

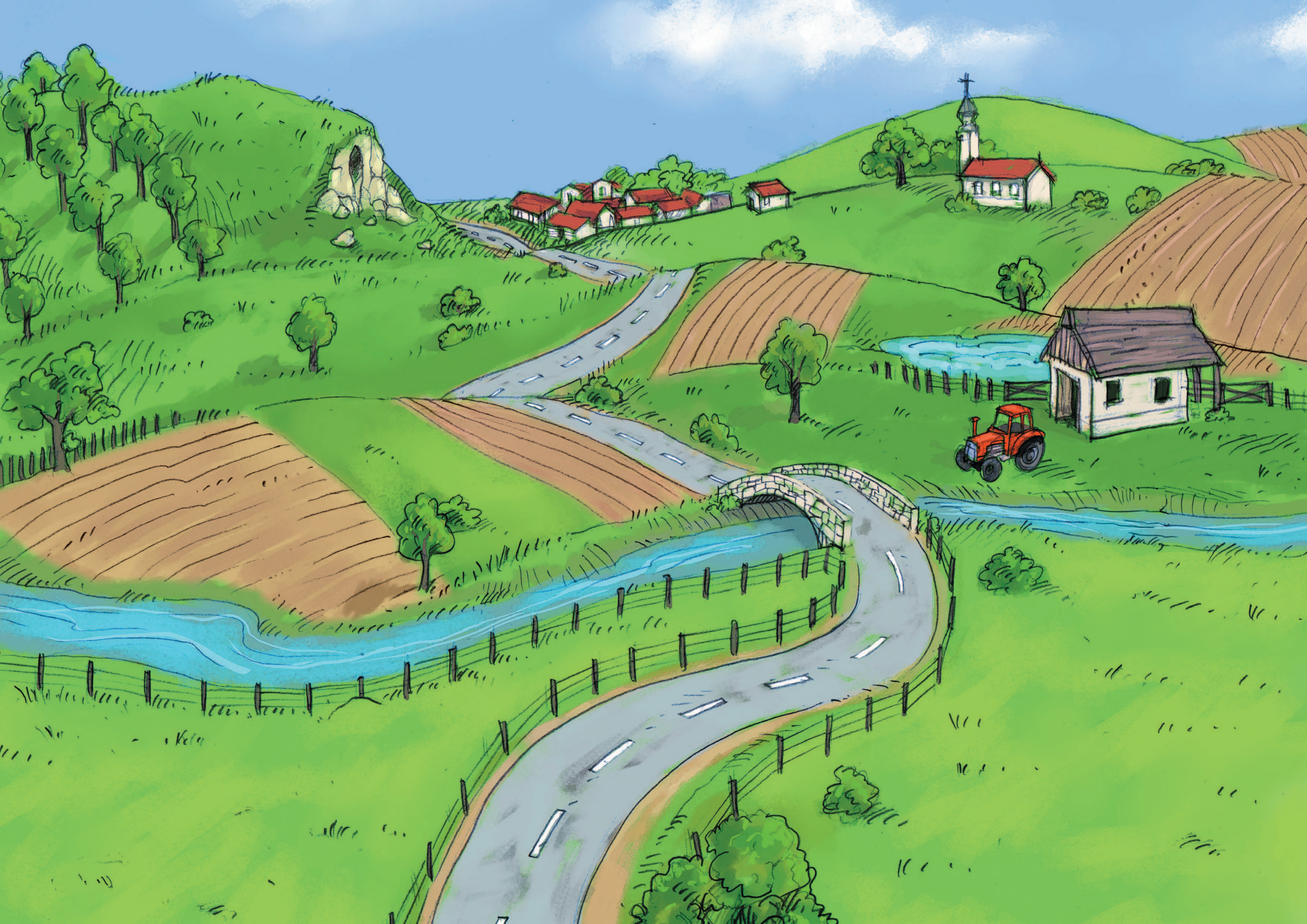
# **Living on the(h)EDGE**



**Bat conservation**  
in agricultural landscapes in Serbia









## Bats are:

### ✓ Important for agriculture

Bats are important inhabitants of agricultural landscapes. Being the only active flying mammals, they are very mobile and able to cross kilometres for only one night. These animals are important natural regulators of insects, some of them being pests in agriculture, forestry, or vectors of diseases which are dangerous for people or domestic animals.

### ✓ Bioindicators and “umbrella” species

Bats are recognized as bioindicators and “umbrella” species in nature protection.

- Bioindicators - because their species diversity, population numbers and level of activity indicate the quality of environment, landscape diversity and structure, as well as they reflect the number and species composition of their prey – insects;
- “Umbrella” species - because through implementation of bat conservation measures, having in mind that bats are highly mobile species using diversity of different habitats, we protect also other wildlife sharing same habitats with bats.

### ✓ Protected by law

Despite the importance of bats for ecosystems and people, bats are species “living on the edge” – ranges of numerous species are contracting, population numbers are decreasing. This is why they need to be protected. All bat species in Serbia are protected by law - from disturbance, abuse and killing. Their roosts are also legally protected as they are particularly important for their survival. However, habitats where they feed or use for commuting to hunting grounds, are not adequately recognized and protected by the law, especially in intensively managed agricultural landscapes.

### Bats are affected by negative impacts of agriculture

Intensive agricultural production has significant negative effect on bats and wildlife in general because of:

- Use of chemicals (pesticides, herbicides, insecticides, etc.)
- Destruction and contamination of water habitats
- Cutting down or bad management of forests
- Removal of hedgerows, tree lines, vegetation along waterways (linear features in the landscape)
- Vast surfaces covered with monocultures
- Disturbance of landscape structure and diversity
- Destruction and fragmentation of natural habitats.



PF BThese negative effects directly influence the abundance and species richness of insects hunted by bats, as well as the structure of habitats used by bats as hunting or commuting grounds.



Agricultural landscape makes around 65% of Serbia's territory, from which 71% belongs to intensive agriculture.

## Agricultural landscape “tailored” for bats

- (1) **Water habitats** are places where bats come to drink water and feed. Bank vegetation provides bats protection while they are hunting, and also presents important habitat for their prey – insects.
- (2) **Woodlands** provide roosts to many bat species, but also important hunting grounds, as high diversity of insects can be found there, especially for bat species who glean insects from vegetation.
- (3) **Meadows and pastures** - natural meadows have high diversity of plants and insects and because of that are very important for bats, but also other wildlife in agricultural landscape
- (4) **Linear features** (hedgerows, tree lines, woodland edges, rivers, streams) are particularly important as bats use these habitats to forage and commute, especially for species which do not fly over open habitats. These linear features provide cover from bad weather conditions and wind, not only to bats but also to their prey (insects), and they can also serve as protection from predators.
- (5) **Orchards and parkland** provide additional feeding habitats for species that feed in semi-open habitats such as woodland edges and glades.
- (6) **Arable land** can be important as feeding grounds for bats if they are managed in a sustainable way and connected with other landscape elements through linear features.

### Legend

R - roost

FS - feeding site

↗ - possible commuting flyway

” Bats are very sensitive to the loss or significant decrease in length of hedgerows in intensive agricultural landscapes“  
(Pocock & Jennings, 2008).

” Agricultural intensification in the 20th century significantly contributed to decreasing population numbers of European bats.“  
(Stebbing, 1988).

” Total bat activity (of all species) was significantly higher (by 61%) over organic farms than over conventional farms, while foraging activity was significantly higher (by 84%) on organic farms“  
(Wickramasinghe et al. 2003).



# HOW TO MITIGATE NEGATIVE EFFECTS WHICH AGRICULTURE HAS ON BATS?



In order to mitigate negative effects which intensive agriculture has on bats, at the same time contributing to the development of sustainable agriculture, it is needed to:

- 1. Develop and implement national agri-environment policy** which will identify agri-environment measures directed to bat conservation, but also other wildlife sharing habitats with bats in the agricultural landscape.
- 2. Continuous informing of citizens, especially farmers,** about benefits which wildlife has for sustainable, healthy and safe agriculture, as well as the ways of conserving, enhancing and creating suitable habitats for wildlife in agricultural environment.

Scientists and experts, non-governmental organisations, media and the state – they all have important role in creating political, social and cultural ambient where wildlife conservation can become part of agricultural and rural development policies.

## Scientific research – precondition for success

In order to achieve the goal, agricultural measures have to be “tailored” according to characteristics of habitats and agricultural landscape of the country where they are applied, and need to be scientifically based.

Research aimed at identifying habitats and landscape features important for bats in agricultural landscapes in Serbia, has been initiated in 2013 through project “Conservation of bats and important habitats in agricultural landscapes in Serbia”. This research project was aimed at assessing presence and level of activity of different bat species and their association with different habitat types at wider areas of Fruška Gora, Obodska bara, Zasavica, Avala i Lower Danube area. Research has been conducted using automatic stationary detectors recording bat ultrasound, as well as using computer analysis of sound recordings, geoinformation systems and statistical methods in the final data analysis.

Results of field research in Serbia showed that there is significant effect of **water** and **woodland habitats**, and that **edge habitats** and **linear elements** are important habitats for bats in agricultural landscapes in Serbia. The look of the agricultural landscape “tailored” by the needs of bats is shown at the central picture of this material.

**More about this project and its result can be found at**  
**[www.rufford.org](http://www.rufford.org) and [www.orca.rs](http://www.orca.rs)**

