

Which species will be our urban neighbours?

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The blackbird is a generalist that eats a lot of different foods and does well in the city. Credit: Zeynel Cebeci, CC BY-SA 4.0, Wikimedia Commons

All over the world, people are moving out of rural areas, and cities are growing. What will be the impact on resident species that live in these cities? Which will be our new plant and animal neighbors, which will have to leave town, and what does that mean for us humans?

"Urban ecology" is a fairly new field that attempts to answer these questions. The field is still struggling to find itself, but a trend is clear.

Researchers previously focused on the ecology of species that inhabited [urban areas](#)—the interaction between species in small isolated green spots of nature. Now the research focus has shifted toward true urban ecology.

We've lifted our sights to study the [city](#) more as a large-scale ecosystem, where we look at how the entire landscape is managed to understand it. Cities differ from other ecosystems. People not only influence the city, but totally define it.

Extreme variations in the city

Human activity—how people change the way places are used—has created a mosaic of big and small green spots in an otherwise unliveable environment of concrete, asphalt and stone.

Living conditions in the city are often characterized by extreme variations in temperature and humidity, pollution and disturbance. If other species are to live with us here, they are forced to adapt to these conditions.

At a global level, we know that the construction of houses and roads, as well as increasing population density, reduce urban species diversity.

Although the number of species has actually grown with increased urbanization in some cities, this is most often because cities have become a gateway for alien species.

Escaped [garden plants](#) like garden lupine and beach rose (*Rosa rugosa*) are especially invasive, and can cause [local species](#) to disappear.

The loss of local species makes cities around the world more alike.

Why nature in the city?

Why should we care? Maybe it would be best to leave the city to humans, and exclude non-human creatures. This is a common perception, even among researchers.

But cities have often been situated in historically species-rich areas. If we don't allow other species to retain their habitats between roads, houses and asphalt, we limit the distribution of local species.

Green areas in and near the city are important for people, too. The natural environment regulates air quality, temperature and humidity, and it contributes benefits from gardens and parks. Nature is important for our social and cultural values and not least, our physical and mental health.

So what does biodiversity look like in Norwegian cities?

6000 different species in Trondheim

How have changes in the environment like urbanization and development affected species diversity? How are different species distributed in the urban space and how has this changed over time?

Over the past four years, we have been studying Trondheim, Norway's third largest city with a population of approximately 200 000, and the built-up part of the city comprising about 13.5 percent of the total area.

Despite the large number of people and lots of area that has been developed, the municipality has a high number of different habitat types.

More than 6,000 different species have been recorded within the municipal boundaries in the last ten years, according to the Norwegian Biodiversity Information Center's Species Map (Artsdatabanken).

And in this regard we have only included species that are visible to the naked eye. Counting species is relatively easy if we only include [plants](#) and animals. But if we want to include microscopic organisms with strange names like "ciliates" and "pine flagellates," the task becomes completely unmanageable.

Of course, a forest has more species than a city center. You find more species on grass than on concrete. But we also need to look at the mosaic of green, blue and gray areas—that is, the entire urban ecosystem.

We created statistical models to calculate the total number of birds, other animals, plants and fungi in Trondheim. We divided the city into a 500m × 500m grid, and we entered the model data about which species lived where into the respective cells, along with what else was in each cell in the way of houses, green space or asphalt.

We also investigated whether endangered species and non-native species lived in different places.

As expected, the relationship between land use and biodiversity is quite complex. Each species group prefers different types of habitats, so the overall highest numbers of endangered species, alien species and other species do not occur in the same cells.

Park trees are spreading

Most species are found in areas where humans exert little influence. Developed areas are not very popular for animals and plants, especially endangered species like the Northern Lapwing and the Norwegian

subspecies of wild thyme.

Surprisingly, the number of [alien species](#) does not depend on how an area is used, but rather where humans first introduced these species. Plane trees were first planted as park trees, for example, but have since spread rapidly. If given the opportunity, the plants succeed in their new environment.

Given that cities are generally a gateway for non-native species, we need to be careful about which species we plant in our gardens.

The new neighbors

But which species can cope with urbanization? What species stay put as the city grows?

The answers to those question can be found in the species' characteristics and the [living conditions](#) to which they are adapted. Taking another look at Trondheim, we investigated which plants are found from within the city center to the outskirts.

We found that the plants that are characteristic of urban areas are relatively tall, have large thin leaves and are adapted to an environment where the ability to metabolize nutrients quickly is an advantage. Soil in the city is alkaline, often dry and high in nitrogen, and the plants are exposed to regular disturbances.

Plants outside the city, on the other hand, are adapted to nutrient-poor conditions. They grow more slowly, but live longer.

New land uses—new species

Next we take the leap from space to time. Which species will disappear and which will be our new neighbors as the city continues to grow?

We looked at area resource maps from 2011 and 2018 and observations of birds in the same period. We found that the probability of a bird species either disappearing from or suddenly coming to an area depends on how big the land use changes have been in that area.

The different characteristics of bird species also plays a role. As with the plants, some bird species are better equipped to cope with the urban conditions. The ones that specialize in forest and wetlands have to leave. The species that are generalists, and that don't care much about where they live, manage to cope with city living.

However, far more species are disappearing than the number of new species being introduced. Simply put, we can say that when cities grow and land use changes, we lose species.

So in essence, if we want to maintain biological diversity within the city limits, we have to take care of the species' habitats, including areas that have not yet been developed.

Urban nature is often the domain of urban planners and architects. Blue and green areas, where [species](#) and the environment interact, are often overlooked. Maybe urban developers should spend a little more time listening to ecologists when planning the sustainable cities of the future?

More information: Tanja K. Petersen et al, Species data for understanding biodiversity dynamics: The what, where and when of species occurrence data collection, *Ecological Solutions and Evidence* (2021). [DOI: 10.1002/2688-8319.12048](https://doi.org/10.1002/2688-8319.12048)

Tanja K. Petersen et al, Urban aliens and threatened near-naturals: Land-

cover affects the species richness of alien- and threatened species in an urban-rural setting, *Scientific Reports* (2020). DOI: [10.1038/s41598-020-65459-2](https://doi.org/10.1038/s41598-020-65459-2)

Tanja K. Petersen et al, Competitors and ruderals go to town: plant community composition and function along an urbanisation gradient, *Nordic Journal of Botany* (2021). DOI: [10.1111/njb.03026](https://doi.org/10.1111/njb.03026)

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