



*LAYMAN'S REPORT*

# THE GREATER HORSESHOE BAT IN UPPER PALATINATE

Optimization of Habitats and Public Awareness

LIFE11 NAT/DE/000346



Impressum

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# LIFE

## The LIFE+ Programme is the EU's funding instrument for the environment.

The program is structured in three fields:

■ Nature and Biodiversity

LIFE Nature is intended to contribute to the implementation of the Birds Directive and the Habitats Directive, especially in regards to the nature conservation network "NATURA 2000". The program allows to take specific action for the conservation and restoration of threatened habitats and/or endangered species. Thus, it is one of the most important funding instruments

■ Environmental Policy and Administrative Practice

■ Information and Communication

for nature and species conservation and its promotion in NATURA 2000 areas. The project presented in this report represents the first LIFE+ project ever with the Greater Horseshoe Bat as the main target species. Moreover, it is the first LIFE+ project in Germany involving an active military training area. The US forces have kindly given consent to this.

For further information, please refer to:  
<http://ec.europa.eu/environment/life/index.htm>



▲ Hillside of Stettkirchen in the valley Lauterachtal (Leitl)

## The LBV

For more than 100 years, the Bavarian Society for the Protection of Birds (LBV) has been a non-profit, state-recognized and party-politically neutral association and one of the driving forces in Bavarian nature protection. With approx. 85,000 members and supporters, the LBV is the largest Bavarian association for the protection of endan-

gered species and biotopes. Originally, the LBV worked to promote conservation and protection of birds. Nowadays it also works for the protection of the wider environment, i. e. the protection of species, habitats and landscapes. Environmental education and public relations activities are further thematic priorities.

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## Bundesanstalt für Immobilienaufgaben / Institute for Federal Real Estate

The Bundesanstalt für Immobilienaufgaben (BImA) (Institute for Federal Real Estate) is the real estate service provider of the Federal German Government with the main office located in Bonn. Its main tasks include the standardized real estate management for the Federal Government, the administration and efficient use of Federal installations as well as forestry and nature conservation services. Within the scope of these activities, the Federal Forest Service Division with its head office and 17 subsidiary bodies undertakes the forestal cultivation and the nature conservation care of these installations.

The Federal Forest Service Hohenfels looks after approximately 37,000 hectares of forest and open areas in more than 170 installations within the Federal State of Bavaria, including 40 installations that are, in whole or in part, located within Natura 2000 areas. Hohenfels Training Area represents the largest individual area with a size of approximately 16,000 hectares where the Federal Forest Service has implemented actions within the scope of the LIFE project. The Federal Forest Service's functions department "Nature Conservation" handles all issues in regards to nature conservation and conservation legislation in this area and is also responsible for the implementation of the Natura 2000 management.

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## Introduction

The last colony of the Greater Horseshoe Bat (*Rhinolophus ferrumequinum*) in Germany has survived in the valley Lauterachtal and at Hohenfels Training Area. The bat species has established its maternity (i. e. reproduction) roost in an old half-timbered barn of a former agricultural estate. In order to protect the colony, this estate was bought by governmental and private nature conservation organizations several years before the project launch and then renovated with funds from the economic stimulus package II to prevent it from collapsing. Actions have been taken within the scope of the LIFE project that are aimed at increasing the availability of roosts and favorable foraging habitats to save the only, isolated occurrence of the Greater Horseshoe Bat from extinction. These actions are to promote the development of a viable, local population.

### Lead partners:

Bavarian Association for the Protection of Birds (Landesbund für Vogelschutz in Bayern e.V.), Institute for Federal Real Estate (Bundesanstalt für Immobilienaufgaben (BImA), Federal Forest Service (Bundesforstbetrieb) Hohenfels

### Project costs:

1.049.138 €

### Project duration:

01 June 2012 to 31 March 2018

### Financing:

50% LIFE Nature, 36.8% Bavarian Nature Conservation Trust, 3.3% Hirschwald National Park, 2.7% LBV, 7.1% BImA

### Project area size:

1.836 hectares





▲ Boundaries of the project area (hatched in blue) in the three FFH areas Hohenfels Training Area (6736-302), "Lauterachtal" (6636-371) und bat roosts around Hohenburg (6636-301.01, .02, .03)

◀ HTA Hohenfels (Schwers)

## The project area

Hohenfels Training Area (HTA) belongs to the Federal Republic of Germany. Silvicultural and nature conservation management is the responsibility of the Federal Institute for Real Estate Tasks, Division of Federal Forest Service (Bundesanstalt für Immobilienaufgaben, Sparte Bundesforst). The area has been ceded to the U. S. Army for exclusive military use as long as needed within the scope of the NATO Status of Forces Agreement.

The military training area is for the greater part designated as a Natura 2000 site, but has no other national protection status. Access by

private individuals is strictly prohibited; this prohibition is enforced by the U. S. Army and members of the Federal Forest Service. About half of the area is a large, continuous, unfragmented habitat complex of nationwide significance. It is covered with forests primarily consisting of beech forest communities and pine forests. Moreover, it includes calcareous nutrient-poor grasslands and large dry grassland complexes subject to low-intensity land use, especially sheep and goat grazing.

The landscape structure and appearance



▲ Valley Lauterachtal (v. Lindeiner)

of the FFH area Lauterachtal is geologically influenced by the White Jurassic and characterized by rock formations and dolomite hill-tops. Both the plateaus and valley sides are strongly karstified and permeable to water.

The valley floodplains are largely subject to grassland use. There are also agricultural fields in the floodplain areas of the creek Lauterach, near Mühlhausen, in the entire community district of Hohenburg and in the valley Hausener Tal. The fields are in many cases structured by hedges growing on walls of collected fieldstones. The shaded steep slopes are located within the training area. The existing forests serve in particular for soil and erosion protection. By contrast, most sun-exposed slopes were still used for grazing for extended periods of time. The Landschaftspflegeverband (landscape man-

agement association) Amberg-Sulzbach e. V. has taken adequate management actions together with a migrating shepherd and local landscape managers for about 20 years to preserve the above-mentioned special landscape features of Juniper heathlands and calcareous nutrient-poor grasslands.

The valley Lauterachtal with its small side valleys is of extraordinary significance to species and biotope protection because of its small-scale mosaic of land use and its high ecological value. Although very rare and critically endangered on a statewide scale, the calcareous nutrient-poor grasslands are widespread in this valley.

In addition, the project area includes several bat roosts designated as FFH area, including the bat house at Hohenburg.





▲ Photographs of Gr. H. Bat: adult, juvenile, sleeping, cluster (Leitl)

*Rhinolophus ferrumequinum*

# THE TARGET SPECIES GREATER HORSESHOE BAT

## Protected species in Annexes II and IV of the FFH Directive

The Greater Horseshoe Bat needs warm areas with a diverse landscape and rather sparse forest stands. The species establishes its summer roosts in spacious and warm attics free from draft and, therefore, is referred to as a “building-inhabiting bat” in Central Europe. It uses caves or mine drifts in the winter. The roosts must have an opening that allows the bats unobstructed access in flight.

The species is extremely philopatric and, as a rule, only migrates for short distances between the winter and summer roosts (approx. 30 kilometers). It occurs in the southern half of Europe and in North Africa and, toward the east, as far as Japan. It had originally been widespread across the southern half of

Germany, but has suffered drastic declines in population since the 1950s and, nowadays, is the rarest bat species in Germany. The maternity roost at Hohenburg/Upper Palatinate is the only current reproducing population in Germany.

Occurrences of the Greater Horseshoe Bat in Central Europe are limited to a major maternity roost in Luxemburg, three small to medium-sized maternity roosts in Switzerland, and a maternity roost in Austria (Styria/Steiermark). Moreover, maternity roosts still exist in Slovakia and northern Hungary. Hence, it is considered a bat species that is acutely and critically endangered throughout Central Europe.

Greater Horseshoe Bats need an abundant availability of insects and are especially sensitive to pesticides (including wood protection agents). Hence, changes in the small-structured cultivated landscape and the use of pesticides in agriculture and silviculture are presumably the main cause of the drastic decline of the species in Central Europe and the reason why the last recent maternity roost in Germany has survived at the periphery of a military training area. Numerous military training areas were founded before industrial agriculture with its large monocultures had been established. Therefore, neither chemically produced fertilizers nor chemical pesticides have been applied in these areas. This results in the fact that the abundance of species, especially insects, is many times higher in military training areas than in the agricultural landscape.

Thus, Germany's last maternity roost of the species that was discovered by telemetry in the Upper-Palatinate Jurassic in 1992 is of great conservation significance, despite, or rather because of, its isolated situation. However, sustainable conservation of the Greater Horseshoe Bat at this site is only possible based on the successful implementation of a comprehensive protection concept to promote the redevelopment of a minimal viable population. Such a protection concept is primarily based on the creation of several new summer and intermediate roosts, besides the consistent protection of disturbance-free winter roosts, in the near and further surroundings and the development of richly structured, ecologically managed cultivated landscapes (grazing livestock, orchard stands) that are free from pesticides, if possible.





## Project objective

The project objective was to markedly bolster the existing population and create potentials for the new establishment of additional maternity roosts within the project period from 2012 to 2018.

### Methods for project objective achievement

- Optimize the foraging habitats by creating landscape structures with an abundance of (large) insects;
- Increase the availability of favorable habitat structures (summer roosts, winter roosts, foraging habitats);
- Strengthen the network structures and reachability of foraging habitats;
- Improve public awareness and responsibility;
- Build an information center for the target species at Hohenburg;
- Monitor the efficiency of actions: high-intensity monitoring of the roosts and basic food resources and scientific monitoring of the food insects.



## Implementation actions

### Actions in the field to optimize foraging habitats

- Initiation of a low-intensity cattle grazing regime for the valley bottom and sides on at least 50 hectares;
- Buy/lease areas to allow the formation of grazing complexes;
- Build a cowshed;
- Buy cattle and build up a project herd of cattle from offspring;
- Establish the grazing infrastructure, primarily suitable fences.



▲ cowshed in Hohenburg (Pirner)



▲ Muckheap with beetles (Knipfer)



▲ Valley meadow with a herd of Red cattle in the valley Lauterachtal (v. Lindeiner)

Some prey animals that the bats forage on in the summer need meadow plants for their development. Low-intensity-use perennial grassland represents an essential mosaic in the foraging habitat of the Greater Horseshoe Bat.

Large herds of wild, herbivorous hoofed animals (e. g. red deer) that also used to influence vegetation, for example, by creating sparse structures in forests in previous centuries left large amounts of dung in the landscape. This resulted in a high number of species that have adapted to this nutrient-rich substrate. In the northern temperate zones alone, more than 1000 dung beetle species have been recorded. More than 1000 beetles can live in a dung heap from cattle reared in a near-natural way. Numerous fly species also develop in dung.

The eradicated hoofed animals were for a long time replaced by human-bred and reared grazing animals, at least as dung producers. Pasture feeding was substituted by animal housing with advancing industrialization of agriculture at the end of last century. This caused a strong decline in biocenoses that had developed on and with dung. The absence of dung in the landscape has resulted in the disappearance of immediately dung-dependent species and secondary biocenoses, such as numerous bird species living on large insects, and also the Greater Horseshoe Bat.

Thus, the herd of Red cattle established within the scope of the project creates both landscape structures suitable for bats and the basic food resource for the target species on a total area of 65 hectares.



### Shrub removal and clearing of formerly grazed areas, also to optimize the sheep grazing regime

The grazing lands around Hohenburg have a long tradition of cultivation. The pasture commons represent a centuries-old herding culture when the areas were grazed by cattle within the scope of common land cultivation.

The grazing activities of the Red cattle (a cattle breed already formerly existing in this area) in the wood pastures resulted in low vegetation resistant to trampling and in dung heaps.

◀ Forest encroachment at the Schwanenwirtsberg (v. Lindeiner)

### Shrub removal and thinning of dense forest stands

The project area Schwanenwirtsberg is characterized by Juniper heathlands with sparse stands of pine and plant species of semi-dry nutrient-poor grasslands in the understory. This is where some "bat plants" grow that are the food source of nocturnal insects, thus providing optimal foraging conditions for the Greater Horseshoe Bat.

Sustainable and nature conservation-oriented grazing is necessary to counteract shrub encroachment in these sparse forest areas and, thus, safeguard the rich species diversity in this semi-open landscape.



▲ Forest after clearing and shrub removal actions at Schwanenwirtsberg (v. Lindeiner)



▲ Newly planned forest aisle to connect hunting territories in TUP in Hohenfels (Schwers)

### Creation of flight paths for foraging habitat networking

Greater Horseshoe Bats are dependent on diverse landscape structures with a mosaic of different habitats. Such low-intensity-use cultivated landscapes represent the preferred foraging habitat of the species. Greater Horseshoe Bats use specific routes on their flight to their foraging habitat based on linear structures such as creek courses, forest edges, hedges or rows of trees. Moreover, trees and hedges provide some protection against detection by predators such as birds of prey and owls. Hence, sparse woodland structures are highly significant landscape features. They allow the networking of potential foraging areas and the extension of the bats' foraging territory. Such networking structures have been created by clearing actions at several sites within the installation.





▲ Fruit tree planting in Schwanenwirtsberg (Leitl)

▼ Bat house (Leitl)



## Optimization of roosts:

Man-made spatial structures provide substitute habitats for numerous bat species. Depending on their aspect, the microclimatic properties in buildings are similar to the conditions in natural cave and crevice systems. Undisturbed and dark attics with high ceiling structures serve as a substitute for warm caves used by bats for rearing their young.

The Greater Horseshoe Bat has become a synanthropic species and mainly uses such locations as summer roosts. It needs openings that allow unobstructed access in flight because it is not able to crawl through crevices. Diversely structured rooms with nooks and crannies and different temperatures are optimal. Thus, the bats can use different places for roosting, depending on the

## Planting of fruit trees

Old fruit trees feature a multitude of structures that are significant to various creatures: the blossoms provide pollen and nectar for numerous insects. The fruit (even as windfall) serves as food for most diverse animals, again including numerous insect species. The larval stages of many insects develop in rotten wood and rot holes. The Greater Horseshoe Bats use this abundant supply of diverse insects not only when passing by in flight but also forage while perching on the fruit trees. Roosting on a branch and waiting for insects passing by is an energy-saving way of foraging and even more worthwhile when grazing animals seeking shade under the fruit trees leave their dung behind, thus adding the attracted dung beetles to the horseshoe bats' diet.

Hence, orchard stands are an indispensable element of the cultivated landscape. Moreover, they harbor numerous warmth-loving species that hardly find suitable habitats elsewhere in our cultivated landscape. Therefore, 50 fruit trees were planted on meadows and along waysides inside and more than 90 outside of the installation.



▲ Bat roost in Hohenburg (Leitl)



▲ Roosting Horseshoe Bats in the cellar of the bat house (Leitl)

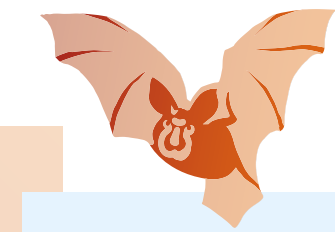


## Erection of two bat towers with intermediate roosts and various information options for visitors

The two new bat towers built at both ends of the project area in the valley Lauterachtal provide the bats with roosts as stepping stones toward further propagation. In addition, they provide information on the Greater Horseshoe Bat and the project for bicyclists and hikers and offer shelter and a rest area.



▲ International Workshop at the Fledermaushaus (bat house) in Hohenburg



▲ Bat tower at the valley Lauterachtal next to Kastl (Leitl)

weather. The habitat conditions for the target species have been continuously optimized in the bat house. For instance, a heating dome was installed, a small cellar was insulated and barriers against predators and "troublemakers" such as martens or dormice were installed.

Winter roosts are established in caves and sometimes also in old earth cellars. It is intended to improve the habitat conditions and reduce disturbances based on regular monitoring of these winter roosts. This includes counting in late winter as well as regular checking of the cave entrances throughout the year because locked caves are time and again forced open by humans. Therefore, a concept for improved safeguarding of cave locks was developed in cooperation with project partners. The number of winter roosts used by the Greater Horseshoe Bat increased from nine to 23 caves during the project period.

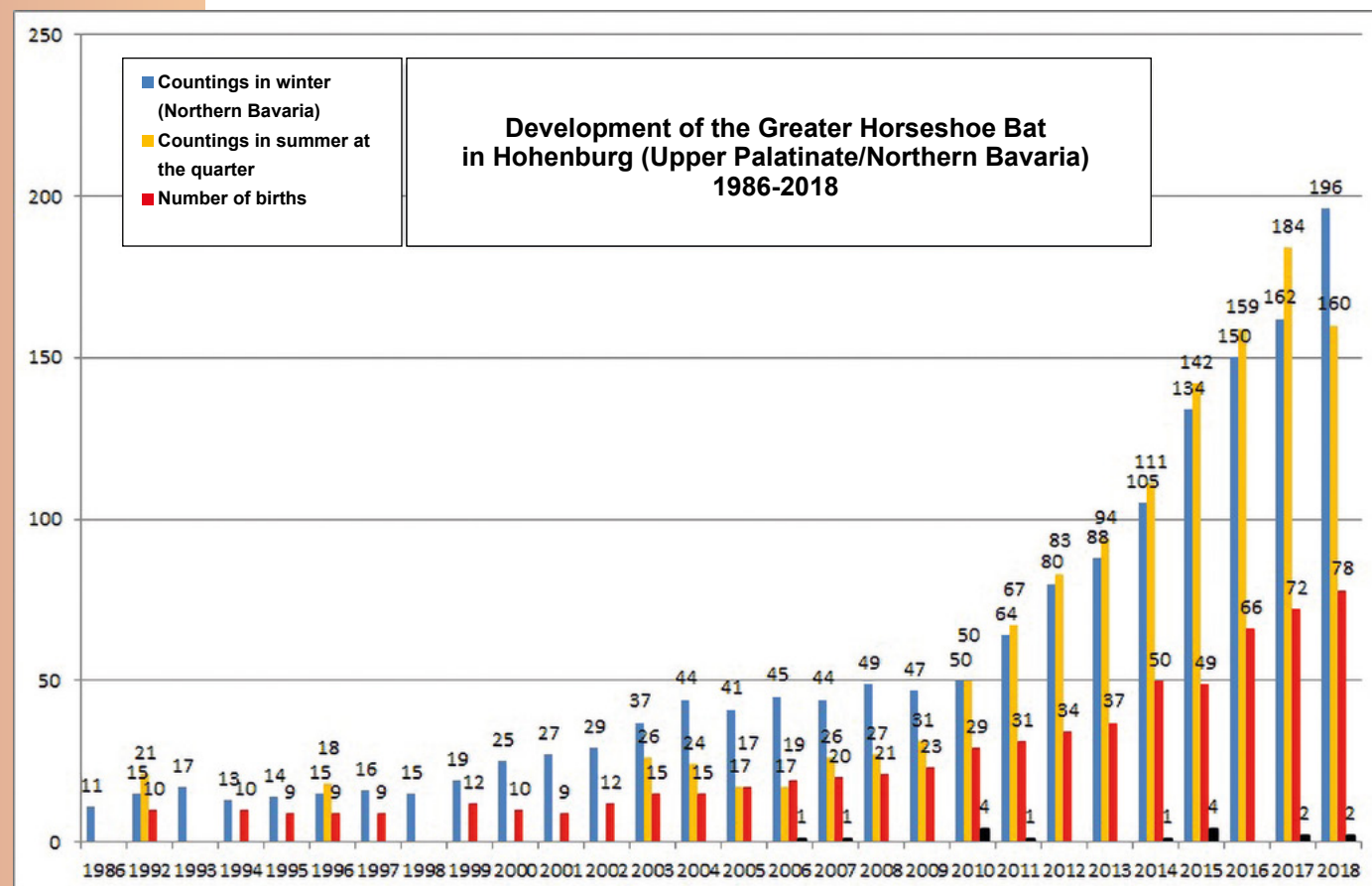


## Monitoring

### Consistent recording of the Greater Horseshoe Bat in summer and winter roosts

A slow continuous increase in the number of adult animals and annually born offspring in the maternity roost at Hohenburg had already been observed prior to the launch of the project. Such maternity roosts include reproducing females as well as young males and females that were born the year before and are not yet involved in reproduction. The population of the Upper-Palatinate maternity roost colony of the Greater Horseshoe Bat recordable in the winter roosts increased from 15 individuals in 1992 to 63 in the winter of 2010/2011. In all, 21 adult females and 10 juveniles were counted in the maternity roost in July of 1992, and 69 adult bats and 30 juveniles were counted in the summer of 2011 – a year before the LIFE project was launched. The project was to promote the species such as to achieve an increase in the number of adult animals to at least 100 individuals by the end of the project period. This goal was markedly surpassed based on 180 individuals counted to date.

▼ Population trend diagram



### Recording of prey and vegetation in the project areas

Associated monitoring of insects was performed from 2013 to 2016 concurrently with action implementation. Moths and dung beetles that represent an essential basic food resource for the Greater Horseshoe Bat as well as butterflies, grasshoppers and crickets that are good rapid indicators for the evaluation of nutrient-poor grasslands were selected as indicator groups. The monitoring of these groups was to accompany the clearing actions with subsequent cattle grazing at Schwanenwirtsberg and the clearing and shrub removal actions on valuable nutrient-poor grasslands with subsequent sheep grazing at Hennenberg within Hohenfels Training Area. A markedly positive development of the numbers of species and, partly, the numbers of individuals of the recorded butterfly, grasshopper and cricket species was observed at all recording locations. Index species of calcareous nutrient-poor grasslands and Red List species, in particular, were able to newly establish themselves at the recording locations and show positive development trends.

Plant monitoring performed at the recording locations revealed an increase in species of semi-dry nutrient-poor grasslands. This increase was approximately 13% in the areas subject to cattle grazing. Low-intensity grazing obviously has a rather rapid promoting effect on light-loving species. Sheep grazing resulted in an even more marked increase in the target species populations (up to 24%).

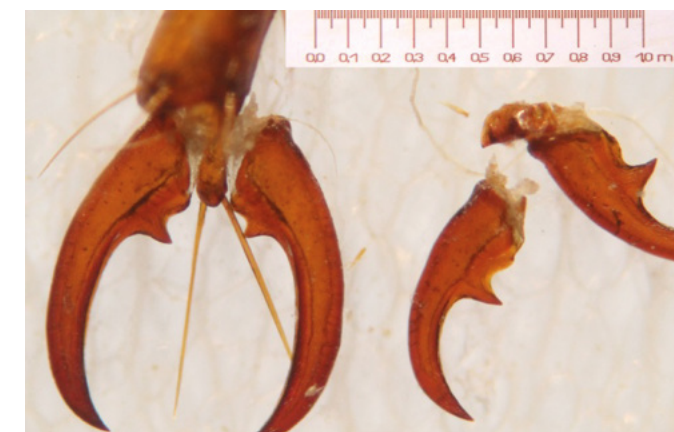
### Analysis of the bats' fecal pellets

The purpose of this action is to find out which insects are eaten by the Greater Horseshoe Bats during the course of the year. This topic is significant, especially in seasons characterized by food scarcity, i. e. in early spring when the skinny animals return from their winter roost, or in the fall after the first nights of frost when fat reserves still need to be built up for hibernation. The prey available during such phases plays a key role for the nourishment of the Greater Horseshoe Bats.



▲ Poplar Hawk-Moth (Zinneckia)

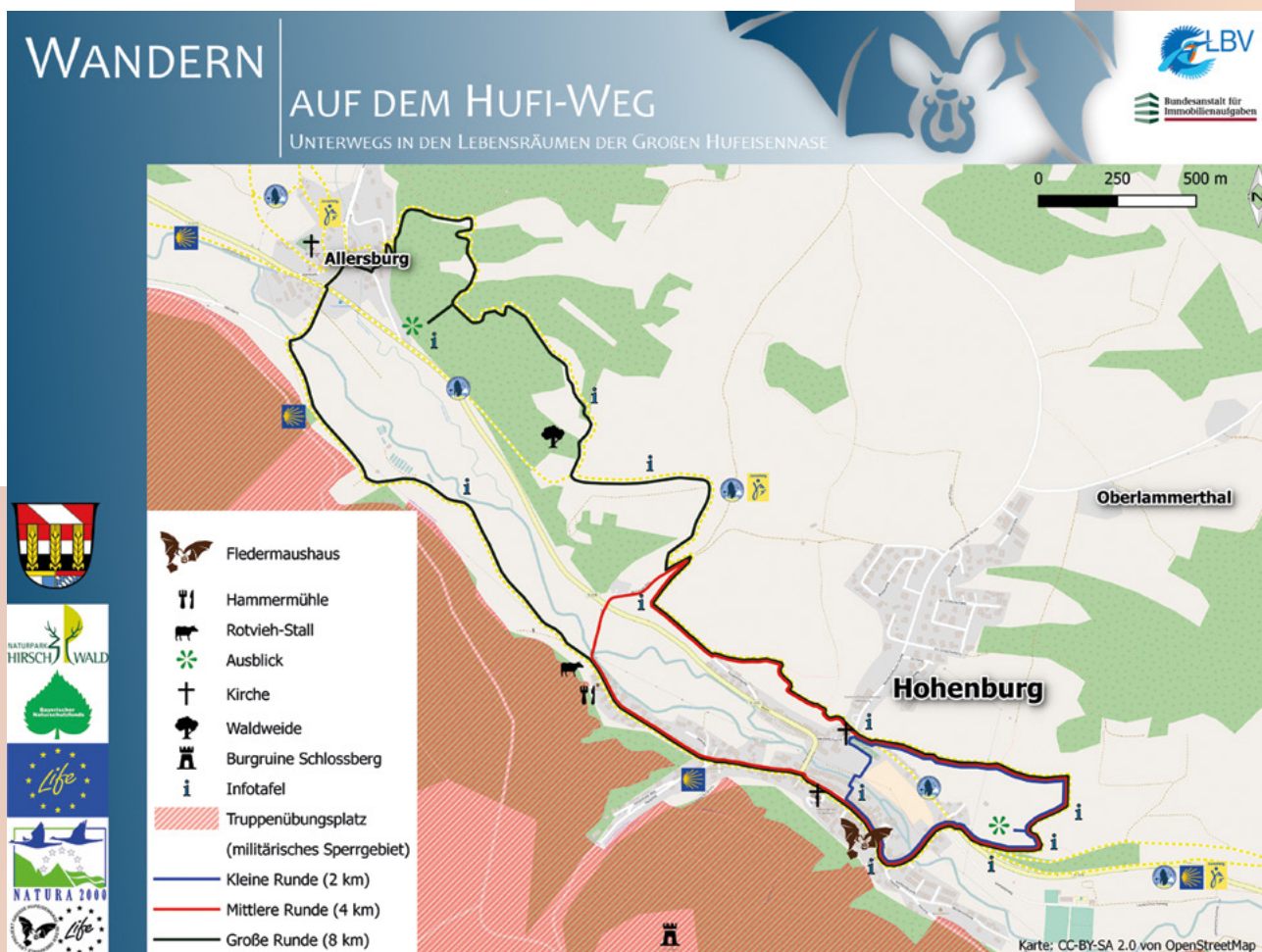
▼ Tarsi of Scarabaeidae from droppings of the Greater Horseshoe Bat (Wolz)



▲ *Rhizotrogus cicatricosus* (Martha Benoit)

Hence, it was determined during the past years which prey plays an important role for the maternity roost colony in Upper Palatinate and how the prey spectrum of the bats changes during the course of the year, possibly as a function of changes in insect populations. This provided the basis for the implementation of actions to promote the main prey of the bats. The landscape still appears wintry bare in early to mid-March when the first Greater Horseshoe Bats arrive at the bat roost house at Hohenburg. It was found that – despite the wintry conditions – numerous individuals of the beetle *Rhizotrogus cicatricosus* already fly at his time of year, thus being available as prey and providing the bats with a basic food supply for several weeks.





▲ Bat theme trail around Hohenburg

## Public relations activities

### Establishment of an information center in the bat house

Special control technology now enables the immediate display (via whiteboard) of pictures taken with infrared zoom cameras that were installed around the roosting places of the animals in the building. This provides the possibility of witnessing – immediately and live – the social life of the Greater Horseshoe Bats in a unique way. Bat detectors are used to

make the bats' calls audible when the animals leave their roosts in the evening. Interactive boards and an interactive monitor with numerous options open up new possibilities to get information on the biology, physiology, behavior and protection of horseshoe bats and other bat species.

### Designation and signposting of a hiking trail with information boards in the project area

Lovers of nature find much information about the Greater Horseshoe Bat, its habitat and the LIFE project on the information boards along the bat theme trail around Hohenburg. The theme trail is intended to raise public aware-

ness regarding this severely threatened bat species and, in combination with a visit to the bat house, offer comprehensive nature experience.

### Further activities that were effective as good publicity included:

- Preparation of a flyers and technical publications;
- Creation and maintenance of a project homepage <https://www.lbv.de/naturschutz/life-natur-projekte/life-projekt-grosse-hufeisennase/>;
- Organization of press trips, public events/guided tours, workshops.

## Socio-economic aspects

The objective of the LIFE project was to implement immediate protective actions for the target species as well as achieve a high socio-economic effect. This has been successful to date. For instance, setting up of a grazing infrastructure has enabled an agricultural enterprise to expand its economic basis and resume livestock farming. This was and is intended to have a signaling effect and encourage other farmers in the vicinity to expand their economic basis by practicing low-intensity grazing on more areas. Moreover, grazing by Red cattle, an Upper Palatinate cattle breed, was to improve the options to safeguard this rare, old livestock breed in the region. In addition, old fruit varieties of partly statewide significance have been planted. Thus, it was possible to associate the nature conservation aspect with the preservation and use of regionally typical fruit varieties that are adapted to specific local conditions.



▲ Red cattle on grazing land (in the vale) (v. Lindeiner)

The established information center provides the community Hohenburg with a new tourist attraction and the possibility to offer environmental education to schools and preschools in the vicinity. Several craft businesses in the vicinity were commissioned with tasks within the scope of the construction work that was funded by the economic stimulus package II of the Federal Republic of Germany, thus resulting in a high degree of identification of the local population with "their" bats. The already high acceptance

by the community and the persons involved increased even higher during the course of the entire LIFE project. At all events, the market town Hohenburg became much more well-known and, thus, upgraded in public appreciation due to the LIFE project, a fact confirmed by the increasing number of visitors to the bat house. Due to the large-scale support of the LIFE project, the market town Hohenburg was awarded the title of first "Natura 2000 community" by the Bavaria State Department of the Environment.

## Outlook

Immediately after the end of the project, the LBV employed an area manager funded by the Bavarian Nature Conservation Trust who will now continue the project-related actions with the assistance of the long-time LIFE project manager.

All partners in the LIFE project will continue their commitment regarding the protection of the Greater Horseshoe Bat in the After-LIFE process.



The Greater Horseshoe Bats would like to thank:



Furthermore, we would like to thank BayStMUV for financing the new cameras, as well as the LfU and the coordination office Fledermausschutz Nordbayern for specialist advice and supporting the project.

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Please find further information about the Life-Programme „Greater Horseshoe Bat“ and the PDF for the brochure „Greater Horseshoe Bat in the Upper Palatinate“ in German and English on our website: [www.lbv.de/hufeisennase](http://www.lbv.de/hufeisennase)