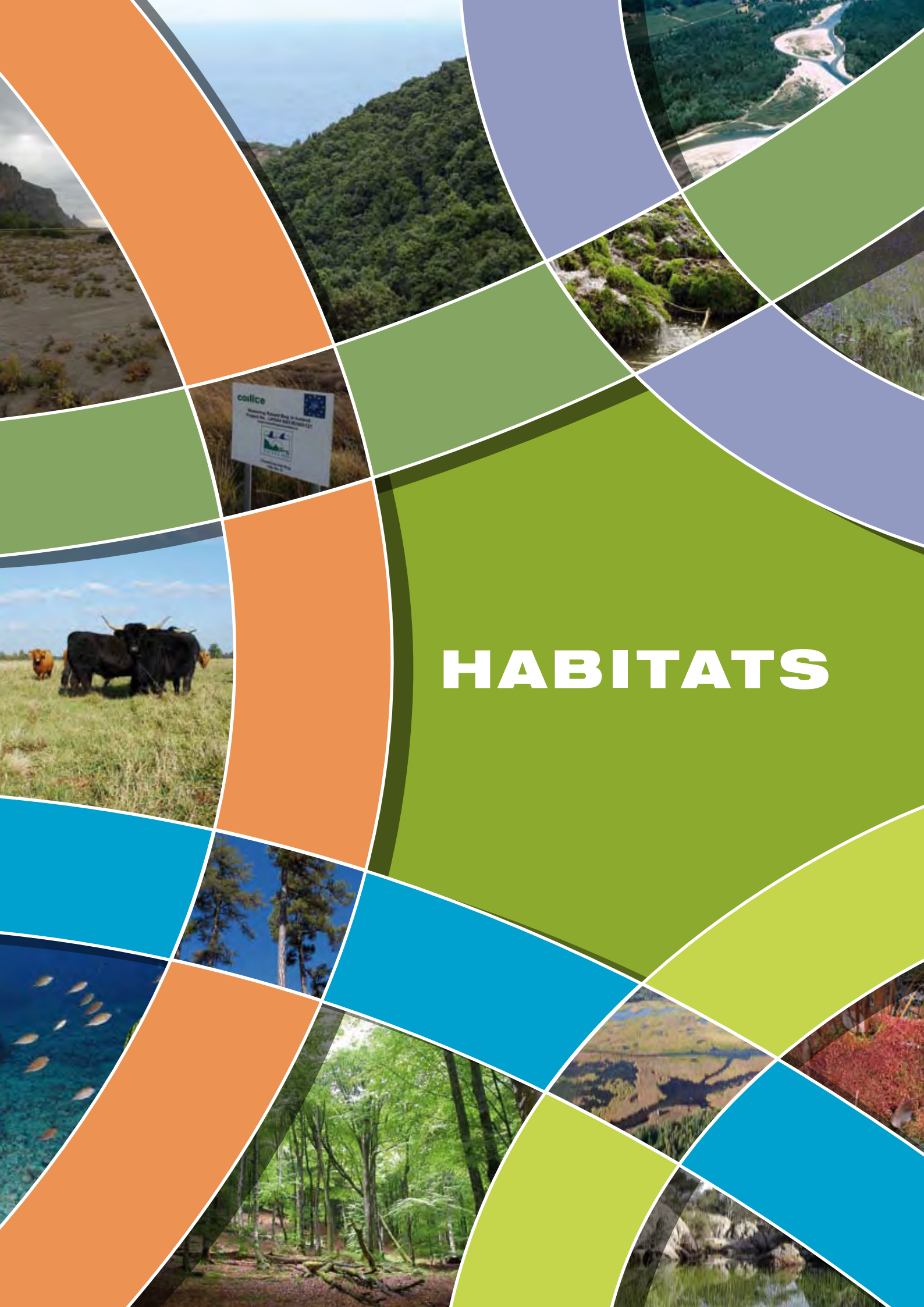
Results from earlier plant propagation work provided valuable lessons in how best to approach nurturing the growth of wild *Aster sorrentinii* populations. Knowledge gained from this conservation process helped to ensure a successful re-establishment of the endangered daisy species in specified target areas. Moreover, by the end of the project, natural dissemination had also led to new specimens being observed on other project sites.

CONCLUSIONS

LIFE's project results have made considerable contributions to the long-term sustainability of *Aster sorrentinii*, as more than 270 plant specimens were noted growing in the wild following the project's final phases. Italy's Article 17 report now records the species as having a favourable conservation status and the beneficiary acknowledges that key success factors can be attributed to the shift in land-use approaches. Land acquisition facilitated these changes, allowing a halt to excessive sheep grazing and silviculture, the main threats to availability of suitable habitats for *Aster sorrentinii*.

Longer term expansion of the plant populations remains reliant on addressing these concerns and LIFE project staff developed conservation methods that encourages stakeholder involvement from local landowners. These actions aim to broaden a sense of understanding and ownership of the plant preservation programme among farmers and foresters.

Mainstreaming more environmentally sensitive approaches within these key sectors remains a challenge throughout the EU. However, while policy support is now moving in this direction, more sustainable benefits for Europe's biodiversity will only be achieved when land holders convert policy rhetoric into action on the ground. LIFE continues to play an important role in testing and demonstrating practical techniques for reaching these essential conservation goals.



HABITATS

Preserving **priority palm forest habitat on Crete**

A combination of practical conservation actions and sustainable tourism principles have contributed to the success of a LIFE project that aimed to conserve and expand the rare Greek palm grove habitat.

Greece's 'Palm groves of Phoenix' habitat (*9370) is defined as an Annex II priority by the Habitats Directive, and is located in the Vai area at the eastern tip of Crete. This forest habitat contains the EU's sole grove of *Phoenix theophrastii* palms. *Phoenix theophrastii* is encountered only in Crete and in south-western Turkey and Vai is the only place where it forms a grove. In all other sites (other parts of Crete and Turkey) it only occurs in small clusters. Only one other endemic type of palm forest habitat exists in the EU (*Phoenix canariensis* in the Canary Isles) and so protection of the Vai palm forests remains an ongoing obligation for Greek environmental authorities and forestry services.

A series of different pressures on the palm habitat are noted in the Greek Article 17 report. These include cultivation, drainage, burning, disease, genetic pollution, competition and tourism impacts.

*LIFE has ensured that the 'Palm groves of Phoenix' habitat (*9370) has retained its favourable conservation status.*

Photo: LIFE04 NAT/GR/000104

Phoenix palms previously covered almost 300 ha. In recent decades, extensive land reclamations destroyed large parts of the unique palm forest. The problem became so acute that by 2000 only 15.6 ha remained, mostly surrounded by agricultural land. This limited the habitat's capacity to expand and natural regeneration was further hampered. Urgent conservation interventions were sought to prevent complete eradication of this endangered EU habitat.

CONSERVATION INTERVENTIONS

LIFE Nature support was used to launch and reinforce a long-term habitat rehabilitation initiative (**LIFE98 NAT/GR/005264**). This involved the implementation of a specific management plan prepared by a previous LIFE project, (**LIFE95 NAT/GR/001140**) followed by a programme of targeted actions co-ordinated by the Greek Biotope-Wetland Centre and designed to help implement key palm grove conservation actions.

To achieve the forest expansion and restoration, farmers agreed to reallocate 2.7 ha of sensitive areas around the forest to alternative land, and the Monastery of Toplou agreed to do the same for a further 13.4 ha. A batch of restoration measures were also implemented in parallel to improve the structure and vigour of both the existing, and now, extended forest area. This work involved: planting the additional 16 ha with *Phoenix theophrastii*; fencing both the existing forest and the new restoration area; implementing specific silvicultural treatments required for safeguarding the existing palm population, as well as monitoring and managing onsite water levels.

LIFE contributions helped to double the surface of Crete's rare forest habitat, which by the end of the project encompassed around 32 ha. The project also introduced a strategy for tourism management to help maintain this site. Another project in Crete (**LIFE04 NAT/GR/000104**) created a micro-reserve for the western – most cluster of the habitat on the island (along with micro-reserves for another six priority species).

Tourism was once one of the palm habitat's main threats, with more than 200 000 visitors regularly using nearby beaches. Managing this scale of visitor pressures remains essential and LIFE's Vai tourism strategy took a multifaceted approach. New information facilities were established and a publicity campaign helped raise awareness among local tourist operators about this unique forest's potential as a green-tourism attraction. In this way, ownership of the palm conservation objectives have now been mainstreamed within the Vai area's economic development agenda.

CONCLUSIONS

These actions continue to help contribute to the 'favourable' conservation status that is now enjoyed by Crete's Palm groves of Phoenix habitat. The Greek Article 17 report acknowledged LIFE's contribution to the endangered palm forest habitat's restoration and its long-term survival. It reported that the habitat area and range is increasing, primarily as the result of the management actions of the LIFE project.

LIFE interventions have helped Italian authorities to adopt long-term strategies for the sustainable management of rare Apennine beech forest habitats.

Sustaining the favourable conservation status of **Italian Mediterranean beech forest habitats**

Photo: Alberto Cozzi

Italy is home to two beech forest habitats: European temperate forests and the Mediterranean mountain broadleaf forests in southern Italy, which includes two Apennine beech habitats that are characterised by their diversified species composition – both are classified as priority for protection by the Habitats Directive and contain mixtures of beech and silver fir (*Abies alba*) (9220*), or beech with yew (*Taxus baccata*) and holly (*Ilex aquifolium*) (9210*).

In the Tuscany region these distinctive mixed forest habitats were once more prolific but are now restricted to small isolated patches along the Apennines and in the isolated area of Monte Amiata. Key factors contributing to the decline of the presence of silver fir in Tuscany's beech forest habitats include:

- Unsustainable timber extraction methods targeting fir species;
- Introduction and proliferation of exotic silver firs which dilute and weaken the local forests' genetic make up;
- Spread of pathogen fungi, such as *Heterobasidium* and *Armillaria*, caused by the substitution of the natural mixed broadleaf-silver fir forests with 100% silver fir plantation.

Habitats	Conservation status at Member State / region level (main regions)	Projects
9210* Apennine beech forest with Taxus and Ilex ad *aquifolium*	Favourable	LIFE04 NAT/IT/000191 LIFE04 NAT/IT/000190
9220* Apennine Beech forests with Abies alba	Favourable	LIFE95 NAT/IT/000610 LIFE96 NAT/IT/003169 LIFE97 NAT/IT/004163 LIFE99 NAT/IT/006260 LIFE04 NAT/IT/000190 LIFE04 NAT/IT/000191

Such pressures on the habitats' conservation status are reflected by the Article 17 report, which highlights problems of inappropriate forest management techniques. It assessed these habitats as 'favourable', but underscored concerns affecting the future sustainability of priority Apennine beech habitats, in particular due to forest conversions to grazing pastures and the impact of ski routes.

ITALIAN LIFE INVOLVEMENT

Italian authorities have recognised that a long-term outlook is required to address these pressures on the Apennine beech woods, and LIFE was identified as an appropriate vehicle to help protect and preserve future prospects for the two priority habitats. Indeed, habitats 9210* and 9220* are the forest habitat most targeted by the Italian LIFE projects, both in the Continental and Mediterranean biogeographical region. In the northern Apennines it was targeted by the project **LIFE95 NAT/IT/000610** and its follow-up **LIFE97 NAT/IT/004163**, and in the central and the southern Apennines by the projects **LIFE96 NAT/IT/003169** and follow-up projects **LIFE99 NAT/IT/006260**, **LIFE04 NAT/IT/000190**, **LIFE06 NAT/IT/000053**. Another project, **LIFE04 NAT/IT/000191**, focused on the Natura 2000 SCI IT5180013 "Foreste del Siele e Pigelleto di Piancastagnaio", where both habitats survive. The local ecotype of silver fir was characterised from a genetic and morphological point of view.

Long-term considerations featured prominently in this particular LIFE project. It established a carefully coordinated framework of forest conservation commitments based on a 25-year management plan. Following development of the plan, LIFE actions centred on a series of habitat remediation measures that were required to help facilitate the beech forest's future vitality.

This involved silvicultural interventions across 36.7 ha that improved natural regeneration conditions for indigenous species by removing diseased silver fir trees and initiating a programme to gradually extract all exotic silver firs from the beech forest. Further conservation gains were achieved via the reproduction and subsequent planting of around 6 000 native tree seedlings (including 3 000 yews) in the project area, which has now been designated as a Special Conservation Area (SCA) by the Province of Siena.

LIFE funding for the long-term management plan was crucial in attaining this legal habitat protection. Another notable success was allocating time for the labour-intensive determination of the genetic origins for individual silver fir specimens. In addition, LIFE support for the purchase of priority forest habitat sections (for a 7 ha dedicated reserve) has allowed conservation managers to operate more freely and effectively.

Photo: Alberto Cozzi

LIFE has played an important role in establishing management methodologies and restoration of the Apennine Beech forests with Abies alba *habitat (9220*).*

CONCLUSIONS

In quantitative terms, the LIFE programme has helped to reconstitute 32 ha of Apennine beech forest with silver fir, 'renaturalise' 18 ha of artificial conifer stands with allochthonous silver fir, and restore 20 ha of Apennine beech woods with yew and holly. These tangible project outcomes are augmented by more qualitative impacts relating to LIFE's securing of a long-term commitment to the conservation of Tuscany's rare beech forest habitats. Such a legacy demonstrates the real potential of the LIFE programme and will safeguard the favourable conservation status of this valuable European forest habitat for future generations.

LIFE support for **Europe's Atlantic Forests**

While the Article 17 report has confirmed that many Atlantic forest habitats remain threatened, LIFE support has shown how key conservation concerns can be addressed.

Europe's Atlantic forest habitats are mainly located in the northwest of France and the British Isles. Three different types of forest habitats are found exclusively in the Atlantic biogeographical region, none of which enjoy a favourable conservation status (see box).

Common threats to these important EU natural resources include excessive exploitation and negative impacts from non-native species. Air pollution, habitat fragmentation and overgrazing are also major problems in many threatened Atlantic woodlands. These conservation concerns often occur in combination thus exacerbating threats to the habitats' status.

LIFE AND EUROPE'S ATLANTIC FOREST HABITATS

A series of LIFE projects have targeted the restoration of habitat quality in these special woodland habitats. The first of these (**LIFE94 NAT/UK/000580**) focused on the conservation of the Caledonian forest. Several LIFE projects have been acknowledged in the Article 17 reports for their beneficial effect on the conservation status of Atlantic forest habitats. Examples include: **LIFE00 NAT/UK/007074** for its work with Tilio-Acerion forests (9180*) and Atlantic oak woods; **LIFE97 NAT/UK/004244**, which also targeted the restoration of Atlantic oak woods; and **LIFE05 NAT/IRL/000182**, which is continuing to restore yew forests as part of a co-ordinated conservation programme addressing priority woodland habitats in Ireland.

THE CALEDONIAN FOREST (91Co*)

A forest habitat type unique to Scotland is the Caledonian forest, comprising a blend of Scots pine (*Pinus sylvestris*), birch (*Betula*) and juniper (*Juniperus*) woodlands. This priority habitat previously enjoyed widespread coverage across northern parts of Scotland but its distribution is now limited and at EU level its status is 'unfavourable bad'. But conservation efforts (in some cases with LIFE support) over many years mean that its conservation status is improving.

Decline of this Scottish habitat has been associated with pressures from steep increases in deer and sheep populations. These have had a major impact on the Caledonian Forest's ability to regenerate and are highlighted in the UK's Article 17 report as an obstacle to this forest's future expansion. Inappropriate forestry operations were also identified during the Article 17 assessment, and the large-scale felling of Caledonian timber resources has fragmented the integrity of remaining indigenous pine, birch and juniper populations. Subsequent replanting with non-native species has further hampered the forest's natural regeneration capacities and also weakened its genetic make-up.

The following review of these LIFE projects' outputs highlights the most common conservation actions that ensure a more promising future for Europe's threatened Atlantic forest habitats.

CONTROL OF INVASIVE AND NON NATIVE SPECIES

Exotic shrubs, such as laurel and rhododendron, can spread vigorously in Atlantic forests to form a dense canopy which prevents the growth of native woodland species. LIFE projects have been at the forefront of campaigns to eradicate or control the spread of these prolific species.

As part of its restoration of Atlantic oak woods, a British LIFE project (**LIFE97 NAT/UK/004244**) helped eradicate the invasive *Rhododendron ponticum* scrub from 405 ha at five sites. Conservation techniques included follow-up spraying of more than 557 ha at the same sites and complementary bracken control on 373 ha at four different sites. Moreover, the project cleared exotic conifers from 688 ha of oak woods at seven separate sites. A Scottish project (**LIFE00 NAT/UK/007074**) invested heavily in the removal of *Rhododendron ponticum* from Atlantic forest habitats, including the necessary remedial measures to inhibit recurrence of the shrub problem after cutting.

LIFE projects have also implemented different techniques to manage the negative impacts associated with non-native trees. Ireland's priority woodlands project (**LIFE05 NAT/IRL/000182**), for example, demonstrated the effectiveness of a carefully planned approach to habitat restoration, which, as well as felling and selling non-native trees to help fund ongoing conservation work, used ringbarking to deliberately leave deadwood and promote forest biodiversity.

NATURAL REGENERATION OF NATIVE TREES

Core objectives driving the removal or control of non-native or commercial species focus on improving the ability of forests to regenerate naturally, and so strengthen the durability of their associated genetic make-up. Natural regeneration can be further facilitated by reducing factors that lead to forest fragmentation, managing woodlands' carrying capacity to maintain grazing herbivores and replanting badly affected areas with native species from local genetic seed sources.

Fragmentation has been targeted by a British project (**LIFE03 NAT/UK/000044**) through its restoration of forest habitats in England and Wales, where the quality of overall woodland mosaics has been improved by encouraging better coordination among forest stakeholders. A key method was the use of management groups, which were set up at each site to help different parties agree on consistent approaches to conservation. Similarly, 'Local Operational Planning Teams' were pioneered by a UK project (**LIFE97 NAT/UK/004244**) and joined-up partnership approaches were shown to be beneficial for the reduction of grazing pressures on Caledonian forests by another UK project (**LIFE94 NAT/UK/000580**).

TAXUS BACCATA WOODS IN THE BRITISH ISLES (91J0)

The remnants of Europe's yew (*Taxus baccata*) forests can be found in dry valleys or scarp slopes on chalk and limestone hills in England and Ireland. Both countries classify the state of their yew habitats as 'unfavourable bad' and this is attributed to problems such as atmospheric pollution and soil eutrophication. The latter has led to a spread of invasive nitrophilous species, and biocenotic evolution is also noted as a threat to *Taxus baccata* habitats. This phenomenon continues to represent a real risk as the ecological make up of these forests changes over time. Subsequent effects impede natural regeneration and alter the age structure of yew forests.

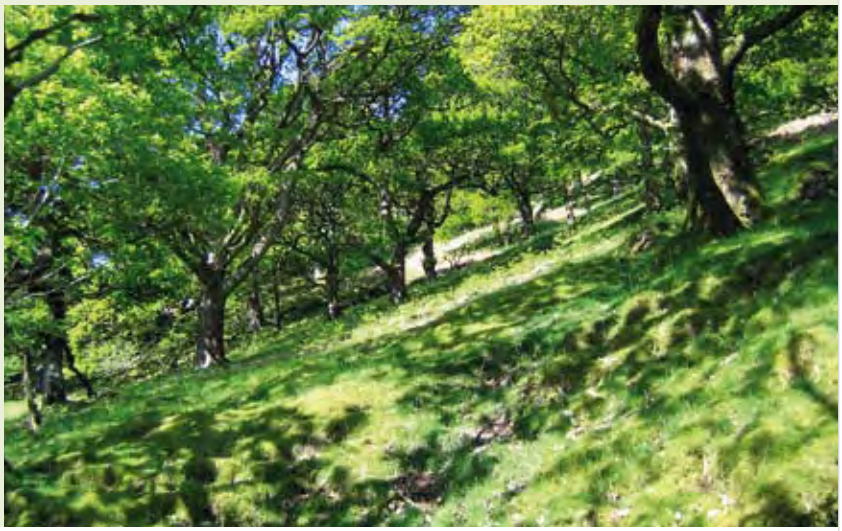
LIFE has invested heavily in the removal of Rhododendron ponticum *from Atlantic forest habitats.*

Photo: LIFE00 NAT/UK/007074

OLD SESSILE OAK WOODS WITH ILEX AND BLECHNUM IN THE BRITISH ISLES (91A0)

Referred to as 'Atlantic oakwoods' these acidophilous sessile oak (*Quercus petraea*) forests are characterised by low-branched trees, evergreen bushes and ferns, mosses, and lichens. Frequently, this oak woodland occurs as part of a mosaic of forest types and the habitat was once common in many maritime regions of the British Isles, as well as northwest France. However, the range of Europe's old sessile oak woods has significantly retracted and its current conservation status is now rated as 'unfavourable bad' at EU level, although reported as improving in the UK which hosts the biggest area of this habitat.

Habitat isolation is identified in the Article 17 report as one of the main threats to oak woods. Fragmentation has been aggravated in upland areas by overgrazing, and controlling the invasion of non-native species continues to present a persistent challenge. The rapid spread of rhododendron-related risks is especially problematic and inappropriate forestry practices are also assessed as a contributing factor in the demise of British oak woods. A similar situation has arisen in Ireland, where the habitat area is still decreasing.



Grazing controls have been a common component of LIFE projects, such as the previously mentioned UK project (**LIFE97 NAT/UK/004244**), which blocked access to forest regeneration sites using more than 61 km of deer fencing at three sites and around 14 km of stock fencing at six additional sites. The results provided a total of 148 ha of protected oak habitat and have made important contributions to improving natural conditions in seven of the UK's most extensive Atlantic woodlands. Long-term benefits were gained from a co-ordinated deer cull carried out by the same LIFE project, and its findings informed a high-level debate about the reduction of deer numbers in Scottish SACs.

The only Irish woodland project so far (**LIFE05 NAT/IRL/000182**) also recognises the need for effective techniques to address grazing pressures. For example, fencing in protected areas where young native seedlings are being planted. The project is regenerating around 33.5 ha of yew forest at five sites by transplanting young trees propagated from local native cuttings.

AWARENESS-RAISING LEGACIES

Guidance manuals on these and other types of restoration techniques for Atlantic forest habitats represent another common conservation tool harnessed with effect by LIFE projects. Good practices are included in the 'Conservation Toolbox' produced by a UK project (**LIFE03 NAT/UK/000044**), which features a database of technical information on topics such as managing sycamore in semi-natural woodlands, addressing forest grazing pressures, implementing appropriate coppicing techniques, realising sustainable scrub-level controls and instigating conservation methodologies for farm woodland areas. A another UK project (**LIFE00 NAT/UK/007074**) produced guidance on thinning Atlantic oak woods and stand dynamics in Tilio-Acerion woodlands, among other measures.

Much of this guidance is available online from the LIFE project websites, which continue to provide valuable peer learning opportunities for those involved in improving the unfavourable, often bad, conservation status of Europe's Atlantic forest habitats.

Habitat	Conservation status at Biogeographical region level (main regions)	Projects
91A0 Old sessile oak woods	Unfavourable-bad	LIFE97NAT/UK/004244 LIFE00NAT/UK/007074 LIFE03NAT/UK/000044
91C0* Caledonian Forest	Unfavourable-bad	LIFE94NAT/UK/000580 LIFE97NAT/UK/004244
91J0 Taxus baccata forest	Unfavourable-bad	LIFE05 NAT/IRL/000182 LIFE99NAT/UK/006094 LIFE03NAT/UK/000044

Significant parts of the Mediterranean black pine forests remain in unfavourable, inadequate or bad condition and LIFE projects have been working towards improving the conservation status of this priority EU habitat.

LIFE boosts **black pine forest habitats in southern Europe**

Coniferous forest habitats are present throughout Europe and include upland forests dominated by black pines of the *Pinus nigra* group. Included under Annex I of the Habitats Directive as an EU conservation priority, this '(Sub-) Mediterranean pine forest with endemic black pine' (9530*) habitat is mainly found in the mountain ranges of southern Member States, where distribution of the black pine habitat remains fragmented.

Often containing trees as high as 30 m or more, the black pine forests tend to comprise mixed-age classes. These habitat features commonly create closed arboreal canopies which help maintain a variety of fauna and offer useful protection against soil erosion following heavy rain showers.

At the European level, this habitat's conservation status is currently 'unfavourable–inadequate' in all Alpine, Continental and Mediterranean regions. While Article 17 reports from a number of Member States rate the habitat status as 'favourable', the less positive overall assessment is attributed to concerns in Austria, France and Italy. Here future prospects are considered problematic, particularly in the habitat's westerly ranges. In Spain the status of black pine remains unclear and French stocks of endemic black pine have declined to such an extent in recent decades that the habitat's condition is considered to be 'unfavourable bad'.

Photo: LIFE03 NAT/E/000064

LIFE projects promoted the sustainable management of Mediterranean Pinus nigra *habitats (9530*).*

Habitat	Conservation status at Biogeographical region level (main regions)	Projects
9530* Mediterranean pine forest with endemic black pine	Unfavourable-inadequate	LIFE 03 NAT/E/000059 LIFE 03 NAT/E/000064 LIFE 00 NAT/F/007273

TACKLING HABITAT THREATS

Some of the most significant threats to the long-term survival of *Pinus nigra* forests include unsustainable cutting for production purposes (particularly timber), the spread of exotic species, defoliation by insect pests (especially

Photo: LIFE03 NAT/E/000064

Pine seedlings ready for plantation to improve the Pinus habitats.

Thaumetopoea pityocampa), overgrazing, fires and genetic pollution. In the last decade, climate change might also be having an adverse effect on some of the most extreme distributions of this habitat. Higher temperatures and lower rainfall would oblige black pines forests to colonise areas at higher altitudes, which in some cases is no longer possible due to their location in the higher mountain ranges. Impacts include the sudden death of individual pines, less resilience to pest attacks and increased risks of fire.

Several LIFE projects have addressed these threats in order to improve the conservation status for this priority EU forest habitat.

Forest managers from the LIFE projects have applied an operational framework that blends sustainable silvicultural techniques with model conservation methodologies in order to help create positive conditions for the black pine and its associated fauna. Actions have concentrated on providing the necessary support to ensure long-term regeneration of irregular canopy structures that contain trees of various ages including very old specimens.

This aspect of LIFE's habitat conservation work is important for preserving genetic variability since intra-specific hybridisation can easily occur among different subspecies of black pine. Such risks have been reduced by avoiding planting black pines of unknown origin in the proximity of autochthonous pinewoods.

Further sustainable forest management measures promoted by LIFE include programmed and informed approaches to pest control, thinning, cleaning, pruning and weeding. Care has been taken to retain sufficient supplies of dead wood since this natural resource is crucial for supporting the habitat's associated, and sometimes interdependent, biodiversity. In the same way, a Spanish project (**LIFE03 NAT/E/000064**) enhanced the biodiversity of the forest composition by planting diverse bushes and promoting bees that would aid pollination and birds that would ensure wider distribution of forest plant species.

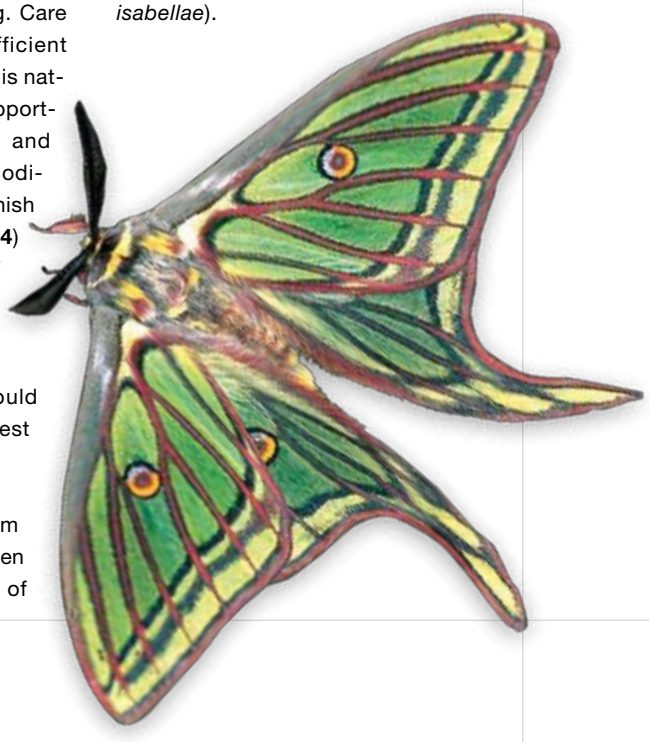
In some cases, the best long-term conservation protection has been the purchase of large surfaces of this habitat. Micro-reserves of flora were approved for specific sites and suitable management plans were drafted for vast areas, serving as a model for management of similar sites.

Other outputs offering good demonstration value included a LIFE-financed book which highlights appropriate guidance on silvicultural and management techniques that will help provide a more sustainable and favourable conservation status for Europe's black pine forests. Also, the monitoring network created for the forest habitats of Murcia has proved effective in the management of this type of habitat.

BENEFICIAL RESULTS

Beneficial results have emerged from LIFE's actions, such as purchasing and rehabilitating more than 400 ha of black pine forest in the region of Murcia, Spain, and the restoration of large areas in Corsica, France. All of these LIFE projects are demonstrating forest endemic black pine evolution, adaptation and a positive response to active management. They will serve as demonstration sites for similar initiatives regarding this vulnerable habitat.

In addition, these LIFE projects have helped species that are highly dependant on these forests such as *Sitta whiteheadi* (endemic to Corsica), some species of woodland bats and many invertebrates (including *Graellsia isabellae*).



Atlantic coast LIFE projects attempt to **reverse dune deterioration**

The coast of the Atlantic biogeographical region stretching from western Denmark to the north-western corner of Portugal, and including the British Isles, contains the most extensive range of coastal sand dunes in the EU. However, with the exception of Denmark, the condition of the dunes is 'bad'.

The table, below, shows the situation for two Atlantic and continental dune habitat types: fixed (grey) dunes and humid dune slacks (areas between dune ridges).

The dune systems along Europe's western flank share common problems. Although still under pressure from development, including residential housing, holiday homes and golf courses, the situation here is less critical than that in the Mediterranean. Recreational pressure is a concern in many areas and has to be managed in a way which does not damage the dune habitats. Much of the focus of project work in the UK, France, Belgium, Netherlands and Denmark has been on the management of the mosaic of Annex I habitats which characterise a dune system. Restoration activities include the removal of planted conifers, the control of native and non-native scrub and the introduction of sustainable grazing. Special attention has been given to the restoration of natural hydrological cycles in the dunes, including the management of humid dune slacks. In some areas, for example along the Belgian coast, debris from the First and Second World War, such as concrete bunkers that impede sand drift, can still be found.

LIFE ACTIONS

LIFE has supported a number of projects across the Atlantic region, helping to formulate good practice and promote information on dune restoration and conservation. These projects have encouraged conservation experts to co-operate in an informal European dune network, supported by the European Coastal and Marine Union[1].

In the UK, only one LIFE project relating to dunes has been carried out, but it has had a significant impact. The project (**LIFE95 NAT/UK/000818**) took place in the north-west of England in the area between the estuaries of the rivers Mersey and Ribble. The sand dunes, beaches and marshes of the 4565 ha Sefton Coast Natura 2000 site is one of the most important areas in the UK and the main site for the natterjack toad (*Bufo calamita*). The project purchased private land (after the owners had failed to develop it as a golf course), designated it as nature reserve, established nature trails, and prepared a management plan in co-operation with local landowners. A significant amount of habitat restoration and species-recovery actions also took place.

The project contributed to the development of the UK Habitat Action Plan for sand dunes and encouraged the sharing of good practice. However, this project by itself was not sufficient to improve the UK assessment of its dunes, which remain 'bad and deteriorating'.

The UK project's approach has since been mirrored by, for example, the large-scale dune and dune-heath restoration project in Denmark, 'Restoration of Dune Habitats along the Danish West Coast' (**LIFE02**

Situation for two Atlantic and continental dune habitat types

	2130* Fixed (grey) dunes		2190 Humid dune slacks	
Member State	**% of habitat**	**Status**	**% of habitat**	**Status**
UK	35.80%	Bad and deteriorating	13.40%	Bad and deteriorating
Ireland	11.30%	Bad	1.60%	Bad
France	19.90%i	Inadequate	44.90%	Bad
Belgium	1.40%	Bad	0.40%	Bad
Germany	5.50%	Favourable	5.90%	Inadequate
Denmark	10.00%	Inadequate	26.50%	Inadequate
Netherlands	16.10%	Bad	7.40%	Inadequate

Note: No information is available for Spain or Portugal.

1 http://www.eucc.net

Photo: LIFE06 NAT/F/000146

LIFE project actions, such as fencing sensitive areas to restore sand dynamics and re-vegetation, have improved the status of dunes at a local level.

NAT/DK/008584) and an equally-ambitious current project in the Netherlands, 'Restoration of dune habitats along the Dutch coast' (**LIFE05 NAT/NL/000124**). In France, the project, 'Preservation of the coast biodiversity on the Gavres-Quiberon site' (**LIFE06 NAT/F/000146**) is working on a 2 500 ha sand dune area in Brittany. Within this area are almost 1000 ha of the priority habitat 'grey dunes'. This project aims to protect this rich dune area and to control some of the more damaging recreational activities such as horse-riding, use of quad bikes and rubbish dumping. In most projects concerning sand dunes public education is an important element of the work.

BELGIUM

It is in Belgium, however, that LIFE Atlantic dune projects have been particularly effective, even though actions have been carried out over a relatively small area. An early project, 'Integral Coastal Conservation Initiative' (**LIFE96 NAT/B/003032**) had a significant pump-priming effect, leading to many spin-off actions. The project started a political debate about the purchase of dunes for conservation. This led to the adoption by the Flemish government in 1998 of a legal instrument for acquiring coastal dunes. The project carried out restoration actions, including scrub clearance over an area of 32 ha to restore humid dune slacks and grey dunes; sod cutting for coastal heathland restoration; removal of soil for restoration of humid dune slacks; and excavation of 17 permanent pools. These pools have since been colonised by the great crested newt (*Triturus cristatus*) and natterjack toad.

The project concluded in 2001, but follow-up work was carried out in 2004. A concrete dyke between the dunes and beach foreshore of the De Westhoek nature reserve was partially removed, allowing the sea to penetrate further into the dunes. This was followed by acquisition of Shetland ponies and other animals for grazing management. LIFE helped the beneficiary gain a better understanding of the benefits of grazing for dune habitats, in particular through exchanges with the British dune management project, which used sheep to graze grey dunes.

Subsequently, the FEYDRA[2] report (**LIFE02 NAT/B/008591**) restored wet grasslands and opened dune vegetation on former wooded areas and the site of a disused sewage plant. The project took place in Ter Yde, an area close to the French border created in the 14th Century by the damming of part of the Ijzer estuary. The project established management approaches for controlling the water level in the area, thus helping ensure the long-term protection of the Ter Yde Natura 2000 sites.

2 'Fossil Estuary of the Yzer Dunes Restoration Area'

Lessons learned during these projects have informed the ongoing 'Zwindunes Ecological Nature Optimalisation' project (**LIFE06 NAT/B/000087**), which is restoring and maintaining a nature reserve near Knokke-Heist, in the northern-most part of the Belgian coast. The project's main objective is to improve the natural habitat that typically exists among coastal dunes, and to encourage transition to salt marshes, where amphibians and birds can thrive. To this end, scrub expansion has to be reversed, and plantation trees will be removed to help to restore the humid dune slacks and fixed dune habitat.

CONCLUSIONS

LIFE projects dealing with Atlantic dunes have generated management models that are applicable to these habitats in other areas and to similar habitats. When considered as a suite of interlinked initiatives, the Atlantic biogeographical region dune projects combine with those in the Baltic Sea and the Mediterranean to make a significant contribution to the Natura 2000 network. The Belgian, Danish and Dutch dune projects in particular have been extensive and strategic.

However, Atlantic and Continental dune habitats remain under considerable threat. Their status is generally poor throughout the EU. More work is needed to build on the results of past LIFE projects if this situation is to be addressed.

A coastline under pressure: **Mediterranean dunes**

Threatened by urban sprawl, increasing tourism, invasive species, sand extraction, pollution and rising tides, Mediterranean dunes are an endangered habitat that need protecting. LIFE projects have shown how their long-term survival can be ensured.

Mediterranean dunes are characterised by a gradient of habitats, stretching inland from the beach. These habitats are shaped by the wind, sand and their distance from the sea. Mediterranean dunes are less dynamic than Atlantic dunes, but in general they are more species rich. They form a complex mosaic of habitats endemic to the Mediterranean region (see table), and are listed in Annex I of the Habitats Directive. Examples include coastal dunes with *Juniperus* species, dunes with hard leaf evergreen scrubs and umbrella pine dunes.

Mediterranean dunes are under threat from several directions. Most damaging is their direct destruction by urban sprawl, followed by sand extraction and disturbance, all of which are linked to the explosion of mass tourism in Mediterranean countries. But there are other, more recent threats, such as the spread of non-native plant species (used for stabilising shifting sands), and rising sea levels due to global warming. Consequently, Mediterranean dunes have been assessed by the Article 17 report as having unfavourable, bad or inadequate status (see table).

LIFE ACTIONS

More than 20 LIFE projects have targeted Mediterranean dune habitats. In all cases, the main objective was the restoration of habitats that had been transformed by human pressure. Actions undertaken by the various projects have included restoration and re-vegetation of the dune systems. Work has been done to restore dune geomorphology and dynamics, and to 'stabilise' dunes using a variety of means, such as planting native species that are specially adapted to sand – for example, umbrella pines (*Pinus pinea*) – or installing artificial barriers. In other cases, dunes have been rehabilitated by controlling access to them, or by eradicating non-native species.

For example, the project 'Model of restoration of dunes habitats in L'Albufera de Valencia' (**LIFE00 NAT/E/007339**), and its follow-up 'Recovery of the littoral sand dunes with Juniper spp in Valencia' (**LIFE04 NAT/ES/000044**), carried out a range of habitat restoration actions in an extensive area close to one of the major costal cities in Spain where the dune system had been nearly completely destroyed. Actions included the removal of undesired pathways, roads, car parks and a sewage network, and the reconstruction of dune hills and abrasion platforms as part of a programme of semi-fixed dune restoration. The project also restored dune slack networks (the areas between the ridges of coastal dune systems), allowing wet vegetation and aquatic fauna to be established.

During the projects, coastal grass (*Spartina versicolor*) was sown, helping to fix and repopulate the dunes. Marine juniper was planted to reinforce the local population. The project also surveyed the dunes, identifying 8 959 vegetation specimens and 18 vegetation types of interest, while manually removing non-native species (*Carpobrotus edulis and Agave Americana*).

The planting of marine juniper was a success, with significant improvements in germination rates (from 7 to 50%). This has had a major positive impact on the extent of juniper in the dunes, and thus the habitat's ability to repopulate the area in the future.

Data from the germination work helped the beneficiary to develop an innovative computerised predictive model, which is being used by habitat managers to identify the best vegetation for different target areas. This technology helps to improve the survival chances of regenerating vegetation, and thus accelerates the recovery of habitat features.

Another project working on the same habitat type, the Vendicari project (**LIFE02 NAT/IT/008533**), also successfully contributed to halting the degradation of the "Coastal dunes with Juniperus spp" priority habitat, and improving

its ecological condition along 3 km of coastline in southeast Sicily.

ITALY

Since 1992, more than 15 LIFE projects have targeted Mediterranean dune habitats along the Italian coast. However, as stated by the Italian report under Article 17[1], the impact of these actions was localised, and the projects lacked an integrated approach and strategy that could have led to more wide-ranging improvements.

The Italian projects had three main concerns: the protection of dunes from public disturbance by installing fences; the construction of walkways to reduce damage caused by people accessing the beach through the dunes; and the installation of small artificial barriers to promote the establishment of dune vegetation.

GREECE

The 'Conservation management in Strofylia-Kotychi' project (**LIFE02 NAT/GR/008491**) targeted the umbrella (stone) pine dune habitat. A significant part of the habitat in the project site was fenced off and thus protected from grazing pressure and vehicles trespassing on the dunes. The project also planted and fenced off 4 000 young umbrella pines, and installed dune restoration fences alongside the most affected parts of the dunes. These actions enabled dune 'rebuilding' and sand accumulation to occur. The conservation activities were accompanied by the marking off of parking areas and visitor access points, and the placing of information signs.

For most projects carried out in these countries, dune plant production was a relevant management measure, as reintroductions need to be carried out with native species to ensure the best chance of adaptation. Good management practices and the establishment of effective germination protocols were another key aspect of these LIFE projects. Finally, extensive awareness campaigns were required to inform beach users of the need to protect the dune habitats.

Photo: LIFE06 NAT/IT/000053

Directing tourist access to the beach through wooden passages is helping restore Mediterranean dunes habitats.

CONCLUSIONS

LIFE project restoration actions have made a very important contribution to improving the conservation status of Mediterranean dune habitats. However, the pressures on the dunes continue to build up, and while projects have brought localised benefits, the conservation status for many habitats remains 'unfavourable bad'. Nevertheless, the projects provide good practice examples, the principles of which could be applied more widely. Future projects could be based on the useful data gathered by past projects, and on the tried and tested restoration techniques that have been shown to improve the status of these threatened habitats.

1 http://www2.minambiente.it/pdf_www2/dpn/pubblicazioni/attuazione_direttiva_Habitat.pdf: "il carattere locale di molti interventi insieme alla frammentazione di questi ambienti in molto tratti del nostro territorio, rende ancora molto lontano il raggiungimento di un obbiettivo di conservazione di questo habitat nel loro complesso"

Habitats	Conservation status	Relevant Projects
2220 - Dunes with Euphorbia terracina	Unfavourable-bad (Mediterranean)	LIFE00 NAT/E/007339 LIFE04 NAT/ES/000044
2230 - Malcolmietalia dune grasslands	Unfavourable-inadequate (Mediterranean)	LIFE00 NAT/E/007339 LIFE04 NAT/ES/000044
2250* - Coastal dunes with various species of juniper (*Juniperus* spp)	Unfavourable-inadequate (Mediterranean)	LIFE00 NAT/E/007339, LIFE04 NAT/ES/000044, LIFE99 NAT/IT/006189, LIFE03 NAT/IT/000141, LIFE05 NAT/IT/000050, LIFE06 NAT/IT/000050, LIFE98 NAT/P/005235, LIFE04 NAT/P/000212
2260 - Cisto-Lavenduletalia dune sclerophyllous scrubs	Unknown	LIFE03 NAT/E/000054, LIFE00 NAT/E/007339, LIFE04 NAT/ES/000044, LIFE99 NAT/IT/006189, LIFE05 NAT/IT/000050, LIFE99 NAT/IT/006275, LIFE04 NAT/P/000212
2270* - Wooded dunes with Pinus pinea and/or Pinus pinaster	Unfavourable-inadequate (Mediterranean)	LIFE02 NAT/GR/008491, LIFE00 NAT/E/007339, LIFE04 NAT/ES/000044, LIFE99 NAT/IT/006189, LIFE03 NAT/IT/000141, LIFE98 NAT/IT/005117, LIFE06 NAT/IT/000050, LIFE98 NAT/P/005235

Protecting Posidonia in the Mediterranean

Posidonia oceanica is a species of seagrass only found in underwater fields along the Mediterranean coastline. The Posidonia beds provide a refuge for a number of species, but they are under threat from several human activities, such as trawling and dredging, random mooring of pleasure boats, construction and pollution. The beds are also threatened by invasive algae species.

Posidonia beds are listed in the annex I of the Habitats Directive as priority for conservation, as they have an essential role as a refuge and an area for feeding and breeding for a large number of marine species. Over the past few decades, nearly 50% of the underwater meadows in the Mediterranean have experienced some reduction in range, density and/or coverage, and 20% have severely regressed since the 1970s. For this reason, their Article 17 assessment is 'unfavourable-inadequate' for all Member States in the Mediterranean.

LIFE ACTIONS

A few projects have directly targeted this habitat in the Mediterreanean: a Spanish project for the Balearic Islands was fully dedicated to the protection of the Posidonia seabeds, and in the 1990s two French projects (**LIFE92 ENV/F/000066** and **LIFE95 ENV/F/000782**) tried to prevent the spread of *Caulerpa taxifolia*.

The Spanish LIFE project, "Protection of Posidonia beds in the Baleares" (**LIFE00 NAT/E/007303**), set out to show how Posidonia conservation could be improved. A considerable proportion of the Balearic coastline had been proposed for inclusion in the Natura 2000 network. The project beneficiary, a biodiversity department within the regional government of the Balearic Islands, in partnership with the department of agriculture and fisheries and the main scientific research institutions in Spain, worked towards their suitable protection by gathering vital information about the relevant marine sites and species.

The first measures taken by the regional government were the mapping and surveying of the Posidonia beds together with a set of scientific studies on clonal growth and species presence. This allowed assessments to be made of the factors impacting Posidonia and its conservation status, as well as factors negatively affecting species living among the beds. The work carried out provided the basis for a range of plans and regulations, such as a regulation to control mooring by boats in seven priority sites of community interest (SCIs). The authority also created three marine reserves and put in place monitoring teams at Cala Ratjada (jointly managed with the Spanish Ministry), Migjorn and Malgrats. The project also developed and approved 14 comprehensive management plans for the 14 marine SCIs declared for *Posidonia oceanica*.

Finally, the region organised exhibitions on the three main Balearic islands to increase public awareness of the value of Posidonia. At present, regulated areas and close surveillance continue to ensure that the most valuable areas for Posidonia meadows will be protected in the future.

Cyprus has also taken action to protect its Posidonia beds. A recent LIFE project, 'Conservation management in Natura 2000 sites of Cyprus' (**LIFE04 NAT/CY/000013**), installed a floating anchoring system for vessels for the protection of Posidonia beds

A Portuguese project (**LIFE06 NAT/P/000192**) has been targeting other species of seagrass habitat in the Atlantic. The project has transplanted several species (*Zostera marina, Zostera noltii* and *Cymodocea nodosa*) collected from donor meadows (such as the Sado estuary and Ria Formosa). So far the project has successfully planted underwater sea grasses with innovative techniques.

CONCLUSIONS

Although the conservation status of Posidonia beds is still 'unfavourable-inadequate', the Spanish project in the Baleares, in particular, has accumulated a great deal of information about their sites. Valuable management tools were created and legal mechanisms adopted, which are central to the management of the marine SCI of the Balearic Islands and adequate protection of the Posidonia meadows. The experience gained during the different LIFE projects could be exported to other sites in the Mediterranean to help improve conservation of this important marine habitat.

Though a characteristic feature of the Atlantic region, European heathlands are under threat, with Member States reporting that the conservation status of heathlands in their countries is 'inadequate' or 'unfavourable'.

LIFE demonstrates how to **regenerate low land and alpine heathlands**

LIFE projects are having a significant impact on the conservation status of lowland and alpine heathlands on a local and regional level, acting as a valuable testing ground for new approaches to conservation with potential for wider application.

Several heathland habitats are listed as priority (*) for conservation in the Annex I of the Habitat Directive, mainly as a result of inadequate management and direct habitat destruction (uncontrolled fires). Threats to the habitats include poor grazing practices and replacement by commercial forests and other land uses (recreation, urbanisation, etc.). Invasive species (especially alien scrub and trees) and nutrient deposition (mainly atmospheric nitrogen and waste) are also a problem for heathlands.

LIFE ACTIONS

Though several LIFE projects have implemented actions that have had an indirect impact on heathlands, few projects have specifically targeted these threatened habitats. In several projects, actions

Main heathlands habitats targeted by LIFE projects (1992-2008)

Habitat	Conservation status at Biogeographical region	Projects
4010 – Northen Atlantic wet heaths with Erica tetralix	Unfavourable-bad (Atlantic)	LIFE99 NAT/B/006298 LIFE97NAT/UK/004242 LIFE00NAT/UK/007079 LIFE02 NAT/B/008595 LIFE04 NAT/NL/000206
4030 - European dry heaths	Unfavourable-bad (Atlantic, Med and continental)	LIFE00NAT/UK/007079 LIFE05 NAT/D/000055 LIFE05 NAT/D/000051 LIFE06 NAT/SK/000115
4040* - Dry Atlantic coastal heaths with Erica vagans	Unknown (Atlantic) - Assessed as 'unknown' as Spain, which has some 90% of the habitat area, reported all parameters as 'unknown'. Reported as 'unfavourable-inadequate' by France and 'favourable' by the UK where this habitat is restricted to a single locality.	LIFE95NAT/UK/000832
4060 - Alpine and boreal heaths	Favourable (Continental) - Unfavourable-Inadequate (Boreal and Alpine)	LIFE05 NAT/A/000078
24070* - Bushes with Pinus mugo and Rhododendron hirsutum (Mugo-Rhododendretum hirsuti)	Favourable (Alpine)	LLIFE00 NAT/A/007053

** Priority for conservation - Source: LIFE Database, Astrale Monitoring team and Art 17 technical report*

were undertaken primarily for bogs and mires which had a beneficial impact on associated heathland habitats. The Dutch project carried out in the region of Drenthe (**LIFE04 NAT/NL/000206**) is a good example of a project that targeted bogs but had an indirect impact on wet heathlands. The construction of dykes and water storage reservoirs primarily to stimulate the formation of a raised bog also increased the area of wet heathland, and locally boosted its conservation status.

Several projects, however, have directly targeted heathland habitats, which are mainly located in the Atlantic biogeographical region (Belgium, France and the UK), though it is found elsewhere to a lesser degree. Most projects include actions for both Northern Atlantic wet heaths and European dry heaths which are often found together in a mosaic of habitat types. Lack of good management (balanced grazing and controlled fire) has led to habitats becoming dominated by trees and therefore the most common restoration activity is tree removal. In some cases, tree removal is not sufficient for the regeneration of natural heathland and the top layer of leaf litter and soil must also be removed.

The project to protect Juniper heaths in Osteifel, Germany (**LIFE05 NAT/D/000055**) took this measure to speed up the restoration of heathlands on the cleared areas (it was also necessary to sow heather (*Calluna vulgaris*) and other typical heathland species). Some projects have also eliminated alien plant species. One of the actions taken as part of the UK project in the New Forest (**LIFE97 NAT/UK/004242**) was the removal of invasive conifers, while a German project in Lower Saxony (**LIFE05 NAT/D/000051**), targeted the non-native woody plant species, black cherry (*Prunus serotina*).

Other management actions undertaken by LIFE projects include grazing with Galloway cattle (**LIFE99 NAT/B/006298**) and ponies (**LIFE97NAT/UK/004242**) and for wet heaths, water-level modification. A German project (**LIFE05 NAT/D/000051**), which focused on the coastal heaths near the North Sea, has introduced grazing with large herbivores such as heck cattle, wild horses (*Equus przewalskii*) and European bisons (*Bison bonasus*). Grazing will suppress the current invasion of shrubs and pioneer grass species. As a result, an area of about 400 ha of open coastal heath landscape will be established and maintained.

LIFE projects have also aimed to increase public awareness of the value of heathlands, which are often treated as dumping grounds and are subject to loss by fire. The Dorset Heaths LIFE project (**LIFE00 NAT/UK/007079**) carried out a schools education programme and involved community groups in monitoring activities. It also introduced fire-prevention measures, such as the construction of firebreaks and fences to protect particularly sensitive areas, the employment of wardens throughout the summer period and increased policing.

Finally, land purchase has been a common action for conserving this type of habitat. Areas of heathland have been bought by LIFE projects and added to the Natura 2000 network sites, ensuring their continued management.

HEATHLANDS HABITAT RESTORATION BENEFITTED DEPENDENT SPECIES

Project actions targeting heathlands have also indirectly benefitted several species. By tackling the fluctuations in the water levels affecting the wet heathlands and bogs in Bargerveen, the Netherlands, a LIFE project (**LIFE04 NAT/NL/000206**) indirectly addressed the threats posed to the amphibians, reptiles and invertebrates found in the area. It has also improved the site as a habitat for wintering birds. Combating the destruction of heathlands in Dorset (UK) also helped to stabilise the population of nesting birds, which was decreasing.

Photo: LIFE04 NAT/B/0010

Erica tetralix *heathlands (4010) were restored by managing the bogs' water levels.*

CONCLUSIONS

While European heathland habitats still have an unfavourable conservation status, many of the actions taken by LIFE projects have had a significant impact on the conservation status of heathlands on a local and regional level.

LIFE projects have provided valuable opportunities for testing and implementing best practices and management tools for this habitat. For example, a Belgian project (**LIFE99 NAT/B/006298**) developed a 'Rescue Plan for Atlantic Heathlands in Flanders'. Though the project's actions had no direct impact on the conservation status of the target habitat (wet heaths, habitat 4010), they provided data for the long-term conservation of the habitat in Flanders.

The demonstration of new techniques and the sharing of information and experience exemplify LIFE projects's important role in improving the conservation status of heathlands, even though Member States do not mention LIFE in their reports. The challenge for the future is, therefore, to ensure a wider uptake of these new techniques and approaches in order to improve the impact at European level.

LIFE helps **restore vital wetland ecosystems**

LIFE has done much to improve the conservation status of wetlands, one of Europe's most threatened habitat types.

An estimated 6% of the Earth's land area – some 570 million ha – is wetlands. Of this wetlands area, 2% consists of lakes, 30% bogs, 26% fens, 20% swamps, and 15% floodplains. Despite supplying the water that an enormous range of plant and animal species require for their day-to-day existence, wetlands are among the most highly threatened ecosystems on the planet, with some 50% of the world's wetlands having disappeared in the last century.

Wetlands require specific hydrological regimes. The Article 17 report assesses more than 80% of the assessments for bogs, mires and fens in the Atlantic and Continental biogeographical regions as 'unfavourable-bad', and more than 70% of the freshwater habitats assessments as 'unfavourable' (30% are 'unfavourable bad'). The coastal habitats follow the same trend. Since 1992 LIFE Nature has co-funded more than 350 projects targeting wetlands in general. The majority of these projects have focused on the restoration and management of wetlands, with some projects targeting specific wetland bird species, and thus contributing to the implementation of both the Habitats Directive and the Birds Directive.

Furthermore, most projects have supported the Ramsar Convention and are indirectly linked to the implementation of the Water Framework Directive by maintaining or improving water quality and the status of ecosystems.

As this section illustrates, LIFE co-funded projects have targeted the full gamut of wetlands habitats – blanket bogs, mires, raised bogs, coastal lagoons, temporary ponds, petrifying springs with tufa formation; riparian forests, rivers and lakes (*see box*). Common actions have included removing overgrowth, blocking drainage systems and introducing grazing.

LIFE AND LAKE CONSERVATION

The naturally eutrophic Lake Fure is one of the largest (940 ha) and deepest (37 m) lakes in Denmark. Once famous for its submerged vegetation, the lake's biological system has been damaged by decades of heavy loading with nutrients. To address this problem, the project, 'Restoration of Lake Fure – a nutrient-rich lake near Copenhagen' (**LIFE02 NAT/DK/008589**), took steps to reduce the standing biomass of 'trash fish' by 80% and to reintroduce pure oxygen into the bottom of the lake to 'clean out' the accumulated phosphorous pools in the sediment. The measures taken improved the oxygen concentration of the bottom layer of water, reducing the release of phosphorous, increasing vegetation and leading to the return to the deepest parts of the lake in 2005 of the relict crayfish (*Mysis relicta*).

In Spain, the project, 'Recuperation of the acquatic environment of Porqueres and the lake of Banyoles' (**LIFE03 NAT/E/000067**), recuperated and increased the area of wetlands and lakeside woods that surround the lacustrine basin of Lake Banyoles, the second largest lake in the Iberian Peninsular. Four new lagoons were constructed on land purchased by the project. Other project actions included the naturalisation of brooks, restoration of ditches, removal of alien species and planting of autochthonous ones. Management plans for the long-term benefit of the lake have also been put in place.

LIFE supports **blanket bog restoration in the UK and Ireland**

Within the EU, active blanket bog is mainly found in the UK and Ireland. The LIFE programme has already helped improve the habitat's status in these countries and continues to support restoration efforts.

Blanket bogs develop where the climate allows peat formation on flat and gently sloping ground. While they are typical of areas of heavy rainfall in northwest Europe, such as the British Isles – 85% of the area covered by this habitat is in the UK, and 10% in the Republic of Ireland – they also occur in northwest Spain, northwest France and alpine Sweden. The status of blanket bog is described as 'bad' in Ireland and 'bad but improving' in the UK.

As part of the pan-European effort to save and restore mire habitats, the LIFE programme has supported five projects in the UK and one in Ireland, with another project getting underway in the UK in 2010 (**LIFE08 NAT/UK/000202**). The projects have made a major contribution at a national, biogeographical and EU level. The 'improving' assessment for the UK is probably partly a result of the projects, since the assessment makes specific mention of the LIFE project, 'Restoring active blanket bog of European importance in North Scotland' (**LIFE00 NAT/UK/007075**).

The threats facing blanket bogs, such as drainage, burning, overgrazing, peat extraction and forestry are widespread, numerous and not easily controlled, due largely to the nature of the damaging operations, the remoteness of the sites and the large areas over which they occur. Moreover, peatland habitats are particularly sensitive to hydrological changes brought about by drainage for agricultural improvement, forestry and peat extraction. The lack of control over these activities has been a key conservation problem which has been addressed by several LIFE projects.

Photo: LIFE06 NAT/UK/000134

Blanket bog habitats are recovering after management of the water levels.

Habitats	Conservation status at Member State / region level (main regions)	Projects	Habitat area targeted by the projects
7130 – Blanket bogs (* active only)	Unfavourable-bad (Atlantic) and Favourable (Alpine)	LIFE94 NAT/UK/000802 LIFE98 NAT/UK/005432 LIFE00 NAT/UK/007075 LIFE02 NAT/IRL/008490 LIFE06 NAT/UK/000134 LIFE08 NAT/UK/000202	<50%

DEVELOPING RESTORATION TECHNIQUES

The first LIFE project to target blanket bogs was the 'Conservation of Active Blanket Bog in Scotland and Northern Ireland' project (**LIFE94 NAT/UK/000802**), which raised awareness about the threats to the vast 400 000 ha Flow Country of north Scotland and began to champion the natural values of this remote corner of the British Isles

A second project, 'The Border Mires-Active Blanket Bog Rehabilitation Project' (**LIFE98 NAT/UK/005432**), was located in the Kielder Forest area of northern England. The principal

objective was to restore about 2 000 ha of blanket bog on 20 sites within the Border Mires Kielder-Butterburn part of the Natura 2000 network and, in particular, to extend the area of blanket bog by means of tree removal. The project focused on the Natura 2000 sites in the wider border mires area of raised and blanket bog sites (59 sites in total). The project exceeded its objectives and managed to complete around a quarter of the tasks set by the Border Mires Management Committee for this complex and vast site. This is an example of LIFE funding acting as a catalyst in what was originally foreseen as a 20-year programme of restoration but was in fact completed in 2009 ahead of schedule.

In total, 500 ha of mires were partially restored through the LIFE project, improving the condition of the sites from 'unfavourable' to 'unfavourable-recovering': it may take another 20 years before the sites can be said to be in 'favourable condition'.

The target of clearing 197 ha of conifers was exceeded. The project tried several techniques of tree removal: cutting and chipping on-site, felling to waste, cable-craning to lift whole trees clear of the bog, conventional harvesting techniques and killing standing trees by ring-barking or herbicide. Increasing the area free from the effects of afforestation will increase the likelihood of recolonisation with Annex I habitat species.

The project refined techniques for damming drainage ditches in peat bogs, publishing a paper on the advantages and disadvantages of different materials for this purpose. Other LIFE projects have drawn inspiration from this pioneering work.

By removing trees it is possible to enhance natural regeneration of the bog.

Photo: LIFE06 NAT/UK/000134

LIFE MAKES PLANS FOR SCOTLAND

A second LIFE project in the Flow Country, using the tried and tested techniques for conifer removal and damming of drainage ditches, successfully restored large areas of blanket bog in Caithness and Sutherland, in north Scotland, between July 2001 and December 2006. The project, 'Restoring active blanket bog of European importance in North Scotland (**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 benefitted the condition of more than 18 000 ha of peatlands.

A crucial element of this project was the development (led by Scottish Natural Heritage) of the 'Peatlands of Caithness & Sutherland Management Strategy 2005-2015'. The strategy is the principal means of securing the long-term benefits of the project and the sustainable management of the peatlands, by bringing together the conservation aims of the project beneficiary (the Royal Society for the Protection of Birds) and the economic objectives of local stakeholders. This has led to the formation of a Peatlands Partnership that will continue to work towards the key objectives of the strategic plan.

RESTORING ACTIVE BLANKET BOG IN IRELAND

Networking between LIFE projects in the early 2000s helped Coillte Teoranta (the Irish Forestry Board) establish the project, 'Restoring active blanket bog in Ireland' (**LIFE02 NAT/IRL/008490**), the first of its kind in Ireland to be run by a key Natura 2000 landowner and stakeholder. Using its own land, Coillte Teoranta carried out an extensive restoration programme on 14 sites covering more than 1 200 ha.

Actions included erecting stock-proof fences to control grazing on open bog

Photo: LIFE06 NAT/UK/000134

The drainage channels of large bogs were commonly blocked with peat.

areas, blocking ditches to restore the integrity of the bogs' hydrological systems, removing forestry plantations of poor quality on 500 ha of bog that was still capable of natural regeneration, and removal of naturally regenerated trees. The overall aim of the project was to demonstrate that the restoration of suitable active blanket bog sites is a real management option for afforested peatlands.

CONCLUSIONS

The LIFE programme has undoubtedly made a significant difference to the conservation status of blanket bogs in the UK and Ireland. There has been good sharing of experience between the projects and the development of landscape-scale strategies for the long-term management of the habitat.

LIFE Nature continues to actively support blanket bog restoration in the region through an ongoing project, 'Restoring active blanket bog in the Berwyn and Migneint SACs in Wales' (**LIFE06 NAT/UK/000134**), and a project, 'Active blanket bog restoration in the South Pennine Moors (**LIFE08 NAT/UK/000202**), starting in 2010. The Welsh project, which runs until March 2011, seeks to implement restoration and conservation actions over 5 039 ha of the Berwyn and South Clwyd Mountains SAC, benefiting 2 955 ha of blanket bog within the conservation area. Practical restoration and conservation actions will also be carried out over 440 ha of the Migneint Arenig Dduallt SAC, benefiting 274 ha of blanket bog habitat. The South Pennines project in England targets the restoration of 1600 ha of blanket bog.

Photo: Mikko Tiira

Blocking ditches to **bring back aapa mires**

Finland's aapa mires are under threat from inappropriate land use and management. LIFE is helping to improve the 'unfavourable-inadequate' status of this important habitat.

Within the habitat group of bogs, mires and fens, aapa mires (7310) are limited to the northern Boreal region and the adjacent part of the Alpine region. They are complexes of several types of mires, such as string fens, flarks and unraised bog moss (*Sphagnum*) spp. While the conservation status of this habitat is 'favourable' in the Alpine region, it is assessed as 'unfavourable-inadequate' for the Boreal region, with 'structure', 'function' and 'future prospects' considered poor in both Finland and Sweden, and 'area' also poor in Finland. Threats and pressures are mostly related to inappropriate land use and management, including drainage to boost commercial forest growth – though this intervention was unsuccessful in several mires as trees (mainly pine) did not grow. The mires were lost without gaining any commercially valuable forests.

A number of LIFE projects in Finland have targeted this important habitat. Restoration of mires in each case was achieved through blocking and filling of ditches and, in some cases, through the removal of excess trees.

LIFE AND FINLAND'S AAPA MIRES

The LIFE project, 'Protection of aapa mire wilderness in Ostrobothnia and

Kainuu' (**LIFE02 NAT/FIN/008469**), drew up 12 restoration plans for mires, forest, old forest roads and meadows, which have now been fully implemented (some after the project ended). Some 924 ha (mainly aapa mires) were acquired by the state for nature conservation purposes and a total of 606 ha of aapa mires were restored. The project also restored 154 ha of mainly boreal forests (9010) through controlled burning and increasing the amount of deadwood, 10 km of old forest roads and 2.4 ha of meadows. In addition, extensive basic inventories of habitats, bracket fungi, birds, epiphytic lichens and historical land use were taken as a basis for the management plans. An ecological survey and conservation plan was also drawn up for the moss species *Hamatocaulis lapponicus*.

'Karelian mires and virgin forests - pearls in the chain of geohistory' (**LIFE03 NAT/FIN/000036**) set out to restore the boreal old-growth forests of northern Karelia, which act as 'stepping stones' for species between Russian forests and those in Finland. The mires of this region are equally important since they make up the transition zone between aapa mires and active raised bogs.

As part of a wider series of actions, the project restored a total of 479 ha of mires by blocking and filling approximately 125 km of ditches. As a result of these actions the water level in the restored mires has increased, leading to the recovery of typical mire vegetation, butterflies and birds.

The project, 'the Natural Forests and mires in the 'green belt' of Koillismaa and Kainuu' (**LIFE04 NAT/FI/000078**), was focused on the conservation of forests and mires in 13 Natura 2000 sites in eastern Finland. The project also co-operated with Russia – project sites situated next to the Russian border act as stepping stones for several threatened species more commonly found in pristine forests and bogs in Russian Karelia (e.g. the Kalevala National Park). Actions included restoring 390 ha of aapa mires and bog woodlands by filling and blocking ditches and by clearing excess trees. Innovative methods were used to recreate flarks, peat banks and former streams to recreate the former hydrological conditions.

An earlier project, 'Protection and usage of aapa mires with a rich avifauna' (**LIFE00 NAT/FIN/007060**), targeted the central Lapland aapa mire zone, which is important as a nesting, resting and feeding area for birds. The 48 200 ha area covered by the project is home to 1 800 pairs of wood sandpipers (Tringa clareola), 400 pairs of ruffs (*Philomachus pugnax*) and 180 pairs of golden plovers (*Pluvialis apricaria*), as well as bears, wolves and wolverines. The Annex-II listed plant species *Hamatocaulis lapponicus, Ranunculus lapponicus* and *Saxifraga hirculus* also grow in the area.

The project drew up management plans for five areas, and more than 6 300 ha of land was acquired for nature conservation purposes and a further 225 ha leased on a five-year contract. The project restored some 80 ha of mires, as well as wet meadows and forests.

CONCLUSIONS

Thanks to LIFE, thousands of hectares of mires have been being restored and their recovery is being monitored. Projects selected areas on the basis of expected results: increased water levels leading to thriving *Sphagnum* mosses and the return of mire birds. However, restoring mires is a long-term investment and results are mostly visible only several decades after restoration. A recently approved project in Finland (**LIFE08 NAT/FIN/000596**) is aiming to restore the conservation status of mires (and aapa mires in particular) in 54 Natura 2000 sites, and another project (**LIFE08 NAT/S/000268**) is aiming to restore mires in 35 sites in Sweden.

Water levels in the aapa mires have increased thanks to LIFE actions.

Photo: Mikko Tiira

Photo: Justin Toland

Raised bog restoration in Europe

An exemplary project in the Irish Midlands provides a great insight into the actions LIFE projects across Europe have taken to restore active raised bog habitats.

The most significant areas of active raised bog in the EU are found in the Atlantic biogeographical region. However, habitat types 7110* (Active raised bogs) and 7120 (degraded raised bogs still capable of natural regeneration) can be found in almost all regions and have been the focus of a large number of LIFE projects (see box).

LIFE ACTIONS

The conservation status of active raised bogs is assessed as 'unfavourable-bad' in the Alpine, Atlantic, Continental, Macaronesian and Mediterranean regions.

The first LIFE project in the EU that addressed the threats to raised bogs was 'Conservation of Scottish lowland raised bogs' (**LIFE92 NAT/UK/013400**). A key output was the publication of the book 'Conserving Bogs -The Management Handbook' in 1997, a detailed good practice restoration manual that generated widespread interest among conservationists.

Lessons learned from this project have fed into subsequent raised bog restoration efforts across the EU, such as 'Restoring raised bogs in Ireland' (**LIFE04 NAT/IE/000121**).

ABOUT THE PROJECT

The peatlands of the Midlands and mid-west of Ireland are among the most important raised bog systems left in Europe. However, the decline of this habitat has been marked: whereas raised bogs once covered an estimated 310 000 ha, today it is estimated that just 18 000 ha of raised bog habitat of conservation value remain, with just 2 000 ha in a favourable condition. Habitat loss has mainly been caused by harvesting of peat for household fuel, electricity production and the horticultural industry. Some 2% of Irish raised bogs have been converted to forestry land. Much of this afforested raised bog is owned by Coillte Teoranta, the Irish Forestry Board.

'Restoring Raised Bogs in Ireland', which ran from October 2004 to September 2008, was the largest single bog restoration project to be undertaken in the country. Actions focused on the removal of forestry plantations within 14 pSCIs

across five counties, which was in line with Coillte Teoranta's objective of managing 15% of its estate for biodiversity.

Within a total project area of 571 ha, the beneficiary removed almost 450 ha of plantations and blocked drains to restore raised bog habitat. Building on the restoration techniques pioneered in earlier LIFE projects in the UK and Ireland (including **LIFE02 NAT/IRL/8490**), the project sought to have its own dissemination effect, with two sites – at Cloonshanville Bog near Frenchpark in Co. Roscommon and Carn Park Bog near Baylin Village in Co. Westmeath – turned into demonstration sites for restoration techniques and for general awareness-raising.

Photo: Jan Sliva

Drain blocks have improved the water levels on the raised bogs.

VISITING CLOONSHANVILLE BOG

As site manager John Tarney explains, conifer plantations were removed and drains blocked in three areas totalling 34 ha on the 240 ha SAC near Frenchpark. The actions took place on land neighbouring 152 ha of intact bog. The vegetation of this intact area is dominated by common heather (*Calluna vulgaris*), deer grass (*Trichophorum cespitosum*) and hare's tail cottongrass (*Eriophorum vaginatum*). Other frequent species include cranberry (*Vaccinium oxycoccus*), cross-leaved heath (*Erica tetralix*), bog asphodel (*Narthecium ossifragum*) and common cottongrass (*Eriophorum angustifolium*), as well as a large population of Sphagnum pulchrum, a rare species of peatmoss in the Republic of Ireland. The SAC also contains 14 ha of

OTHER LIFE NATURE PROJECTS TARGETING RAISED BOGS

While the Irish project is one of just two projects to have exclusively targeted raised bogs (the other is **LIFE00 NAT/UK/007078**), LIFE has co-funded a large number of projects that have taken actions to improve the status of raised bogs, together with other associated wetland habitats such as transition mires and quaking bogs (7140) or wet heathlands.

- **LIFE04 NAT/PL/000208** - Conservation of Baltic raised bogs in Pomerania, Poland: This project, the first in Poland, was very successful. It improved the water level conditions of Baltic raised bogs on 17 sites by felling trees on 720 ha, blocking 724 points of drainage systems and cutting 4 km of ditches. As a result of the project actions, 13 new protected areas of national importance were created, including 10 new nature reserves. The project also led to the formation of a group of some 30 specialists in bog conservation, a collaborative initiative that is continuing after LIFE.
- **LIFE05 NAT/D/000053** - Rosenheimer master basin bogs: This project, which concludes in October 2010, is aiming to restore a 444 ha raised bog area and improve the hydrological situation of adjacent fen-meadow habitats.
- **LIFE00 NAT/UK/007078**- Restoration of Scottish raised bogs: The project achieved the removal of 430ha of trees, clearance of 253 ha of encroaching scrub, installation of 2 153 dams, erection of 12.1 km of fencing and removal of 3.6 ha of rank heather across 11 sites (10 cSACs).
- **LIFE00 NAT/EE/007082** - Restoration and management of the Häädemeeste wetland complex: 1 500-1 800 ha of the Tolkuse bog area was restored through the blocking of key ditches. This raised the water level by 180 cm. Overgrowing bushes and trees were removed from a 6 ha area of the abandoned peat extraction fields and a 3 ha area was rewetted by blocking drainage ditches with peat dams. In addition, the project restored some 600 ha of boreal coastal meadow habitat.
- **LIFE02 NAT/IT/008574**- Alpe Veglia and Alpe Devero: actions of conservation of mountain grasslands and peatlands (7230 Alkaline fens and 7140 Transition mires and quaking bogs): The survival of the peat bogs in the Alpe Veglia – Alpe Devero Park (located in the Mountain Valley of Val D'Ossola on the Italian-Swiss border) was under serious threat because of a drainage system operating in the area. The LIFE project built fences and a wooden gangway to stop trampling of 17 ha of peatlands. Drainage ditches were blocked to aid water retention.
- **LIFE03 NAT/FIN/000036**- Karelian mires and virgin forests - pearls in the chain of geohistory: 479.1 ha of mires were restored by blocking and filling approximately 125 km of ditches.

bog woodland, an Annex I-listed habitat. Unlike plantation forests, these mostly birch woodlands (of which just 130 ha are left in Ireland) stay on the peatland margins where the nutrients suit them and do not dry out the central bog.

Removal of trees and blocking of drains is a common feature of all raised bog LIFE restoration projects around the EU (see box). "It's all about creating the conditions for restoration", notes Tarney. "When the trees were taken off there was an increase in the water level. When damming took place there was a further increase and over time we expect plant species that came in when the water level was low will die back."

"There will be waves of changes in vegetation composition, but the aim is to have more and more typical bog species," says Philip Murphy, project manager.

"Generally, the lower the vegetation on the bog, the better the quality – it's an indication of wetness," explains Angela Wallace, PR Manager, Coillte Teoranta. "In the short time since the planted conifers were removed at Cloonshanville, the intact high bog has got visibly wetter," she adds. The aim, says Tarney, is "to keep the water level six inches (15 cm) below the peat moss surface, even in summer".

Typical bog species, such as peat moss (*Sphagnum pulchrum*) and cranberry have already reappeared on the restored area. "The last time our ecologist was out he found liverwort, a species that hadn't been on the site before," says Wallace. "Third year Environmental Science students at the University of Galway have taken on the monitoring of the site after the project," she adds. "Hopefully this will continue for years to come."

Taney notes that it will take "30-40 years for the project area to look like the neighbouring high bog. Fauna that will benefit from the restoration include curlew and snipe, lots of butterflies, frogs and newts," he says.

SPREADING THE KNOWLEDGE

The Irish raised bog restoration project used a mix of plastic trays and peat dams to block drains on the newly-cleared sites. Over the four years of the project, Coillte Teoranta's team moved more to using peat dams, notes Tarney, although this was not possible on the driest areas. The idea of using plastic came from a UK LIFE project in the Kielder Forest, 'The Border Mires-Active Blanket Bog Rehabilitation Project' (**LIFE98 NAT/UK/005432**). Coillte Teoranta disseminated details of water management devices (names of suppliers, etc) to three LIFE projects (from Denmark, Finland and Latvia) that visited its sites. "The visitors from the Finnish Aapa Mires project (**LIFE02 NAT/FIN/008469**) were so taken by the idea of the plastic dam that they took one home with them," recalls Wallace.

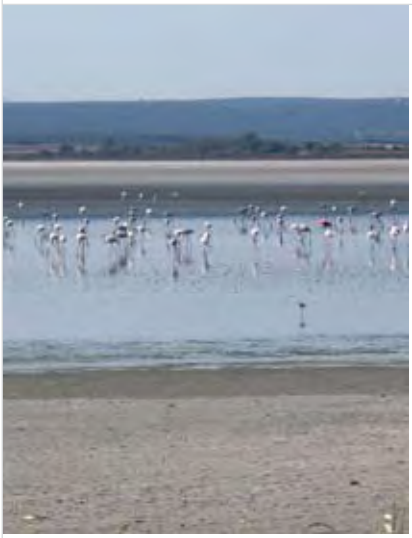
"The networking was really important and we wouldn't have been able to do that without LIFE," says Murphy.

Photo: Jan Sliva

It takes around 30 to 40 years for a raised bog to reacquire peat formation and for all associated species to return.

Sphagnum mosses are now thriving after restoration efforts.

Photo: Jan Sliva



Restoring coastal lagoons to a favourable status

Europe's coastal lagoons are reported as having an unfavourable status. LIFE is supporting projects that aim to improve this situation.

Coastal lagoons are found in all coastal regions of the EU. The status of this habitat type is classed as 'unfavourable-bad' in all regions except the Boreal, where it is 'unfavourable-inadequate'. Pressures and threats are mostly linked to human activities, such as intensive agriculture (which leads to eutrophication). Better reporting is required, particularly in the Mediterranean, since several parameters are unknown.

Two notable LIFE nature projects that have targeted coastal lagoons are the Danish project, 'Improving status of coastal lagoon Tryggelev Nor, Denmark (IMAGE)' (**LIFE02 NAT/DK/008588**), and the Spanish project, 'Restoration and management of the coastal lagoons and marshes of the Baix Ter' (**LIFE99 NAT/E/006386**).

COASTAL LAGOONS IN DENMARK

The Danish project took place in Tryggelev Nor on the island of Langeland, one of several coastal lagoon areas that feed into the Baltic Sea. The lagoon had been suffering from increasing eutrophication and stagnation, causing a negative impact on its conservation status and that of resident bird populations such as the Annex I-listed bittern (*Botaurus botaurus*) and spotted crake (*Porzana porzana*).

The LIFE Nature project intended to address this problem by reducing the nitrogen load in the whole wetland area by 70%. Actions taken to achieve this included the construction of a salt water inlet into the lagoon to help flush out the accumulation of nutrients and re-establish a more natural water exchange between the sea and the lagoon. In addition, the water level of the nearby Norrebolle Nor was raised to create a freshwater lake with surrounding reed beds and wet meadows.

The project has converted intensively farmed land to wetland habitats: the area of well-functioning reed bed has been enlarged by more than 15 ha and the area of open freshwater by 69 ha. Appropriate grazing with cattle has been established on 44 ha of salt meadows. Management contracts for extensive grazing have been drawn up to ensure the long-term maintenance of the whole site.

The results of monitoring indicate that the nitrogen input to Tryggelev Nor has decreased by 60% thanks to the improved retention capacity in the catchment. While the external phosphorus input has not yet decreased this is expected to happen when Nørreballe Nor becomes more ecologically stable. A decreased nutrient load creates the possibility for the area to develop into a rich wetland area with a wide variety of breeding birds.

COASTAL LAGOONS IN SPAIN

The Baix Ter wetlands in north-east Spain are under heavy pressure from agriculture and uncontrolled tourism. The LIFE Nature project carried out a series of measures that have improved the conservation status of the area, including the implementation of a management plan.

The water quality of the Ter Vell lagoons has been improved by means of a 'green filter' created over a 2.57 ha estate acquired for the purpose. The *Phragmites*, *Typha* and *Scirpus* communities covering this natural purification system have proved effective in managing an average daily flow of 700-800 m^3 and retaining 95% of suspended solids and 65% of N and P load. The benefits of this action were reflected in the bird inventories, which were carried out in the area throughout the project.

Two new lagoons were created, covering 1.54 ha in total. Some 500 specimens of the Iberian toothcarp (*Lebias ibera*) were released into La Platera lagoon to ensure a healthy population. The lagoons developed the typical vegetation found in the habitat dominated by the endangered fish *Ruppia cirrhosa*.

CONCLUSIONS

Although very few LIFE projects targeted this particular habitat, they show that it is possible to improve the conservation status of this important habitat. The main issue addressed by the projects is improving water quality by green filtering or by reconnecting the coastal lagoon with the sea. These project actions might be complemented by the comprehensive implementation of agri-environmental measures that support farmers in reducing nutrient loads on the lagoons' surroundings. Moreover, this is also a Water Framework Directive requirement.

Mediterranean temporary ponds (MTPs) are small, shallow ponds that undergo a periodic cycle of flooding and drought. As a result, this habitat hosts characteristic flora and fauna adapted to this alternation. MTPs are mainly distributed in southern European countries and are found in dry and sub-arid areas in particular.

LIFE aids **Mediterranean temporary ponds**

A priority habitat for conservation listed in the Habitats Directive, MTPs are vulnerable to human activities and changes to their natural dynamic. Their continued existence is threatened by agricultural practices and land management that does not take into account their particular requirements.

Conservation efforts have, as a result, aimed to reverse the negative effects of these activities and to restore the ecological functions of the ponds. The lack of recognition of their importance and vulnerability heightened the need for awareness raising and better management. Several LIFE projects have targeted specific areas with direct actions such as restoration of old ponds and the reduction of negative impacts such as over extraction of water, artificial drainage, overgrazing, water eutrophication, siltation, invasive species, solid waste disposal and high visitor pressure. Management actions had to be tailored to each situation as MTPs show a high degree of variability.

Photo: LIFE05 NAT/ES/00058

LIFE projects implemented management plans for the Natura 2000 sites with temporary pond habitats.

LIFE ACTIONS

The Crete project (**LIFE04 NAT/GR/000105**) focused on several MTPs on the island of Crete, located within five different pSCIs. It carried out a detailed assessment of the hydroperiod, water quality and threats to these MTPs. In particular, the impact of polluted run-off from unsustainable agricultural practices was quantified through monitoring on a site-by-site basis. Such data informed subsequent conservation activities and allowed for management plans to be drawn up for each site.

Habitat	Conservation status at Biogeographical region level (main regions)	Projects
3170* - Mediterranean temporary ponds	Unknown (Mediterranean)	LIFE93 NAT/E/011100 LIFE99 NAT/F/006304 LIFE99 NAT/E/006417 LIFE02 NAT/SLO/008587 LIFE03 NAT/E/000052 LIFE04 NAT/GR/000105 LIFE05 NAT/E/000058 LIFE05 NAT/E/000060

Another project that focused on improving knowledge of the habitat was carried out in Minorca (**LIFE05 NAT/E/000058**). It carried out an inventory of all of the ponds on the island and made important limnological discoveries. A main outcome of the project is the enlargement of the SCI to cover all ponds in Minorca, many of which were discovered by the project's intensive survey and local stakeholder collaboration. Comprehensive management plans were also drafted.

The Karst project (**LIFE02 NAT/SLO/008587**) in Slovenia mapped all the habitats in the target area, which is an important resting and feeding place for migrating birds, as well as for amphibians, mammals, dragonflies and others. This information allowed site-specific management plans to be drawn up giving detailed and clear guidelines for the landowners. For the first time in Slovenia,

stewardship contracts were signed with land-owners to commit them to managing the land according to the plans.

A Spanish project in Valencia (**LIFE05 NAT/E/000060**), which aimed to protect amphibians, also resulted in important limnological discoveries. It surveyed, characterised and classified all temporary ponds hosting amphibian species.

Restoration has also been the focus of LIFE projects. The Karst project cleaned and removed invasive flora and fauna from 45 ponds. Restoration also included deepening the bottoms of the ponds and their subsequent sealing with a layer of clay, and the replanting of native vegetation. In the case of a Spanish project in La Albuera, Extremadura (**LIFE03 NAT/E/000052**), restoration included reconnecting a lagoon complex that had been drained and altered by agricultural practices. The negative impact of overgrazing was tackled by constructing alternative water points for livestock and through fencing and shore restoration.

In addition to restoration measures, the LIFE projects dealing with the creation of a network of flora microreserves in the Valencia region (**LIFE93 NAT/E/011100**, **LIFE99 NAT/E/006417**) included land purchase as a long-term protection of this type of habitat.

The French project (**LIFE99 NAT/F/006304**) helped to increase the knowledge of the habitat and management of temporary ponds, not only on the seven sites of the project, but also in the French Mediterranean area in general. Experimental management work took place on most of the sites, including scrub clearing, digging-out of pools, removal of invasive exotic species, and restoration of filled-in pools. Most of this work was accompanied by careful monitoring of its impact, in order to draw lessons that could be of relevance elsewhere. The project produced a ponds management handbook. The conservation status of the seven sites directly targeted by the project was significantly improved.

Photo: LIFE03 NAT/ES/0052

The main LIFE project actions were to restore the winter water levels and quality of ponds.

Finally, awareness raising and the involvement of land owners and the local community have had a positive effect on the long-term survival of this habitat. The Crete project made extensive efforts to inform the local communities and to enlist the support of local authorities in the conservation of the ponds. The Minorca project constructed a temporary pond for educational purposes. The Slovenian project carried out a particularly strong awareness campaign that included establishing an information centre for tourists and visitors that has a permanent exhibition about the ponds.

CONCLUSIONS

LIFE projects have successfully demonstrated how the unfavourable conservation status of MTPs can be improved in Crete, France, Spain and Slovenia. This type of habitat has a very quick and positive response to simple restoration and management actions, with results seen in the very short-term, as showed by these projects. While having only a local impact, these projects have helped to gain knowledge of a habitat that was scarcely studied, contributing to an increased representation of MTPs in the Natura 2000 network and to the discovery of new species in the regions covered. In addition, the French project pushed for a resolution calling for the conservation of temporary pools that was adopted at the eighth Ramsar Conference in November 2002. It is hoped that through the spread of best practise implemented successfully by LIFE projects, an overall good conservation status of this habitat will be achieved across Europe.

Project actions involved the clearing of scrubs and the elimination of invasive species.

Photo: LIFE05 NAT/ES/00058

Though often only a few square metres in area, petrifying springs with tufa formation and their immediate surroundings are a valuable and unique habitat for certain species.

LIFE conservation of a special habitat: **petrifying springs** with tufa formation

Many petrifying springs have suffered from human interference such as attempts to make them more attractive by encasing them in constructions, draining and their use as rubbish dumps. They are also highly sensitive to changes in their surroundings.

This particular type of spring is formed where spring water with high calcium carbonate content comes out of the ground. On contact with the air, carbon dioxide is lost from the water and a hard deposit of calcium carbonate (tufa) is formed. Tufa-forming springheads are characterised by the swelling yellow-orange mats of the mosses and algae of the phytosociological alliance *Cratoneurion,* with the mosses from the genus *Cratoneuron* dominant. Many rare, lime-loving (calcicole) species live in the moss carpet.

Threats resulting from direct human intervention include the discharge of liquid manure and pesticides in adjacent catchment areas and the inflow of warmer drainage water from farmland. Moreover, the mosses and algae on which the habitat depends decline if conditions concerning shade, microclimate and pH of the water are not perfect.

LIFE projects have demonstrated that restoring the natural conditions for this unique micro-habitat can have a beneficial effect on its long-term survival. A wide range of site-specific hydromorphological actions have been carried out at strategically important sites in Europe.

LIFE ACTIONS

One of the largest concentrations of petrifying springs in the EU is located in the Franco-Swabian Jura region of southern Germany. A particular threat for the tufa springs in the region is the substitution of native deciduous forests with monotonous stands of planted spruce. A LIFE project (**LIFE03 NAT/D/000002**) helped restore 56 spring habitats, carrying out a number of small-scale initiatives to 'renaturalise' individual springs.

Various actions were carried out at specific sites. For example, a spring near Hohenstadt was used by the local community. Households were connected instead to the central drinking water supply and the concrete shafts to the spring were removed and the downstream area restored. Other actions included removing a concrete wall acting as a dam at one site to restore the free-flowing character of the stream fed from the spring. Around another spring a spruce monoculture was cleared from an area of around 2 000 m^2. The exposed slope was then planted with more appropriate trees.

Protection of the spring with fences is another common conservation action. A spring in the community of Dittenheim, which has suffered from contamination and damage resulting from the grazing and excrement of sheep, was protected by a fence built by a youth welfare organisation. Also at a site near Rohrbach, in addition to the removal of spruce trees, the area around the spring was fenced off.

LIFE projects have also increased our knowledge of the micro-habitat. For example, the Italian project, 'V. Curone - V. S. Croce : protection priority habitats' (**LIFE98 NAT/IT/005037**), carried out a study of the petrifying springs in the Valle San Croce Valle del Curone area close to Milan and undertook various measures in order to stabilise their hydrology, reduce visitor pressure and increase their stability. Detailed mapping of springs with tufa allowed new localisation in several sites within the target pSCI, evidencing a wider distribution than expected. These key conservation measures have demonstrated how the conservation status of petrified springs can be improved in Europe.

LIFE has restored petrifying spring habitats by restoring the spring flow and by fencing off the habitat area to avoid grazing and contamination.

Photo: Landesbund für Vogelschutz (LBV) Bayern

Photo: Jan Sliva

Wet forests are dependent on the good management of the river systems and the catchment areas on which they rely. A decrease in water levels, as a result of water abstraction and drainage, and regulation of watercourses, has resulted in the 'unfavourable bad' conservation status of this habitat in all regions.

LIFE conserving **wet forests**

Poor water quality resulting from agricultural run-off, industrial effluents or rubbish dumping, expansive spreading of aggressive invasive species and large-scale plantations of poplar hybrids in river alluvia are factors that adversely affect the status of wet forests. Moreover, the richness of the associated soils has made them attractive for conversion to agriculture, particularly in the uplands. The abundance of semi-natural habitats and interconnecting features within the wider countryside has also declined, increasing ecological isolation.

Wet forests are a varied habitat type that includes riparian ash (*Fraxinus excelsior*) and alder (*Alnus glutinosa*) forests and willow (*Salix alba, Salix fragilis*) and black poplar (*Populus nigra*) galleries along lowland and hill water courses together with grey alder (*Alnus incana*) riparian forests of sub-montane to sub-alpine rivers. The habitat occurs on heavy and periodically inundated soils. Though this habitat type is relatively widespread, it occurs as fragmentary stands where the hydrologic regime is favourable. It is seriously threatened, particularly in lowland areas.

LIFE ACTIONS

One of the most important conservation actions that LIFE has demonstrated for this habitat is the adoption of an integrated management approach. A LIFE project (**LIFE02 NAT/UK/008544**) carried out in the UK's New Forest focused on restoring woodlands, which an earlier project (**LIFE97 NAT/UK/004242**) highlighted problems relating to the hydrological networks on which they depend. The new project created a Water Basin Management Forum, made up of key statutory agencies and stakeholder groups. Its remit was to introduce an integrated and strategic approach to the management of the water basins, supported by local interest groups and communities. Direct actions included mire restoration, the re-installment of debris dams to restore natural river channel features, the restoration of alluvial forests, bog wood-

Alluvial forests (91E0) is a habitat that has greatly benefited from LIFE projects.

Photo: Jan Sliva

land and wet grassland habitats, and the creation of conditions to allow the natural regeneration of these habitats.

Alluvial forests with common alder (*Alnus glutinosa*) and European ash (*Fraxinus excelsior*) (91E0) is a habitat that has benefitted from several other LIFE projects. The objective of the Slovakian project (**LIFE03 NAT/SK/000097**) was to preserve the last remaining natural floodplain forests in the Slovakian part of the Danube floodplain, and to introduce sustainable forest management in the area. Most of the residual alluvial forests within the project area were under real threat of being cut down or degraded by forest management practices. These forest habitats benefited from the change of forest management plans, designation of new nature reserves (or enlargement of existing ones) and large-scale removal of invasive tree species.

An Austrian project (**LIFE04 NAT/AT/000001**) focused on the river Lafnitz, one of the last lowland rivers in the country to have retained a semi-natural state, having been left to meander without intervention for over three-quarters of its 112 km course. As a result, it hosts numerous Annex II-listed fish species, amphibians and Annex I-listed birds in and around its loops, oxbow lakes, side channels and associated alluvial forests. The entire river area has been designated an EU Special Area of Conservation within the Natura 2000 network.

Alder forests were also targeted by an Italian project (**LIFE03 NAT/IT/000109**) in the Pavia province. Changes in irrigation systems and irrigation canals, a reduction in the level of the water table and invading exotic vegetation had impacted on the conservation status of the forest. To combat these threats the project extended reforested and flooded areas, created new wetlands, and restored hydrological systems.

A key aspect of the project was the active involvement of local farmers in the interventions. For the maintenance of these results, especially the hydrological system, their involvement is vital. The success of the NIMOS project (**LIFE95 NAT/IT/000742**) in the Trento province of Italy was also dependent on the participation of local farmers.

Another important conservation action for wet forests is information gathering. Alder woodlands are strongly affected by the changes in water availability, and the Pavia project focused therefore on monitoring the water table. The data gathered allowed comparisons to be made for the first time of water tables by geological location, season, irrigation and land use of the surrounding areas. Additionally, field surveys were carried out in order to classify the botanical value of the area and to explore differences between woodlands managed according to different criteria.

To achieve the favourable conservation status of alder forests, water should be present above or close to the surface throughout the year. Hence, springs, which had long been abandoned, were drilled in order to allow the upper aquifer to come to the surface and sediments of the surrounding pools were removed. In some areas, the pools were enlarged to create new open waters. The efficiency of these measures was reduced by canals in the area, which took off surface water and caused periodic lowering of the water table, mostly during winter periods. To avoid these problems, canal profiles and existing throughways were reshaped and specially shaped metal and wooden sluices were installed to retain water and regulate water levels in some areas.

CONCLUSIONS

Actions carried out by LIFE projects point the way forward for the conservation of wet forests, namely, the restoration of whole floodplain systems, the regeneration of natural ground water tables and the stopping of unfavourable management practices. Wide-scale implementation of such measures will greatly contribute to the improvement of the conservation status of this habitat.

Reconnecting floodplains and improving water levels have benefited wet forest habitats.

Photo: Jan Slva

The vast majority of pannonic grasslands and steppe habitats are found in the Pannonian biogeographical region, though some of these habitats also occur in adjacent parts of the Continental region. Under threat from changes in agricultural practices and inappropriate land use, Member States report that their conservation status is 'unfavourable-bad'.

Stepping up actions to **conserve pannonic grasslands**

The characteristic pannonic grasslands and steppes were formed over centuries as a result of extensive management, notably through traditional grazing. LIFE projects have targeted conservation efforts mainly in Hungary, including pannonic steppic grasslands, sand steppes and salt steppes – listed as priority (*) for conservation in Annex I of the Habitats Directive (see table). These unique habitats are under threat from changing cultivation practices, afforestation, over – or under – grazing, as well as unbalanced use of fertilisers and pesticides. Moreover, many grassland areas have been abandoned and have reverted to scrubland. LIFE has also focused on the restoration of small remnants of pannonic steppe and dry grasslands found in Lower Austria.

LIFE ACTIONS

LIFE projects have implemented the following actions: the re-introduction of appropriate levels of grazing (with low inputs and low stocking densities accompanied by late mowing), hydrological works for the restoration of wet grasslands and marshes and the clearing of encroaching woodlands. Particularly successful are actions to encourage the reintroduction of hardy grazing stock of endemic or native breeds of cattle, such as Hungarian flecked and Hungarian grey, Racka sheep, goats and Mangalica pigs.

The open grassland plains found in Hungary's Hortobágy National Park host Europe's largest coherent coverage of priority pannonic salt steppes and marsh habitat (habitat 1530*). The park incorporates around 54 000 ha of this internationally important habitat that supports a valuable variety of flora and fauna within its mosaic of wild grasslands, wetland marshes and semi-natural watercourses.

It is also an ornithologist's paradise: important bird species such as the great bustard (*Otis tarda*), bittern (*Botaurus stellaris*), common crane (Grus grus) and aquatic warbler (*Acrocephalus paludicola*) all live on the Hortobágy steppe.

The steppe was the location of a successful project, 'Restoration of pannonic steppes, marshes of Hortobágy

By implementing restoration actions on the grasslands habitats LIFE has boosted rare flora and fauna species.

Photo: Jan Sliva

National Park' (**LIFE02 NAT/H/008634**), whose main focus was the large-scale restoration of 10 000 ha of the grassland habitats that had been adversely affected by a complex network of dykes and channels built as an irrigation system during the socialist era. The project re-established the natural water-flow dynamics to create more favourable habitat conditions. At the same time, extensive cattle grazing was introduced in certain areas.

Two other LIFE projects (**LIFE02 NAT/H/008638** and **LIFE04 NAT/HU/000119**) have also focused on the restoration of dry and wet grasslands and salt marshes in the Hortobágy region. The former project was successful in reducing negative impacts on 2 000 ha of salt steppes, including periodical drying of the area and eliminating of harmful agricultural practices. Shallow-water habitats were enlarged to 295 hectares, through inundations and the elimination of channels. The latter project initially targeted an area of 1 500 ha. In total, more than 90 ha of steppic grassland (habitat 6250) and around 650 ha of alkali steppe grasslands (habitat 1530) were restored.

However, by adopting a holistic restoration approach – that also includes the creation of ecological corridors between valuable sites and the establishment of buffer zones by restoring grasslands on arable land adjacent to marshland areas affected by agricultural contaminants – wider conservation impacts over 5 000 ha are a strong long-term possibility.

Also focusing on wider impacts is the ongoing, 'Grasshabit' project (**LIFE05 NAT/H/000117**), led by MME-Birdlife Hungary. This Hungarian project is researching the best possible management methods to ensure the ecological and economic sustainability of six characteristic grassland and steppe habitat types. Information on best practices will be disseminated to landowners and managers, farmers and the general public to encourage their application on patches of existing habitats, as well as in agricultural areas. The project is also aiming to achieve adequate changes in the national agricultural policy in order to assure the long-term sustainability of conservation measures on grasslands.

Photo: Jan Sliva

LIFE has reintroduced appropriate levels of grazing to conserve the pannonic grasslands.

Finally, the project, 'Pannonic Steppes and Dry Grasslands' (**LIFE04 NAT/AT/000002**), addressed habitat loss of the last remaining patches of grassland and steppe habitats in eastern Austria. As well as being areas of valuable biodiversity, these isolated sites have an important connectivity function. The project serves as a model and provides a practical boost to the conservation of steppe grasslands in Austria and neighbouring countries.

CONCLUSIONS

LIFE projects located mainly in Hungary have demonstrated significant positive impacts at a local or regional level – helping to tackle threats to the grasslands and steppes of the Pannonian biogeographical region, and improving their conservation status. Significantly, these actions are also benefitting populations of Annex I-listed bird species, with population growth already recorded for certain species including the bittern, common crane, aquatic warbler and great bustard.

Habitats	Conservation status at Biogeographical region level (main regions)	Projects
1530* Pannonic salt steppes and salt marshes	Unfavorouble-bad (Pannonian and Continental)	LIFE02 NAT/H/008634 LIFE04 NAT/HU/000119 LIFE02 NAT/H/008638 LIFE05 NAT/H/000117 LIFE04 NAT/AT/000002
6240* Sub-Pannonic steppic grasslands	Unfavorouble-bad (Pannonian) and unfavourable inadequate (Continental)	
6250* - Pannonic loess steppic grasslands	Unfavorouble-bad (Pannonian and Continental)	LIFE02 NAT/H/008634 LIFE04 NAT/HU/000119 LIFE02 NAT/H/008638 LIFE05 NAT/H/000117
6260* - Pannonic sand steppes	Unfavorouble-bad (Pannonian and Continental)	LIFE02 NAT/H/008634 LIFE04 NAT/HU/000119 LIFE02 NAT/H/008638 LIFE05 NAT/H/000117

A widely distributed and once common European mountain grassland habitat type, the species-rich *Nardus* grasslands, included in Annex I of the Habitats Directive, occurs in almost all EU Member States. However, due to the abandonment of traditional agricultural practices, these priority grasslands have lost more than 90% of their original area in Europe and Member States report a sharp decline across all regions.

Concerted action **to halt the decline of *Nardus* grasslands**

LIFE projects have contributed to the restoration of *Nardus* grasslands at a local and regional level, and are encouraging cross-border links to enhance future conservation prospects.

Species-rich *Nardus* grasslands (habitat 6230*) are most commonly found within the Alpine biogeographical region (the Alps, Pyrenees and Carpathians). The priority grasslands also occur relatively frequently in mountain and sub-mountain areas of the Mediterranean, Continental and Atlantic biogeographical regions. They are very important for biodiversity, as they harbour a wide diversity of species included in Annexes II and IV of the Habitats Directive, ranging from butterflies, such as the Alcon blue (*Maculinea alcon*), grasshoppers and crickets (*Orthoptera*), e.g. *Pholidoptera transsylvanica*. The main threats and pressures come from the intensification of agricultural practices on the one hand and land abandonment and low intensity use on the other. *Nardus* grasslands are particularly sensitive to human activities, and unsustainable mountain tourism practices (such as hiking and skiing) are a growing threat. These grasslands often require several restoration measures – the most frequently employed by LIFE being the removal of trees and shrubs (by machines or by hand) and the reintroduction or management of traditional grazing.

Species-rich Nardus grasslands are dependent on low-intensity grazing.

Photo: Conny Schmitz

LIFE ACTIONS

The Italian project, 'RETICNET VALCHIAVENNA' (**LIFE03 NAT/IT/000139**), covered five Natura 2000 sites in the Rhaetian Alps in northern Lombardy, tackling areas where the grasslands had become overgrown or where the conservation status was threatened by increasing pressure from tourism. The project established a GIS database, which provides much needed information on the location and state of conservation of the grasslands. Using this information, site management plans were then drawn up. Four of the five plans have already been implemented by local authorities, which should help to ensure future sustainable management of the habitat in the region.

Another Italian project targeted the conservation of *Nardus* and other mountain grasslands found in the "Alpe Veglia-Alpe Devero" national park in the Ossola valley, on the Italian-Swiss border. The main habitat actions of the project, 'Alpe Veglia and Alpe Devero:

Photo: Conny Schmitz

Several projects removed overgrown scrubs and trees to restore Nardus grasslands.

actions of conservation of mountain grasslands and peatlands' (**LIFE02 NAT/IT/008574**), focused on the re-introduction of sustainable management of the pastureland, e.g. grazing with cattle and horses, supported by shrub removal operations in formerly abandoned areas to help restore the high-altitude meadows. These resulted in an enlargement by more than 90 ha of the *Nardus* grassland.

A particularly innovative action was the introduction of a new method for grazing cattle and horses using temporary electric fences over large areas to improve the restoration prospects of the grasslands. This action was implemented by the Piedmont region park authority, the project beneficiary, with the support of local farmers.

The habitat improvements have also indirectly benefited one of Europe's rarest butterfly species: Raetzer's ringlet (*Erebia christi*) – found almost exclusively in this area.

In Latvia, a nationwide programme for the restoration and long-term management of priority and other important grasslands occurring in floodplain meadows was introduced by the 'Meadows' project (**LIFE04 NAT/LV/000198**). Run by a non-governmental organisation, the Latvian nature fund, the project restored a total of 2 500 ha of grasslands of Community importance, including *Nardus* grasslands, over 15 sites.

Habitat restoration works included the construction of fencing and the use of Konik horses (a hardy breed) to graze sections of the fenced areas. To enable further management by grazing and mowing, it was necessary to remove encroaching shrubs. The project successfully removed more than 1 000 ha of overgrowth. An innovative method used to promote this action was a day-long practical habitat restoration event involving local volunteers and gaining widespread public support. The project also drew up 13 site management plans, setting the management goals and measures for these areas for the next decade.

During the project, the emphasis was on individual contracts with landowners for the habitat restoration works. Looking ahead, management activities will be continued under the Rural Development Plan for Latvia. The project assisted more than 400 farmers in applying for these funds for grassland management.

Finally, an ambitious partnership project to restore the *Nardus* grasslands across areas of Central Europe is being co-ordinated by the German nature conservation NGO, "Naturlandstiftung Saar". The ongoing 2006-10 project, 'Conservation and regeneration of Nardus Grasslands in Central Europe' (**LIFE06 NAT/D/000008**), is focusing on 32 Natura 2000 sites where the targeted Nardus grasslands occur: northern Luxembourg, the Belgian Ardennes and two regions of western Germany (Saarland and Reinland-Pfalz). The aim is to create a network of core-protected sites whereby co-operation between project partners in Germany, Belgium and Luxembourg will ensure connectivity across borders.

CONCLUSIONS

Despite their continuing unfavourable condition, prospects for achieving 'favourable' conservation status for *Nardus* grasslands in areas of Europe have been enhanced by LIFE actions at a local and regional level. Moreover, LIFE is also encouraging international co-operation for the restoration of this important habitat across borders.

Habitat	Conservation status at Biogeographical region level (main regions)	Projects
6230* - Species-rich *Nardus* grasslands	Assessed as either 'unfavourable-inadequate' or 'unfavourable-bad' across all countries except for Greece and Italy who reported its status as 'favourable ' in all regions.	LIFE03 NAT/IT/000139 LIFE02 NAT/IT/008574 LIFE06 NAT/D/000008 LIFE04 NAT/LV/000198 LIFE03NAT/LV/0082

Regeneration and protection of **species-rich dry calcareous grasslands**

Semi-natural dry grasslands are under threat, especially those associated with various orchid species. Many Member States report that the conservation status in their countries is 'unfavourable-bad'. LIFE projects, however, are having a positive impact on the conservation status of these priority grasslands at a local and regional level. Importantly, they demonstrate new approaches to their conservation with potential for wider application.

Photo: LIFE04 NAT/IE/000125

Semi-natural dry grasslands are present almost everywhere in Europe where 'basic' to 'neutral basic' soils occur and are among the most species-rich plant communities in Europe, hosting a large number of rare and endangered species including many orchids. Where *Festuco-Brometalia* grasslands (6210*) are orchid-rich, they are considered to be a priority for conservation under the Annex I of the Habitats Directive.

The structural and floristic characteristics of these dry and calcareous (chalky) grasslands are strongly influenced by climatic factors and management practices, in particular the intensity of grazing. Large areas have disappeared due to the lack of suitable management over the past century, causing severe fragmentation of the remaining habitat areas and a consequent drop in populations of certain species by as much as 20-50% across Europe.

Between 1999 and 2006, LIFE co-financed 26 projects around Europe targeting calcareous grasslands. Several of these projects, located in northern and central Europe, directly target grasslands identified as important orchid sites[1]. As in other grassland areas, pressure on these rare and endangered habitats is steadily increasing, mainly due to abandonment or change in use. In the areas where the habitat is still present, a lack of management is resulting in the continuing decrease in range of the many dependent species (see box).

LIFE habitat actions typically include clearance of shrubs and other invasive plants (e.g. using controlled fire), mowing and balanced grazing, and, importantly, often rely on good co-operation with farmers and local landowners who, with the support of agri-environmental programmes, are responsible for the future sustainable management of these areas.

1 Important orchid sites are defined in accordance with the Interpretation Manual of EU Habitats. Version EUR27 European Commission DG Environment (July 2007): http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf

MANY SPECIES BENEFIT FROM DRY LAND HABITAT RESTORATION ACTIONS

As well as rare and endangered orchids, many other species – herbs such as trefoil, grazing animals, butterflies, reptiles and birds – benefit from habitat improvement and restoration actions. For example, raptors and other birds of prey such as lanner falcon (*Falco biarmicus*) and Montagu's harrier (*Circus pygargus*) rely on these grassland habitats for an abundant food supply during winter. Many passerine (migrating) species including the ortolan bunting (*Emberiza hortulana*) and the woodlark (*Lullula arborea*) also use the habitats; while a number of invertebrate fauna – notably butterflies – are also associated with these grasslands.

A regional project to restore natural pastures and hay meadows in Jämtland and Härjedalen, Sweden, (**LIFE03 NAT/S/000070**) used a combination of these measures to restore various grassland habitats, including the orchid-rich (6210*) habitat type over 31 Natura 2000 sites. The project achieved a good level of co-operation with local farmers and, in particular, helped to promote good grassland management practices, supported by agri-environment schemes, among the mainly small-scale farming communities.

Another very successful large-scale Swedish project is the 2000-05 LIFE project to protect important grasslands over 18 sites within the agricultural landscape of the island of Öland (**LIFE00 NAT/S/007117**). This project – a continuation of an earlier 1996-99 project (**LIFE96 NAT/S/003185**) in the same region – successfully cleared and restored to a favourable conservation status more than 1 400 ha of calcareous grasslands, mostly the priority habitat type Nordic Alvar grasslands (6280*) but also the orchid-rich grasslands (6210*).

As in other parts of Europe, Denmark's dry grasslands are under threat from the combined effects of scrub encroachment, lack of grazing and the invasion of non-native species. The LIFE project (**LIFE04 NAT/DK/000020**) launched a national strategy to restore many valuable Danish grassland sites within the Natura 2000 network to a favourable conservation status. The 11 project sites house a quarter of the priority dry grasslands (6210*), as well as significant areas of other grasslands habitats in Denmark.

The project's habitat conservation works included clearing, mowing and grazing with hardy breeds of cattle, horses, sheep and goats. The project helped to promote agri-environmental contracts under the Danish Rural Development Programme whereby local farmers have undertaken to maintain grazing in certain areas for the next ten years. The project also successfully reintroduced the large blue butterfly (*Maculinea arion*) at one site – this is especially significant as the butterfly is considered an indicator species for habitat quality.

In Latvia, a nationwide programme for the restoration and long-term management of priority and other important dry and calcareous grasslands occurring in floodplain meadows was introduced by a LIFE project (**LIFE04 NAT/LV/000198**). Run by a non-governmental organisation, the Latvian Fund for Nature, the 'Meadows' project restored a total of 2 500 ha of grasslands of Community importance over 15 sites, including about a half of Latvian area of Fennoscandian wooded meadows (6530), considerable patches of Species-rich *Nardus* grasslands (6230), Fennoscandian lowland species-rich dry to mesic grasslands (6270), semi-natural dry grasslands and scrubland facies on calcareous substrates (6210). The main actions focused on shrub cutting and removal of shrub roots, controlled burning and early mowing/grazing. To ensure the continuity of the management activities, contracts were signed on the agreement that landowners involved would apply for funding under national and international agri-environmental programmes for at least five years after the end of the project in 2008.

Finally, LIFE Nature projects in Austria (**LIFE06 NAT/A/000123**) and in Germany (**LIFE00 NAT/D/007058** and **LIFE02 NAT/D/008461**) have shown considerable success in the restoration and conservation of areas of dry and semi-dry grasslands. The German project targeted the special xeric[2] grasslands of Rhineland-Palatinate –- home to up to 25 species of rare and endangered orchids (including *Cypripedum calcedus, Ophrys insectifea, Orchis mascula* and *Himantoglassum hircinum*) – under threat from invading shrubs and human actions. Thanks to the project, 76 ha of xeric grasslands have been successfully restored and a long-term management plan put in place to preserve a unique natural resource.

CONCLUSIONS

Despite their continuing unfavourable-bad condition, prospects for achieving favourable conservation status for priority dry and calcareous grasslands in areas of northern Europe have been enhanced by LIFE actions at a local and regional level. Moreover, LIFE has also been a driver of stakeholder co-operation among communities responsible for the future sustainable management of these grasslands.

2 These xeric grasslands are of special biogeographical importance since they straddle the divide between the sub-Mediterranean/ Atlantic and Continental climactic areas. Rhineland-Palatinate represents the northern limit of propagation for many species that are otherwise more native to the Mediterranean area or the Balkans.

Wooded pastures and meadows have been disappearing in the Fennoscandia and Baltic. LIFE is contributing to the reversal of the decline of these rich habitats by restoring and re-establishing management for their long-term conservation.

Safeguarding **Fennoscandian wooded pastures and meadows**

As late as the 1920s, forest grazing was the predominant form of pasture in Sweden and other Nordic Baltic countries – in Finland, the practice continued up to the 1960s. However, in Sweden and Finland a major shift in the landscape followed the introduction of a law establishing forestry activities as the economic basis of forestland. In Baltic countries the decline in forest grazing followed the collapse of the Soviet Union. Cattle were removed from the woodland pastures and meadows and put to graze in fertilised grasslands and subsequently enclosures where they were artificially fed.

Photo: ROSORIS LIFE05 NAT/S/000108

LIFE project actions for wooded meadows and grasslands often included mowing or grazing, reintroduced in partnership with local farmers.

After 1945, the wooded grassland and meadow habitats (9070 and 6530 in the Habitat directive) suffered a drastic reduction and almost disappeared, with just 1% of the original area still remaining in Sweden and Finland. These habitats are pastures characterised by the more or less scattered presence of deciduous trees, such as lime tree, ash and oak. In addition in Sweden and Finland the wooded meadows broadleaf trees are often pollarded for feeding the cattle, creating typical candlestick-shaped trees.

Wooded meadows (6530) are a mosaic of open meadows and scattered deciduous trees and bush. It is a very species-rich habitat type with up to 85 vascular plants in 1m^2 (wooded meadows are often combined with calcareous grasslands and may have very rich orchid flora). Wooded pastures (9070) have fewer open meadow patches and trees are not pollarded. A similar pasture habitat, the 'dehesa' or 'montados' (6310), is found in Spain and Portugal, but consists of evergreen oaks.

The impact of mowing or grazing defines the species composition and richness, resulting in meadows or grasslands respectively. In Sweden, grazing and mowing practices distinguish the two habitat types defined in the Annex I of the Habitats Directive: 6530 wooded meadows (mowing) and 9070, wooded grasslands (grazed). These habitats occur together in a mosaic and are sometimes related to other grasslands/meadows or forest habitat types. More than 70% of the 9070 habitat area is in Sweden, with the remaining in Estonia, Finland and Latvia. And the bulk of the habitat 6530 area is in Estonia and Sweden.

Typical management practices that are carried out in Finland include spring raking for collecting fallen twigs, mowing after midsummer followed by grazing and pollarding of trees (i.e. collecting bundles of young twig for winter fodder). Most of the wooded meadows are found in southwest Finland especially in the Baltic archipelago.

Moreover, these habitats are very diverse and hold several plant and invertebrate species such as the Annex II and IV beetle *Osmoderma eremita*.

LIFE ACTIONS

All projects included actions that can be divided into two stages: first the restoration of the grassland and meadow, followed by recurring habitat management activities based on mowing and/or grazing and in a few cases pollarding was also re-established. For example, in one Swedish project (**LIFE05 NAT/S/000108**), which was carried out on 41

Natura 2000 sites in Östergötland, the restoration stage consisted of clearing the areas by removing overgrown woods and scrubs – i.e. spruce and other trees were eliminated, while key trees species, such as old oaks that characterise the habitats and grant the long-term conservation of the habitat, were protected.

The restoration of the grasslands and meadows poses some problems as following the cutting of trees and scrubs nutrients are released into the soil, favouring nitrofilous species. The continued success of one Swedish project (**LIFE02 NAT/S/008484**) is dependent on immediate grazing and mowing after restoration. Grazing is mostly done by cattle (though sheep and horses are also sometimes used) from spring to autumn, and hay is mowed between July and September. In the case of wooded meadows, the winter stock is fed with the stored mowed hay as well as with leaves and more tender branches of pollard trees.The pollarding has almost disappeared as livestock is now fed artificially.

The Östergötland project (**LIFE05 NAT/S/000108**) is resuming pollarding of old deciduous trees, especially lime trees and ash, in order to benefit the many species of flora and fauna that need old trees for their survival, such as the eremite beetle. The pollarding is performed in the traditional way but also with new techniques with the help of experts, in order to enhance the tree's longevity and the restoration of the former pollarded trees. In addition, new oak trees are being planted in the project sites to ensure its long-term conservation. In the Finnish project (**LIFE00 NAT/FIN/007067**), wooded meadows were cleared and typical spring raking, mowing and grazing was initiated in island pastures in southwest Finland. Pollarding was not undertaken but previously pollarded trees were protected and their surroundings were opened. In Estonia a clearing was made and mowing carried out.

For these LIFE projects the challenge is the continuity of the grazing and mowing actions after the project. The projects are very successful at implementing the restoration measures, but without continuous management the habitats will decline once more in species-poor forest and scrubs habitat. The involvement of the farmers and cattle owners from the beginning of the project is crucial for the success of the project actions.

According to one Swedish project (**LIFE05 NAT/S/000108**), the cost of restoration is on average around € 2 000 per hectare, including the first pollarding, and the mowing around € 2 000 per ha per year. In order to ensure the continuity of the mowing and grazing activities, the Latvian project (**LIFE04 NAT/LV/000198**) and the Finnish project, (**LIFE00 NAT/FIN/007067**), which also included Sweden and Estonia, signed contracts with the landowners that will apply for funding under agri-environmental schemes for at least five years after the end of the project. Therefore, agri-environmental schemes included in the new Rural Development Plan for Latvia for the time period of 2007-13 will be the main financial tool for the maintenance of the habitats. The LIFE projects combined offered hundreds of farmers assistance with applying for funds for grassland management of the projects areas.

CONCLUSIONS

Though on a small scale, LIFE projects have been improving the conservation status of the wooded grasslands and meadows. A recent project (**LIFE08 NAT/S/000262**) proposes to restore more than 600 ha of grasslands and meadow habitats including wooded ones. Moreover, the projects have defined techniques and methodologies that are transferable and are proven to be successful for the restoration and management of these unique habitats.

The challenge is to ensure the continuity of the project actions after the project ends. LIFE is giving support to the implementation of best practices for the management of these habitats and the European Agricultural Fund for Rural Development has the potential to fund the recurring actions that are relevant for wooded pastures and meadows. These actions have to be covered in National Strategic Plans and related Rural Development plans in order to be eligible at the national level. Costs for grazing and mowing these habitats are mainly eligible for agri-environmental subsidies within this programme.

The LIFE+ programme does not financially support recurring management but projects that promote recurring management. LIFE+ can be used for implementing restoration measures but continued management must be funded from other sources.

Habitats	Conservation Status	Relevant projects
6530* – Fennoscandian wooded meadows	Unfavourable-bad (Boreal)	LIFE02 NAT/S/008484 LIFE05 NAT/S/000108 LIFE00 NAT/FIN/007067
9070 – Fennoscandian wooded pastures	Unfavourable-bad (Boreal)	LIFE04 NAT/LV/000198 LIFE02 NAT/S/008484 LIFE03 NAT/S/000070 LIFE05 NAT/S/000108 LIFE00 NAT/FIN/007067

Photo: ROSORIS LIFE05 NAT/S/000108

In Sweden LIFE projects have reintroduced pollarding as a restoration action.

Projects **Index**

Available LIFE Nature **publications**

LIFE and Europe's reptiles and amphibians: Conservation in practice (2009 – 60 pp. - ISBN 978-92-79-12567-6)

Nature & Biodiversity: Projects 2007 (2009 – 63 pp. - ISBN 978-92-79-12257-6)

Learning from LIFE: Nature conservation best practices
(2008 - 68 pp. – ISBN 978-92-79-11635-3)

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A number of LIFE publications are available on the LIFE website: ***http://ec.europa.eu/environment/life/publications/lifepublications/index.htm***

A number of printed copies of certain LIFE publications are available and can be ordered free-of-charge at: ***http://ec.europa.eu/environment/life/publications/order.htm***

The programme

LIFE+ "**L**'**I**nstrument **F**inancier pour l'**E**nvironnement" / The financial instrument for the environment

Period covered (LIFE+) 2007-2013.

EU funding available approximately EUR 2,143 million

Type of intervention at least 78% of the budget is for co-financing actions in favour of the environment (LIFE+ projects) in the Member States of the European Union and in certain non-EU countries.

LIFE+ projects

> **LIFE Nature projects** improve the conservation status of endangered species and natural habitats. They support the implementation of the Birds and Habitats Directives and the Natura 2000 network.

> **LIFE+ Biodiversity projects** improve biodiversity in the EU. They contribute to the implementation of the objectives of the Commission Communication, "*Halting the loss of Biodiversity by 2010 – and beyond*" (COM (2006) 216 final).

> **LIFE+ Environment Policy and Governance projects** contribute to the development and demonstration of innovative policy approaches, technologies, methods and instruments in support of European environmental policy and legislation.

> **LIFE+ Information and Communication projects** are communication and awareness raising campaigns related to the implementation, updating and development of European environmental policy and legislation, including the prevention of forest fires and training for forest fire agents.

Further information further information on LIFE and 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/lifeplus.htm

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