

Despite frequent sightings, red squirrel habitats in Berlin are small and fragmented

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Stephanie Kramer-Schadt. Credit: Leibniz-IZW/Stephanie Kramer-Schadt

Red squirrels are among the most commonly sighted wildlife in European big cities such as Berlin. However, their habitats are more reminiscent of a patchwork quilt full of challenges, a team of scientists

led by the Leibniz Institute for Zoo and Wildlife Research (Leibniz-IZW) found out, with the help of computer models and red squirrel sightings by citizen scientists. The models link sightings to numerous environmental parameters and thus become important tools for urban planning, as they identify areas where ecological corridors are missing that could connect fragmented habitats.

The work is published in the journal *Frontiers in Ecology and Evolution*. In a follow-up project, the team aims to fill [knowledge gaps](#) on survival, dispersal potential, diet and health of Berlin's [red squirrels](#).

Even in big European cities such as Berlin, squirrels—or more precisely the Eurasian red squirrel (*Sciurus vulgaris*)—are a common wildlife species. However, the fact that they are frequently seen belies the fact that the big city is a challenging place for the rodents and [suitable habitats](#) are small and fragmented. These "islands" in the metropolitan "ocean" are often isolated and roads as well as free-roaming domestic cats pose major challenges for the squirrels.

As a result, urban squirrels have smaller ranges than their counterparts in large, contiguous habitats. Further densification of the urban building stock could further degrade connectivity of fragmented habitats and push individual populations closer to the edge of their viability. The increasing formation of heat islands in cities owing to climate change could also cause additional harm. Therefore, the knowledge on squirrel distribution and mortality risk in relation to built-up structures and other environmental variables is important for [urban planning](#) and the management of urban open and [green spaces](#).

This knowledge originates from integrating data and their mathematical modeling at the Leibniz-IZW and the Berlin-Brandenburg Institute for Biodiversity Research (BBIB). "We could draw on data from two [citizen science projects](#) in which Berliners reported squirrel sightings and where

the animals were registered via wildlife cameras in private gardens and allotments," says Prof Stephanie Kramer-Schadt, head of the Department of Ecological Dynamics at the Leibniz-IZW and holder of the Chair of Planning-Related Animal Ecology at the Technical University Berlin (TUB).

"These data show different levels of quality and arose from different sampling designs: The wildlife cameras were evenly distributed across Berlin using a 2x2 kilometer grid, whereas sightings were recorded opportunistically where and when people happened to see animals," adds Marius Grabow, doctoral student in Kramer-Schadt's department and first author of the paper.

Grabow and Kramer-Schadt's team used several methods to design several computer models that best predict the occurrence of squirrels based on environmental variables. The environmental variables included distance to the nearest green space, distance to the nearest road, tree stock and tree age, night-time temperatures and degree of sealing of surfaces.



Stephanie Kramer-Schadt Credit: Leibniz-IZW/Stephanie Kramer-Schadt

"Our goal was to improve spatial models so that we could make the most accurate predictions possible about the actual occurrence of the animals based on existing environmental data—the great data from the citizen scientists was our reference for this," says Grabow.

The team was able to use the models to identify critical hotspots where the connection of habitat islands is particularly important. This is the case, for example, at Elsenstraße/Elsenbrücke in Treptow, where the Spree River and roads with several lanes separate the green spaces in Treptower Park, on the Stralau Peninsula and in the Schlesischer Busch/Görlitzer Park. Equally "incisive" are the routes of highway A111

in the areas of the Tegeler forest and Frohnau as well as railway and city motorway routes between Tempelhofer Feld and the green spaces in Britz. A positive discovery was the important, long corridor for squirrels formed by a series of green spaces along the Spree. "This belt has the potential to connect Berlin's eastern and western city areas and is only occasionally interrupted by structural barriers," says Grabow.

"The frequent sighting of squirrels in Berlin not only leads to the misconception that they have plenty of good habitats in the big city, but also to the erroneous belief that we know much about their lifestyle and health," says co-author Sinah Drenske from Leibniz-IZW. "Much of the presumed knowledge on their movement patterns, diet or [health status](#) is actually just anecdotal," says Drenske, who is doing her doctoral project at the Leibniz-IZW and the TUB with the project "Ecology of squirrels in Berlin." In fact, Dr. Gudrun Wibbelt from the Department of Wildlife Diseases at Leibniz-IZW, in cooperation with the consiliary laboratory for poxviruses at the Robert Koch-Institute, discovered not long ago a previously unknown strain of poxviruses in Berlin squirrels, now known as the Berlin Squirrel Poxvirus, which can be lethal for young squirrels.

Over the next two or three years, Drenske will repeatedly tag squirrels in Berlin with chips and transmitters, measure and examine them, as well as take samples and immediately release them again. Through this long-term observation, her doctoral project will provide reliable findings on the viability of the populations and their genetic structure, the health status of the animals, their movement behavior, their diet and their ecosystem services such as seed dispersal.

"For this research, the squirrel distribution models based on the citizen science data are used to select study sites along an urban gradient in Berlin," says Dr. Conny Landgraf from the Leibniz-IZW, who works in the squirrel project. There are indications that cities can be refuges for squirrels, e.g. owing to the different composition of predators compared

to rural areas and the supplementary feeding provided by city dwellers.

"We still don't know how the squirrels are doing health-wise, how many there are and how various hazards (such as roads or inappropriate supplementary food) affect squirrel health," says Drenke. "Before any population decline takes place in Berlin, we want to generate the relevant knowledge that can help secure the viability of the squirrel population in the city in the long term."

More information: Marius Grabow et al, Data-integration of opportunistic species observations into hierarchical modeling frameworks improves spatial predictions for urban red squirrels, *Frontiers in Ecology and Evolution* (2022). [DOI: 10.3389/fevo.2022.881247](https://doi.org/10.3389/fevo.2022.881247)

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