

4.1 Urban ecology meets architecture and urban planning

L'écologie urbaine rencontre l'architecture et l'aménagement

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Cities are considered hotspots of biodiversity. Due to their high spatial heterogeneity, which represents high habitat diversity, and their unique habitats (e.g., ruderal areas, wastelands, buildings as artificial rock environments) they host many different plant and animal species. In addition, animals profit from food waste (e.g. foxes), and in affluent neighbourhoods caring for people can mean caring for wildlife and wildflowers: environmental pollution and noise are under control, private and public green spaces are well represented, and gardening ensures that year-round plants are in flower thereby providing food for pollinators. It is however not evident that nature thrives in urban areas. In city centres green spaces are rare and most surfaces are sealed; they therefore lack the soils and vegetation structures necessary for animals and plants to prosper. Widespread lawns, introduced evergreen species (that are not animal-pollinated and are difficult to attack by non-specialised herbivores), rock gardens and sealed surfaces as part of garden design, concrete, glass and steel buildings (leaving no cracks and openings for animals to breed and plants to grow), and especially excessive use of pesticides and artificial fertilizers threaten urban biodiversity.

Urban biodiversity represents a paradigmatic case for contemporary ecology and nature conservation. In the Anthropocene, the separation between on the one side wild land with high biodiversity and on the other side anthropogenic land reserved for human use becomes obsolete (Kueffer 2015). Much biodiversity will only survive amidst human land use, whether in forest plantations, on agricultural land, or in urban areas. This new situation forces ecology and nature conservation to rethink how to understand processes and patterns in nature, value qualities of nature, and contribute to nature conservation management. To understand ecological processes and patterns, ecology must acknowledge that *Homo sapiens* has become a keystone species in most ecosystems (Kueffer 2017). To value nature, cultural stereotypes of what we consider good nature and an appropriate relationship between humans and ecosystems and their wildlife must be renegotiated. To save and restore qualities of nature, conservationists must work closely together with practitioners from professions as diverse as farming, fisheries and city planning.

In this paper we illustrate how ecological research can respond to these novel challenges by using the example of an urban ecology research project that aims at better understanding the long-term survival of wildflower populations in cities as a basis for deriving effective nature conservation strategies.

In a collaboration between the Ecological Genetics research group at ETH Zurich, HSR Rapperswil and the Office of Parks and Open Spaces of the municipality of Zurich (Grün Stadt Zürich), we use methods and concepts from landscape ecology (species-area relationships, habitat fragmentation), community ecology (vegetation surveys), conservation genetics (gene flow), and evolutionary ecology (admixture) to understand the effects of fragmentation and wildflower sowing on population viability, rapid evolution, and plant community dynamics. This part of the project is rooted within disciplinary ecology, but humans are a main causal driver of patterns and processes (socioeconomics of different neighbourhoods; fragmentation through built infrastructures; dispersal by humans, their animals and cars; guerrilla gardening; sowing of new genotypes).

At a second – interdisciplinary – level of the project we aim at integrating ecology with open space planning (e.g., Bezzola et al. 2018). We derive from the ecological research project metrics relevant for planning, e.g. relative importance of small versus large vegetation patches, minimal sizes of vegetation patches needed for wildflowers to survive, minimal distances between vegetation patches needed to ensure connection between plant populations, best-practice maintenance work of natural vegetation and sowing of wildflowers. Further, we aim to identify synergies between different ecosystem services of open and green spaces: cooling the urban climate, restoring water cycles (decentralized collection and storage of water, reduction of flood risks), and health (outdoor activities, exposure to greenery and daylight). Each of these services has its relevant spatial scales that only partly correspond. This part of the project involves collaborations with planners, architects, landscape architects, health experts, engineers, and environmental scientists.

At a third – transdisciplinary – level we aim to facilitate deliberations with the public about what wild nature means in a city. The citizen science project “Wo Samen fallen” asks citizens to leave a box filled with sterilized soil in their garden (or in other outdoors urban spaces) and then to observe which plants arrive on their own and grow in the boxes (Wo Samen fallen 2019). The citizens can upload lists of the species found in their box (identified with the help of botanists) and photos to a GIS-based webpage, and compare their observations with those of neighbours or else of someone living in a distant part of the city. The project asks questions such as: how does the creation and maintenance of ecological connectivity build on collaboration among citizens and social connectivity? What does it mean in a city to be a ‘wild’ plant that ‘decides’ on its own where to grow (instead of being planted by a human)? When do we welcome wilderness in front of our door and when not (i.e. when do we consider new arrivals as weeds rather than a valuable addition to our garden)? The project runs for its second year, and we have so far organised about 10 public activities related to it: at local markets, science fairs and outreach days of ETH Zurich, the Zürcher Festspiele (a music and arts festival) and workshops targeting specifically the participants of the citizen science project. ‘Wild’ plants, gardening, and the idea of connectivity inspire both specific and fundamental discussions about nature in cities. The project builds on concepts and methods from the arts and science communication (Schlaepfer-Miller & Dahinden 2017), and it relates to concepts in urban and landscape design such as terrain vague, third landscape and blackbox gardening.

We understand transdisciplinarity in this project as a rhizomatous and dynamic network of different knowledge production and consumption processes that influence each other

mutually through an open-ended and long-term learning process (Kueffer et al. 2014). The involved discipline – ecology – produces disciplinary products (but in a different way than without the learning process) while the involved professions improve their tools and procedures (Kueffer et al. 2007).

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Wo Samen fallen 2019.

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<http://stadtnatur.ch/samen>

<https://www.plantsciences.uzh.ch/de/outreach/citizenscience.html>

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