



LIFE Bridging the Gap

preserving unique oak environments in Sweden

Bridging the gap – in time and space

Between 2016 and 2022, the project LIFE Bridging the Gap has restored 30 valuable oak environments in Blekinge, Kalmar and Östergötland counties in southern Sweden.

Many species are dependent on a landscape that includes oaks of many different sizes and ages, particularly a good supply of hollow old oaks. LIFE Bridging the Gap has used various restoration methods to recreate functioning oak landscapes.

During the course of the project, the participants have also developed and increased knowledge of the oak as a habitat for various identified species, and have, in various ways, conveyed information to conservationists, land-owners, contractors and the public.

The Blekinge, Kalmar and Östergötland county administrative boards, as well as Linköping municipality, manage these areas in the project.



Natura 2000

is a network of valuable natural areas containing species or ecosystems which, from a European perspective, are considered particularly worthy of protection. The oak areas in the project are Natura 2000 areas.



The Life programme

LIFE Bridging the Gap is funded by the EU's Life programme. LIFE is the EU's funding instrument for the environment and climate. The programme started in 1992, and it funds projects in the EU. Its aim is to accelerate the implementation of European or national environment and climate legislation. This includes the protection and improvement of biodiversity, the environment, health, and the transition to a circular, energy-efficient economy.



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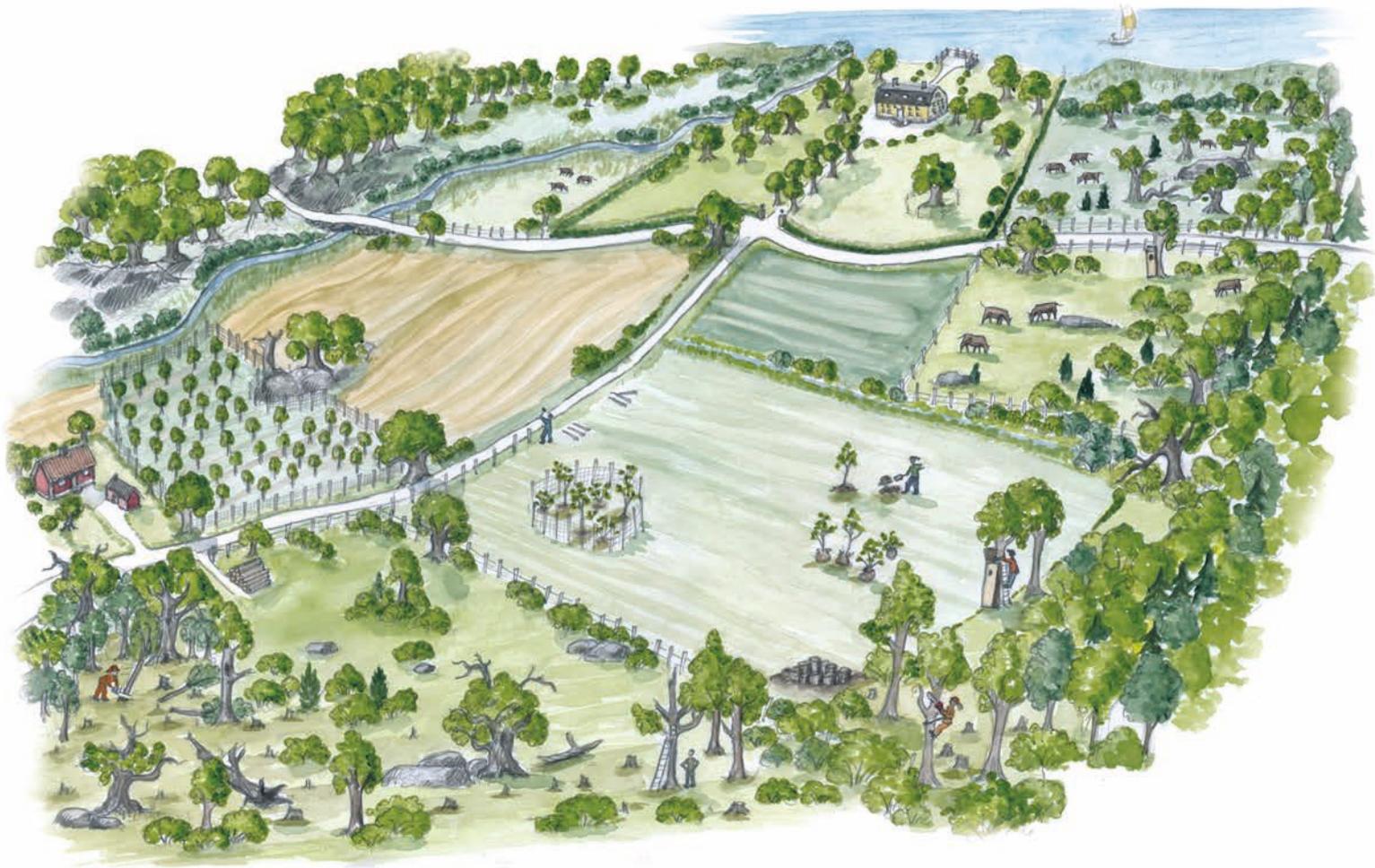
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Thirty oak areas

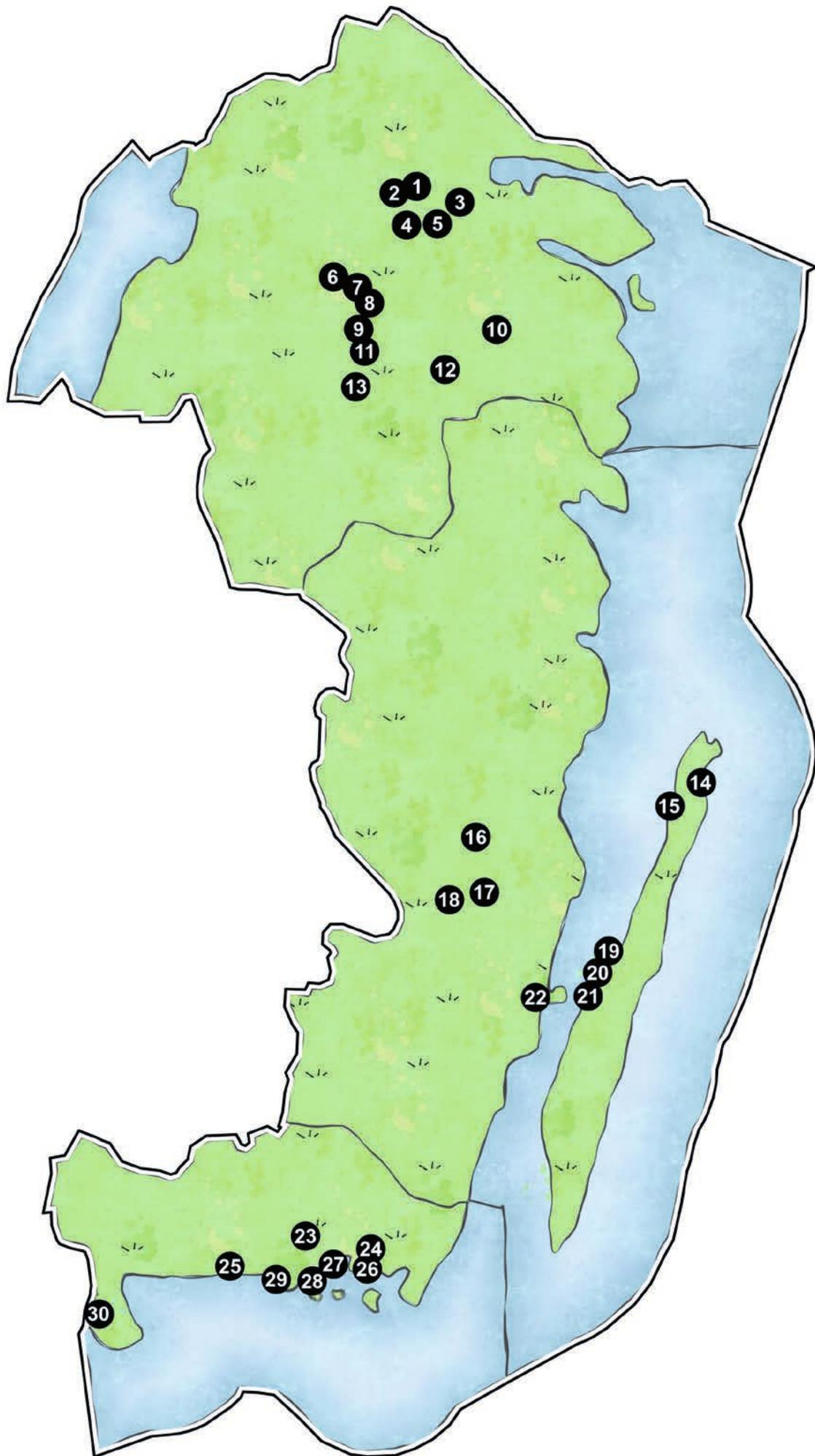
In Sweden there are still some well-functioning oak landscapes that are largely interconnected. But when previously grazed oak meadows are abandoned, they become overgrown, and with time become so dark that many species that live there leave or die out. Eventually the oaks also die.

Several analyses have shown that the unique oak landscapes have declined dramatically for many years, and that the areas that still exist must be preserved and managed. Also, we must restore overgrown pastures, in order to retain the various species.

LIFE Bridging the Gap brought new focus, and initiated important work to restore and to connect these valuable areas in a landscape perspective.

The oak's lifespan. Oaks can live for several centuries. ►
Some species don't move in until the oak is 200-300 years old; for others it takes about 500 years.





1. Ribbingsholm
2. Ljusfors
3. Borg
4. Runstorp
5. Norsholm
6. Tinnerö Oak Landscape
7. Vidingsjö
8. Ullstämman
9. Stafsäter
10. Hästenäs
11. Västerby
12. Ätvidsnäs
13. Viggeby
14. Böda Parsonage
15. Horn Parsonage
16. Åsebo
17. Getebro
18. Allgunnen
19. Borga hage
20. Strandskogen
21. Halltorp
22. Björnö
23. Johannishus Ridges
24. Kummeln
25. Sonekulla
26. Knösö
27. Haglö
28. Tromtö-Almö
29. Gö
30. Valje

Threatened species and the oak as a habitat

The oak is a tree type which can provide a habitat for as many as 1800 species in Sweden. It is an important host for almost 900 species, and some 900 others can use oaks as their habitat during their lifetime.



Anthrenochernes stellae

Beetles, butterflies, lichens and fungi are species groups that are particularly well represented among the species that inhabit oaks. To suit many of these species, the oak must be relatively old, often 200-300 years, and have developed special structures and habitats.

Oaks do not start to develop habitats for many threatened species until they are 200 years old, but it can take another 300 years for the most demanding species to find their special habitats. The number of old oaks in the landscape has fallen

dramatically, and in order to return to the number of old oaks required, there is a need to make young and middle-aged oaks biologically old.

Today the oak environments have a large extinction debt; the landscape we see now hosts a greater diversity of species than what it can maintain long-term. This is because many species remain in areas that have lost many old oaks, without successors of an appropriate age. To preserve the species in the long term there must be several overlapping generations of oaks.



▲ The hermit beetle, *Osmoderna eremita*, lives in a habitat that develops in hollow oaks when the tree reaches 200-300 years of age.



▲ *Lecanographa amylacea* is a lichen that begins to colonise oaks after they reach an age of about 200 years. The colonisation rate is low, and is affected by the distance to other trees where the lichen grows.



◀ The hermit beetle's larvae mix the wood mould, and enrich it with their droppings. This makes its structure grainy. The pseudoscorpion *anthrenochernes stellae* lives in this environment.



Hermit beetle

Threats to the oak

The oak is a fantastic tree species that can reach a very advanced age, and can function as a home for many species. The massive harvesting of oak during the nineteenth century resulted in a drastic reduction in the number of old oaks, and worsened living conditions for species associated with the oak. The situation is different today, but many threats remain.



Lack of rejuvenation

This is a large problem, especially in enclosed deciduous broad-leaf forest without grazing. Other problems include grazing by wild animals and clearing in forestry areas.

Diseases and pests

Many oaks are stressed by diseases and pests, such as mildew and leaf blotch miner moth.

Overgrowth

In the short term, the greatest threat to oak landscapes is overgrowth. In certain regions of southeastern Sweden, there are still relatively large numbers of old oaks. These trees often stand in former hay meadows and pastures that are no longer used. Inventories have concluded that a large proportion of these oaks urgently require clearing around them.

Development

Valuable oak environments are sacrificed to make room for major infrastructure or housing projects.

Fragmentation

With an increased distance between areas with really old oaks, individuals of the species that are associated with these environments have more difficulty spreading. This means that when local populations die out, they will not be replaced by recolonisation from other areas.

Too few oaks of the right age

Most endangered species only live in some of the trees that are suitable for that species. Perhaps the species only lives in one of the old oak's successions, which means that for a few old oaks to be at the right stage of succession, there must be many of them.

Restoration

In the LIFE Bridging the Gap project, the most extensive measures have been to restore different types of oak habitats – everything from oak-dominated, overgrown oak pastures to deciduous broad-leaf forests with a considerable oak component. At project start, several Natura 2000 areas were lacking in terms of favourable conservation status. This was due to overgrowth, low or non-existent grazing pressure, too few old trees, too little dead wood or poor preconditions for the species associated with the nature types.

LIFE Bridging the Gap has restored 800 hectares of oak meadow and cleared several hundred

hectares of brushwood. So that animals can be put out to graze, more than 50 kilometres of fencing has been installed. Using aerial photography, we can see clear effects in 16 areas. Before the restoration, tree crowns and bushes covered 81% to 100% of the ground; after the measures, only half was covered.

One sixth of the trees that were assessed as worthy of protection had, before the measures, an urgent need for measures. This was addressed in the project.



▲ **Before** Nature reserve at Böda parsonage before restoration.



▲ **After** The same area, after the brushwood has been removed.





Trees and bushes should preferably be planted in the autumn.

Planting of trees and bushes

To ensure rejuvenation and to increase the area of oak environments in the future, and to reduce the distance between valuable oak environments, planting is an important measure. New generations of oaks, other deciduous broad-leaf trees, flowering and fruit-bearing small trees and bushes enable plants and animals that live in oaks to eventually increase their populations and spread to new areas.

With the changes in the climate, it is best to plant in the autumn, so you do not need to water more than necessary. If the summer is dry, you still have to water young plants. Nurseries have cultivated small oaks from acorns gathered in the project areas – an easy way to ensure local origins. Quite a large volume of bushes has been planted, and it has been difficult to source sufficient amounts of Swedish materials for certain species.

In the project we have planted more than 900 trees and 22,000 bushes and small trees. At the end of the project, 94% had survived.

Veteranisation

In veteranisation, healthy young trees are damaged, in order to create structures that are normally formed in older trees.

Veteranisation functions as a 'lifeboat' for endangered species, by relatively quickly creating habitats in young trees. In areas with few old trees and large age gaps between trees, the method can be crucial to the long-term survival of large numbers of endangered species.

Within the project, some 1300 trees have been veteranised using three different methods. These trees would otherwise have been felled. We have created wood mould boxes, mimicked lightning strikes and ringbarked branches. Using eclector traps, we followed up the effects of 36 wood mould boxes.

A total of 1923 individuals from 104 wood-living beetle species were collected. Of these, 14 species are included on the Swedish red list.

The most common finds:

- *Epurea guttata*
- *Thamiarea cinnamomea*
- *Lymexylon navale*

Interesting or unusual finds:

- Moccas beetle *Hypebaeus flavipes*
- Lined flat-bark beetles *Cryptolestes duplicatus* and *Notolaemus unifasciatus*
- European lyctus beetle *Lyctus linearis*
- *Corticeus fasciatus*
- Noble chafer *Gnorimus nobilis*
- Hermit beetle *Osmoderma eremita*

The results are better than expected, and are promising for future efforts to favour the beetle fauna that inhabit tree cavities.



Wood mould boxes, chainsaw-carved lightning strikes and ringbarked branches are methods for accelerating the aging process of oaks.

Wood mould boxes

Cavities in old deciduous trees are important homes for many threatened insects, but they are in short supply.

As we wait for the next trees to reach an appropriate age and develop cavities, these species require support in the form of temporary housing. A wood mould box resembles a birdhouse, but is for insects. The idea is to copy the conditions present in tree cavities.

During the course of the project, more than 400 wood mould boxes were placed in 28 of the project areas. 39 were checked for colonised beetle species, and 935 individuals from 93 wood-living beetle species were gathered. Of these, 8 are included on the Swedish red list.

The most common finds:

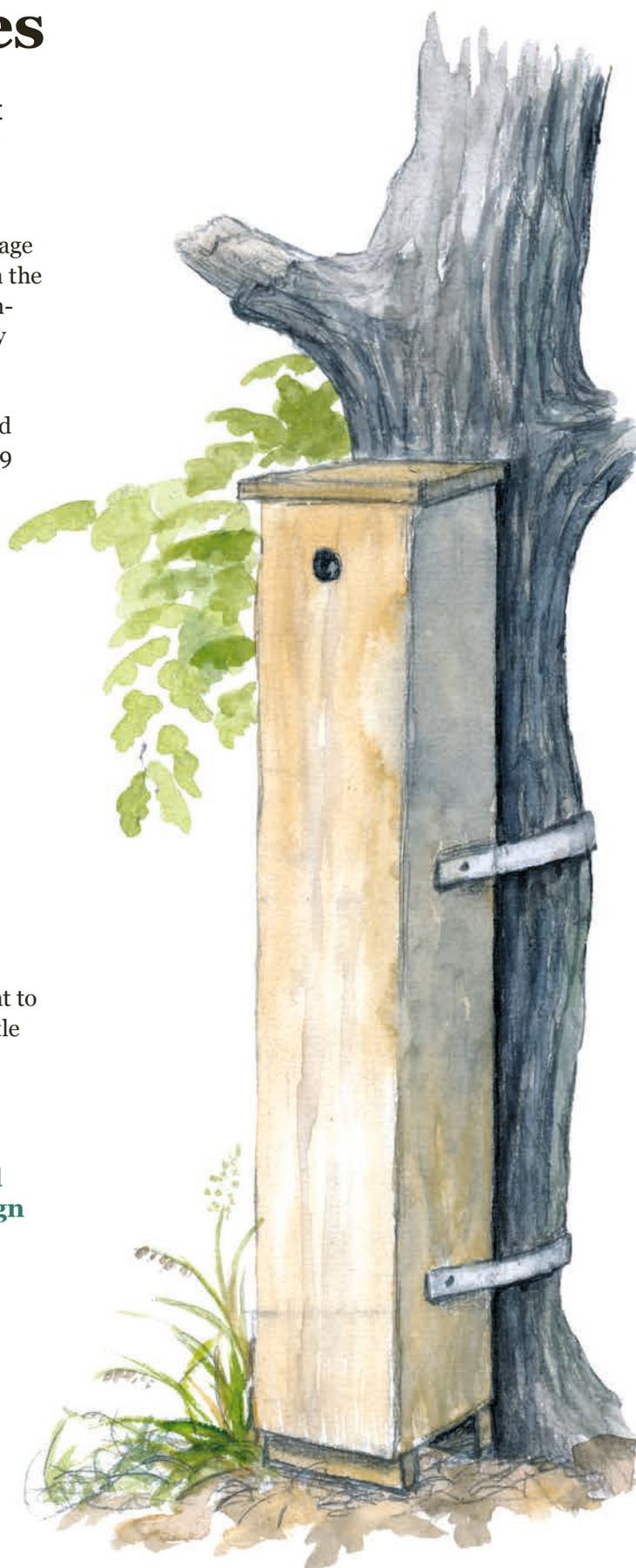
- Whitemarked spider beetle *Ptinus fur*
- Fungus beetle *Corticaria longicollis* and *Latridius minutus*
- *Cerylon histeroides*

Interesting or unusual finds:

- Spotted hairy fungus beetle *Mycetophagus quadriguttatus*
- Noble chafer *Gnorimus nobilis*
- *Euryusa sinuata*

The result is slightly below expectations, but sufficient to use the method in future measures to favour the beetle fauna that live in tree cavities.

In LIFE Bridging the Gap, a new, larger model of wood mould box was tested, and we have learnt a good deal about the design of the boxes.



Stag beetle habitat piles

Partially buried logs have proven to be an effective way to recreate the environment on which stag beetles and other wood-living insects are dependent.

A stag beetle habitat pile consists of a number of logs that are partially buried in the ground, and covered with wood chips and shavings. It resembles the natural habitats where the stag beetle lays its eggs, and is created for the benefit of the stag beetle and many other species.

185 stag beetle habitat piles were built in 27 of the project areas. Of these, stag beetle habitat piles in 12 areas were examined. A total of 4 659 individuals from 246 wood-living beetle species were gathered. Of these, 16 are included on the Swedish red list.

The most common finds:

- Sap beetle *Glischrochilus hortensis*
- Root-eating beetle *Rhizophagus bipustulatus*
- *Trixagus dermestoides*
- *Xyleborinus saxesenii*
- *Cerylon histeroides*

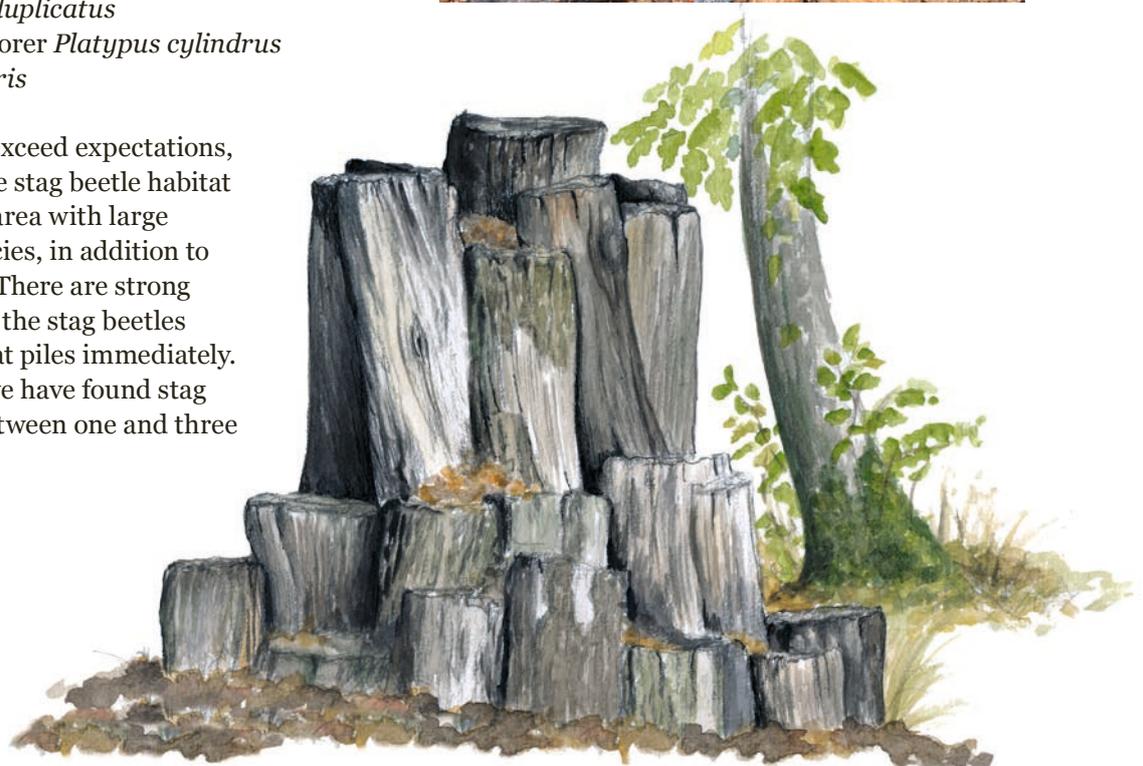
Interesting or unusual finds:

- *Cryptolestes duplicatus*
- Oak pinhole borer *Platypus cylindrus*
- *Uloma culinaris*

The results far exceed expectations, showing that the stag beetle habitat piles enrich an area with large numbers of species, in addition to the stag beetle. There are strong indications that the stag beetles locate the habitat piles immediately. In inventories we have found stag beetle larvae between one and three years of age.



Stag beetle



Reintroduction of great capricorn beetle

The critically endangered great capricorn beetle has been bred at Nordens Ark and reintroduced at the Björnö and Tromtö-Almö nature reserves.

For the past 50 years, the great capricorn beetle (*Cerambyx cerdo*) has only been found at one location in Sweden: Halltorp nature reserve on the island of Öland. In LIFE Bridging the Gap, the reintroduction of this beetle is an important measure because it is a keystone species that creates environments for many other species.

Since 2018, mature individuals bred at the Nordens Ark breeding facility are placed in the two project areas at Björnö and Tromtö-Almö, in the counties of Kalmar and Blekinge, respectively. The sites are located in the former habitat of

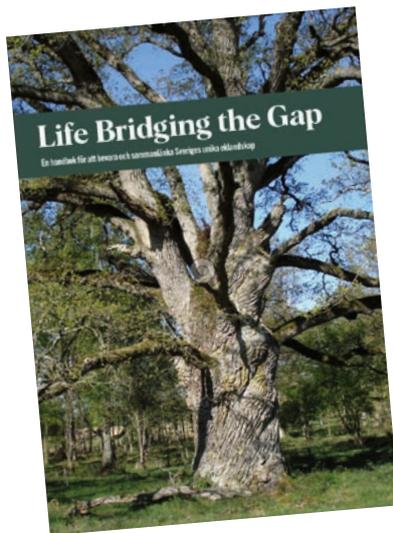
the great capricorn beetle, and the reintroduction of the beetles is an important measure in the national action plan for the species.

In Sweden, the development of the great capricorn beetle is believed to take about five years, which means the results are not fully available at the end of the project. With the reintroduction in 2018, we expect the beetles to hatch in 2023. However, finds of hatch holes in 2022 indicate that they have already reproduced successfully.



Increase knowledge

Updated and relevant knowledge is a prerequisite for long-term work where oaks provide a habitat for various identified species. One important project aim has been to disseminate this knowledge – to conservationists, land-owners, contractors and the public.



◀ Handbook for living oak landscapes

In the handbook we describe the project's measures, as well as our thoughts and development ideas for keeping oak landscapes alive. The handbook is available as a printed book and digitally at handbok.lifebridgingthegap.se/english – in both Swedish and English. The handbook will enable the project's aims to continue after LIFE Bridging the Gap is concluded.

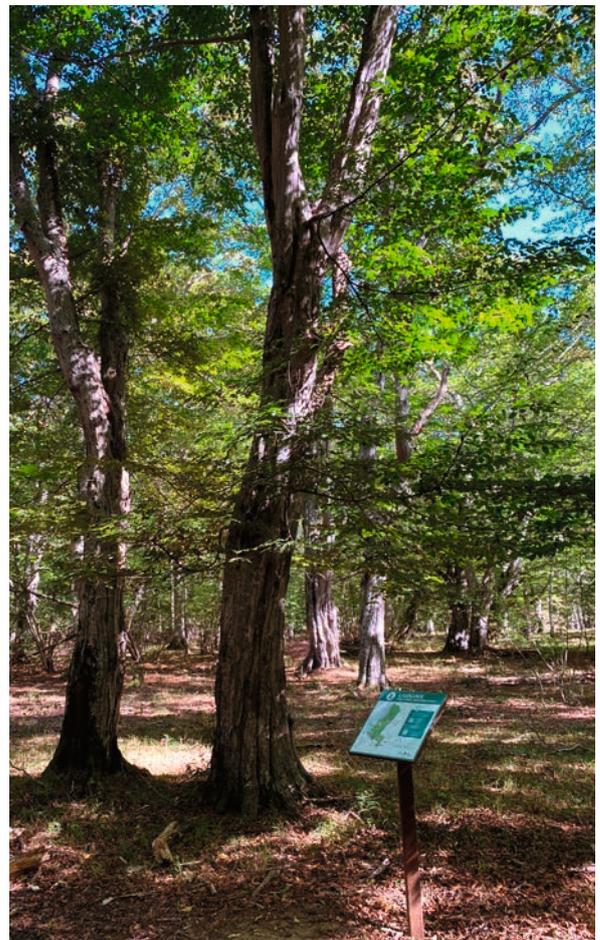
Information films about the oak landscape

As part of the project, five films were made. They are about five minutes long, and are available digitally, with English subtitles. Their titles: Our valuable grazed oak pastures, The capricorn beetle and the oaks, Wood mould boxes and hermit beetles, Building a stag beetle habitat pile and Veteranisation: why we damages trees deliberately.

Information on site ▶

Wood mould boxes, stag beetle habitat piles and veteranisation are all measures that generate questions and attention from the public. For this reason, in the beginning of the project, signs were produced to explain the idea behind these measures.

The project has also reached many people by way of guided visits. Some of these were organised by the project, and sometimes we have attended other events and presented what we have done.



Halltorp, audioguide.



▲ The project's final conference. Roughly 100 participants from Sweden and other EU countries learned about the results of the project.

Outdoor activities

Various activities such as creating walking paths, building parking spaces and installing tables have been done to facilitate outdoor activities. A podcast has been produced, and in Halltorp on Öland there is an audio guide.

Arborist training

In the beginning of the project, we held courses arborists on why and how veteranisation can be used as a conservation method. It was a successful venture that meant we had considerably more contractors to work with than we had before the project started.

Exhibitions about the oak landscape

To increase the general public's knowledge about the oak landscape, its species and challenges, a number of local exhibitions were held, for instance at naturum venues.



▲ A six-part podcast discusses grazed oak pastures and their unique environment from six different perspectives. The different parts are constructed partly as audio guides; listening to them while walking through Västerby deciduous forests in Östergötland is recommended.



After LIFE Bridging the Gap

LIFE Bridging the Gap has improved many oak environments and the diversity of species associated with this habitat. It has laid the groundwork so that in the future, we can have a functioning management with grazing, and the possibility for cattle owners to receive compensation. A supply of grazing animals and collaboration with animal keepers and land-owners are vital in the ongoing management. Also, to achieve the goal of a functioning oak landscape, clearing and felling must continue.

It will take a long time before we can see the effects of several of the conservation measures. So far, the relatively new conservation efforts have shown positive results, but future follow-ups are important to properly be able to evaluate the measures.

LIFE Bridging the Gap has improved the chances of linking the areas that have been restored. Outside the project areas, much work remains to create functioning networks in a landscape perspective. Information campaigns within the project aimed to inspire land-owners and other stakeholders to work more actively with spoke environments. Analyses in the work with Green Infrastructure show where the measures have the greatest effect. Here, the measures programme for threatened species (ÅGP) is an important actor for initiating and funding prioritised measures. We will further develop the lessons learned and knowledge gained from the project, in ongoing and future LIFE projects.



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