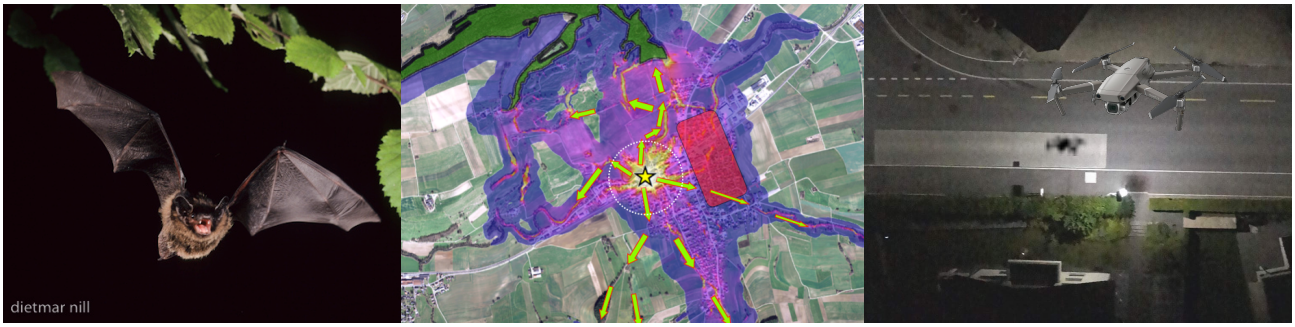
Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL
Swiss Federal Institute for Forest, Snow and Landscape Research WSL

Master thesis project
Remote Sensing and Conservation Biology of Bats



Effects of artificial light at night on bat commuting

Bats depend on roosts, foraging areas and the inter-connecting habitat for their survival. While roosts of many bat species are localized and protected in Switzerland, foraging areas and flight corridors are far less known. In a pilot study, we established spatial models for locating such corridors, often characterized by e.g. high surface roughness. However, as bats are strongly impaired by artificial illumination - a stressor not mapped so far in required resolution for spatial modeling - these corridor models need improving.

This study strives to evaluate the environmental impact of Artificial Light At Night (ALAN) on bats commuting along flight corridors to their foraging grounds. We will use a drone to collect nocturnal images of the wider surrounding of maternity roosts of Greater Mouse-eared Bats (*Myotis myotis*) and Lesser Horseshoe Bats (*Rhinolophus hipposideros*). We envisage acquiring such imagery in up to 13 study regions in Switzerland, where we measured bat activity during emergence at dusk and nocturnal light measurements in ground surveys (394 points).

Light levels derived from aerial imagery will be challenged against alternate measures as VIIRS or ISS satellite imagery and ground based data like light measurements or position of public lighting infrastructures. All measures will be evaluated for their suitability in improving the performance of existing bat flight corridor models, which only use information on surface structure and quality.

After challenging preparations, the master candidate will image the vicinity of roosts in the summer 2019 by a drone at night. Acquiring information on public lighting infrastructure and additional ground light measurements is part of the project. Work will comprise basic image processing and GIS methods. Statistical analyses will evaluate the improvements of models in predicting bat activity in R, and discuss the ecological findings. The student should strive for a scientific publication of the thesis' results.

The thesis will be part of a larger implementation project of WSL and partners on flight corridors of bats from roosts to foraging areas. The results will allow to optimize the models for applying in a larger scale on Swiss bat roots. This will meet the strong demand from conservation stakeholders for applying such models to known bat roosts of priority species.

Prerequisites: organizing skills; driving license and experience; willing to travel and to work at night; experience in english writing; knowledgeable in remote sensing, GIS-techniques and R.

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