# How to avoid traffic jams in urban biodiversity corridors

### Biodiversity corridors are the future

It is time to start thinking more holistically about urban biodiversity corridor networks. The "stepping stone" strategy of the past, where cities opportunistically preserved islands of biodiversity within an urban sea, is quickly being replaced by a corridor design strategy, where cities actively design least-cost-path corridors between habitat patches to maintain movement and dispersal connectivity for wildlife.

The problem is, that connecting multiple patches together using least-cost-paths will always configure into a nearest-neighbor web, which is prone to traffic-jams and may be impeding the movement and dispersal of organisms that these designs are trying to benifit. There are currently no evidence-based standards guiding how biodiversity corridors should be arranged at the scale of large metro-

politan areas. We aim to fix that.

## The evolution of green infrastructure









**Living trophy case** - In the history of cities, non-agricultural green space is a relatively new and amorphous concept. In the earliest cities, people were traveling by foot and much of the city was dedicated to rudimentary agricultural plots that were green and relatively wild by today's standards. It was a luxury to have a green space that was managed but wasn't harvested for subsistence and so most non-agricultural green spaces were either unmanaged or analogous to trophy cases, highlighting the newest and best domesticated species. Because these spaces were such an energetic luxury, they were largely reserved for religious or royal gardens.

Nature for the masses. Parks as a gift to the working class -- First parks were spaces designed for humans, not spaces designed for nature, but people loved them. The global popularity of green space was codified in the early 1920's, when land use zoning became the primary tool for land use planning and zoning regulations could stipulate the amount of green coverage for different zoning types. For many nations, those standard plans included provisions about building parks or common space. This was not only a western phenomenon, nations across the globe shifted their view of nature and by the early 1900's, many were creating public, common, green spaces of their own.

**Conservation era** -- Since the establishment of Central Park in 1858 and Yellowstone National Park in 1872, human-controlled green spaces have operated on a gradient of ecological realism. On one end of this gradient is Central Park, which was created as an inviting public architectural space built from living organisms but having a low capacity for producing ecological structures or functions. On the other end of the gradient is Yellowstone, which was created as a refuge for ecosystems to remain isolated from human development in the hopes of facilitating a higher capacity for producing ecological structures and functions. Both public parks and conservation reserves have grown exponentially in number since their invention, but they have also both evolved to be more like each other over that time.

### Working landscapes and Ecosystem function -

Currently, green space design is focusing heavily on creating green spaces that serves multiple functions at once and do a good job of producing all of those functions consistently and reliably. The focus on sustainability comes largely from the fact that green spaces filter and sequester carbon, which are essential first steps to overcoming the climate crisis. The focus on resilience comes from the realization that green spaces mitigate and contain some of the variance associated with climate change like major storms, temperature swings, and novel disease transmission.

# How to design urban green infrastructure

Design arena

transport networks = Design



Some cities prioritize land use and others prioritize their transport network



Montreal is an island with mountain ranges to the North and South. Our first priority is to induce flow of biodiversity across the island and then to optimize that flow across the transport network.

We build the network out of the general design tools: wedges and circles. The large circle to the North accumulate individuals who flow through the island to the large circle to the South, or via versa.



### Design tools

### Design success criteria



Fractal transport networks increase occupancy across all land-use types. They are a better way to connect space.

# A design for green infrastructure in Montreal, QC







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The circles on the island are designed to distribute flow across the island and create areas where flow is slow and biodiversity has a chance to interact and create ecosystem function.

This final model shows the traffic patterns across the whole network. The circle perimeter corridors are particularly fruitful locations for the accumulation of biodiversity.