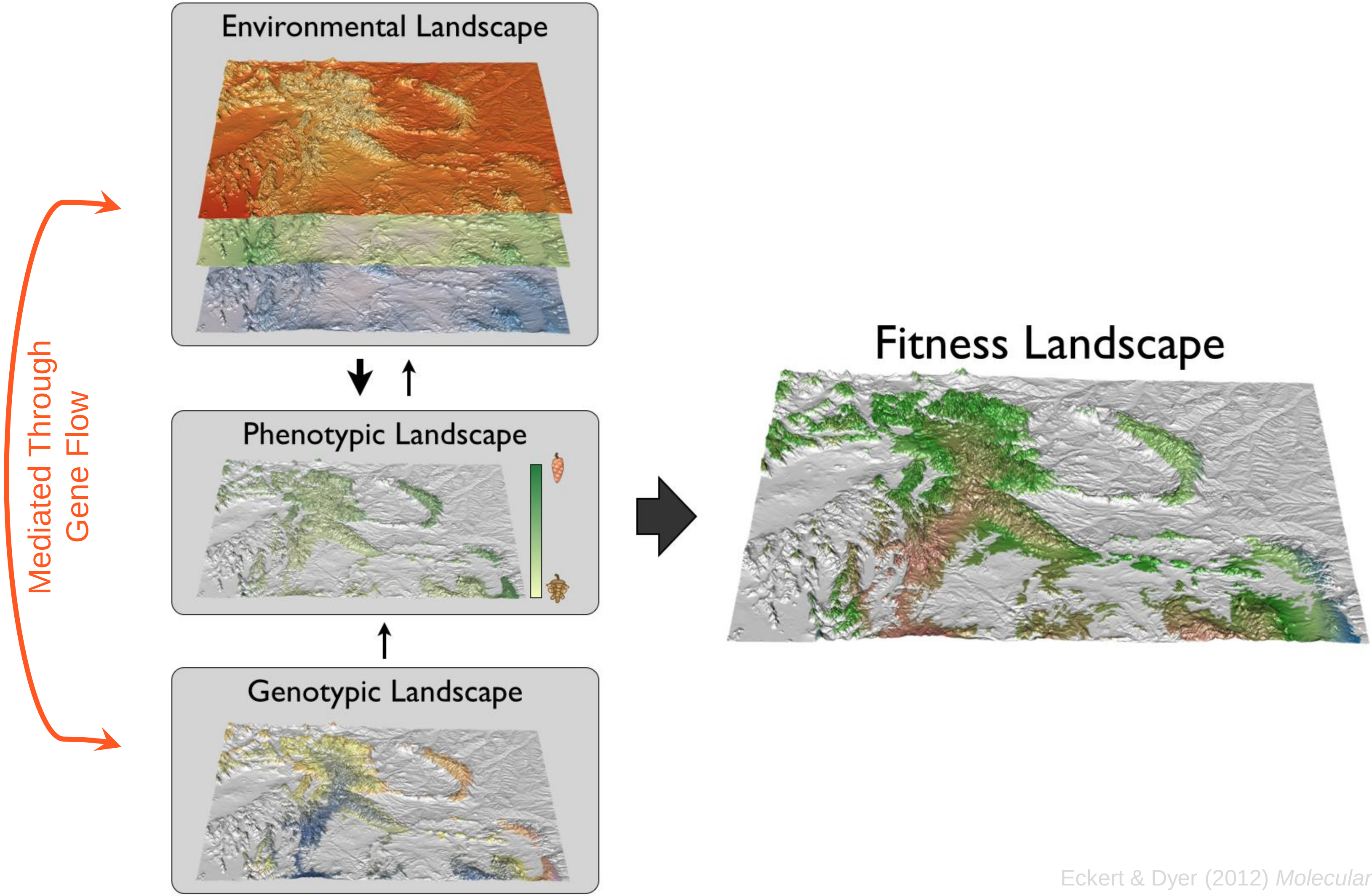
Network Theory & Urban Design

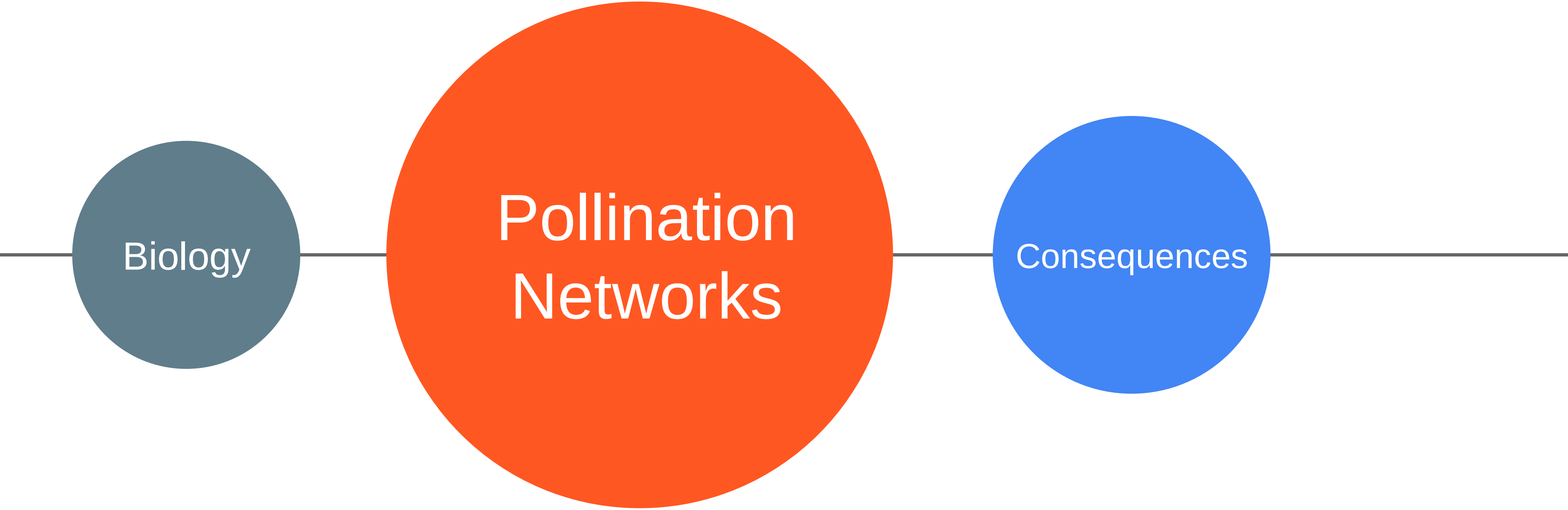
Uncovering genetic connectivity using pollination networks

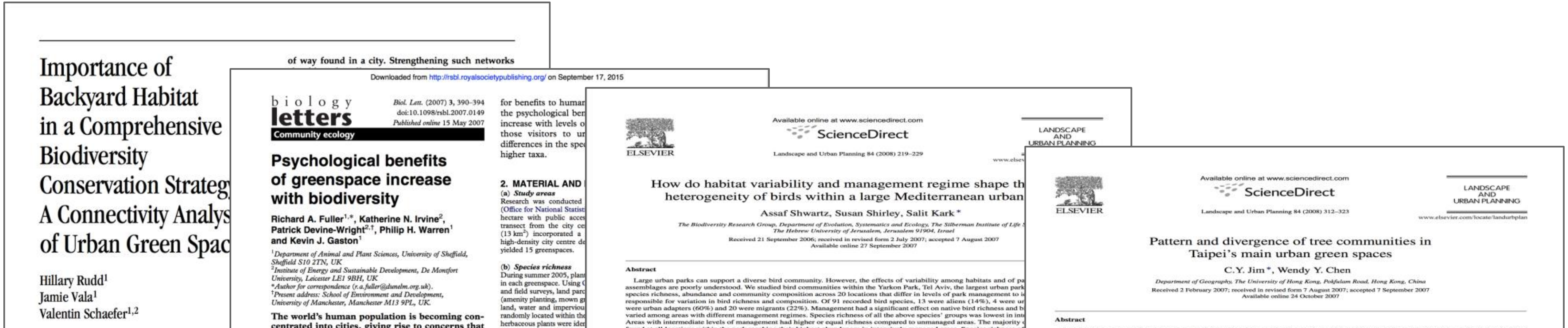
Rodney J. Dyer, Center for Environmental Studies, Virginia Commonwealth University



Eckert & Dyer (2012) *Molecular Ecology*, 21, 2836.

Outline





Importance of Backyard Habitat in a Comprehensive Biodiversity Conservation Strateg[y]: A Connectivity Analys[is] of Urban Green Spac[es]

Hillary Rudd[1]
Jamie Vala[1]
Valentin Schaefer[1,2]

of way found in a city. Strengthening such networks

biology letters
Community ecology

Biol. Lett. (2007) 3, 390–394
doi:10.1098/rsbl.2007.0149
Published online 15 May 2007

Psychological benefits of greenspace increase with biodiversity

Richard A. Fuller[1,*], Katherine N. Irvine[2], Patrick Devine-Wright[2,†], Philip H. Warren[1] and Kevin J. Gaston[1]

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The world's human population is becoming concentrated into cities, giving rise to concerns that

for benefits to human ... the psychological ben... increase with levels o... those visitors to ur... differences in the spec... higher taxa.

2. MATERIAL AND ...
(a) Study areas

(b) Species richness

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Landscape and Urban Planning 84 (2008) 219–229

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LANDSCAPE AND URBAN PLANNING

How do habitat variability and management regime shape th[e] heterogeneity of birds within a large Mediterranean urban ...

Assaf Shwartz, Susan Shirley, Salit Kark *

The Biodiversity Research Group, Department of Evolution, Systematics and Ecology, The Silberman Institute of Life S...
The Hebrew University of Jerusalem, Jerusalem 91904, Israel

Received 21 September 2006; received in revised form 2 July 2007; accepted 7 August 2007
Available online 27 September 2007

Abstract

Large urban parks can support a diverse bird community. However, the effects of variability among habitats and of pa... assemblages are poorly understood. We studied bird communities within the Yarkon Park, Tel Aviv, the largest urban park... species richness, abundance and community composition across 20 locations that differ in levels of park management to i... responsible for variation in bird richness and composition. Of 91 recorded bird species, 13 were aliens (14%), 4 were ur... were urban adapters (60%) and 20 were migrants (22%). Management had a significant effect on native bird richness and b... varied among areas with different management regimes. Species richness of all the above species' groups was lowest in int... Areas with intermediate levels of management had higher or equal richness compared to unmanaged areas. The majority o...

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Landscape and Urban Planning 84 (2008) 312–323

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LANDSCAPE AND URBAN PLANNING
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Pattern and divergence of tree communities in Taipei's main urban green spaces

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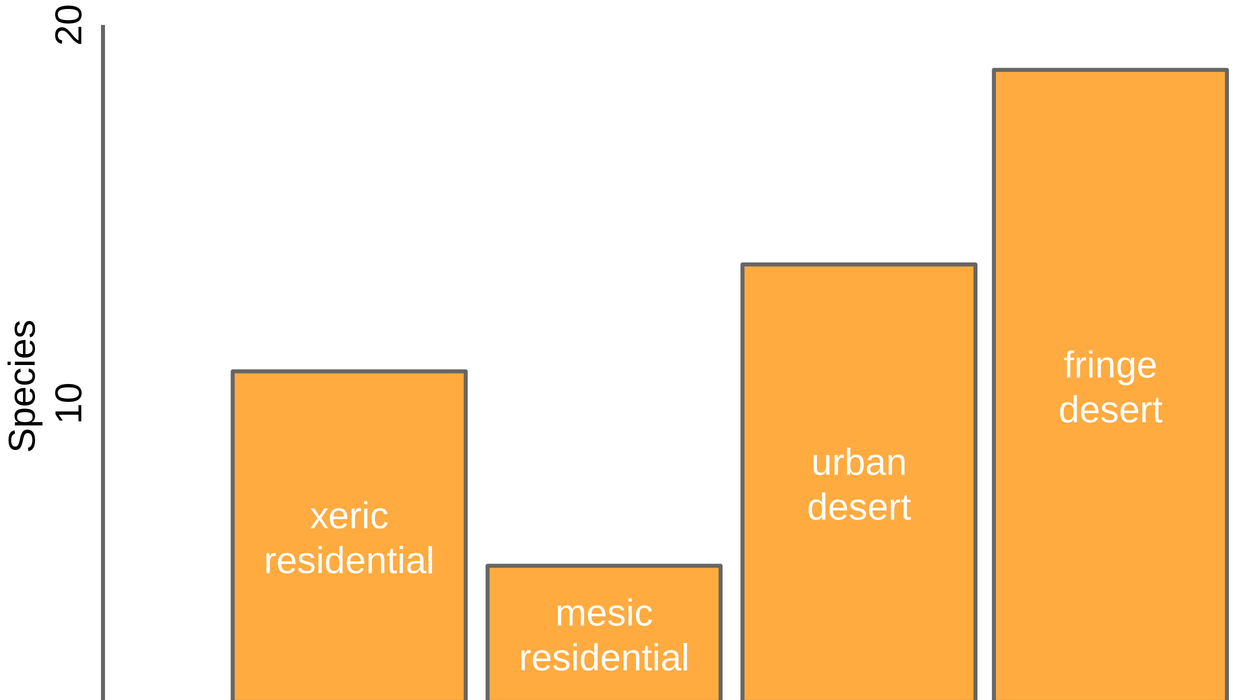
Available online 24 October 2007

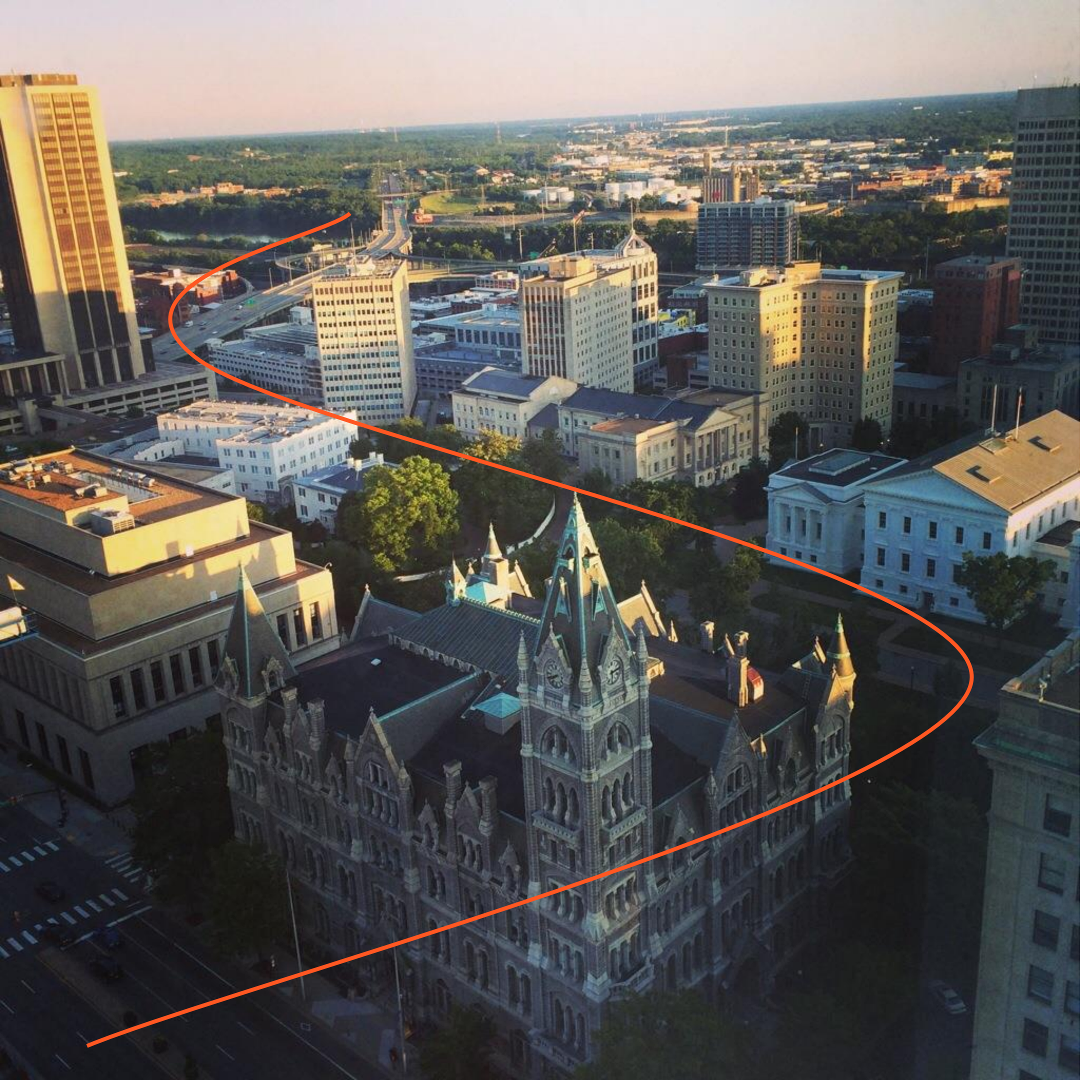
Abstract

Transport Agents Change



Gene flow requires functioning pollinator assemblies for landscape connectivity

McIntyre & Hostetler (2001) Basic Appl Ecol, 2, 209.

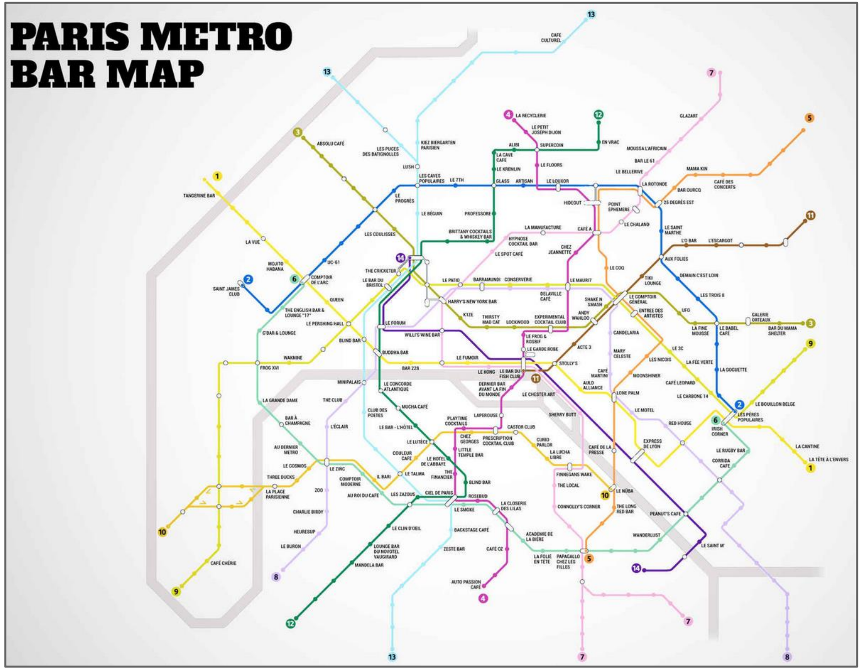


Separating Populations

Physical barriers

Differential permeability

Transportation

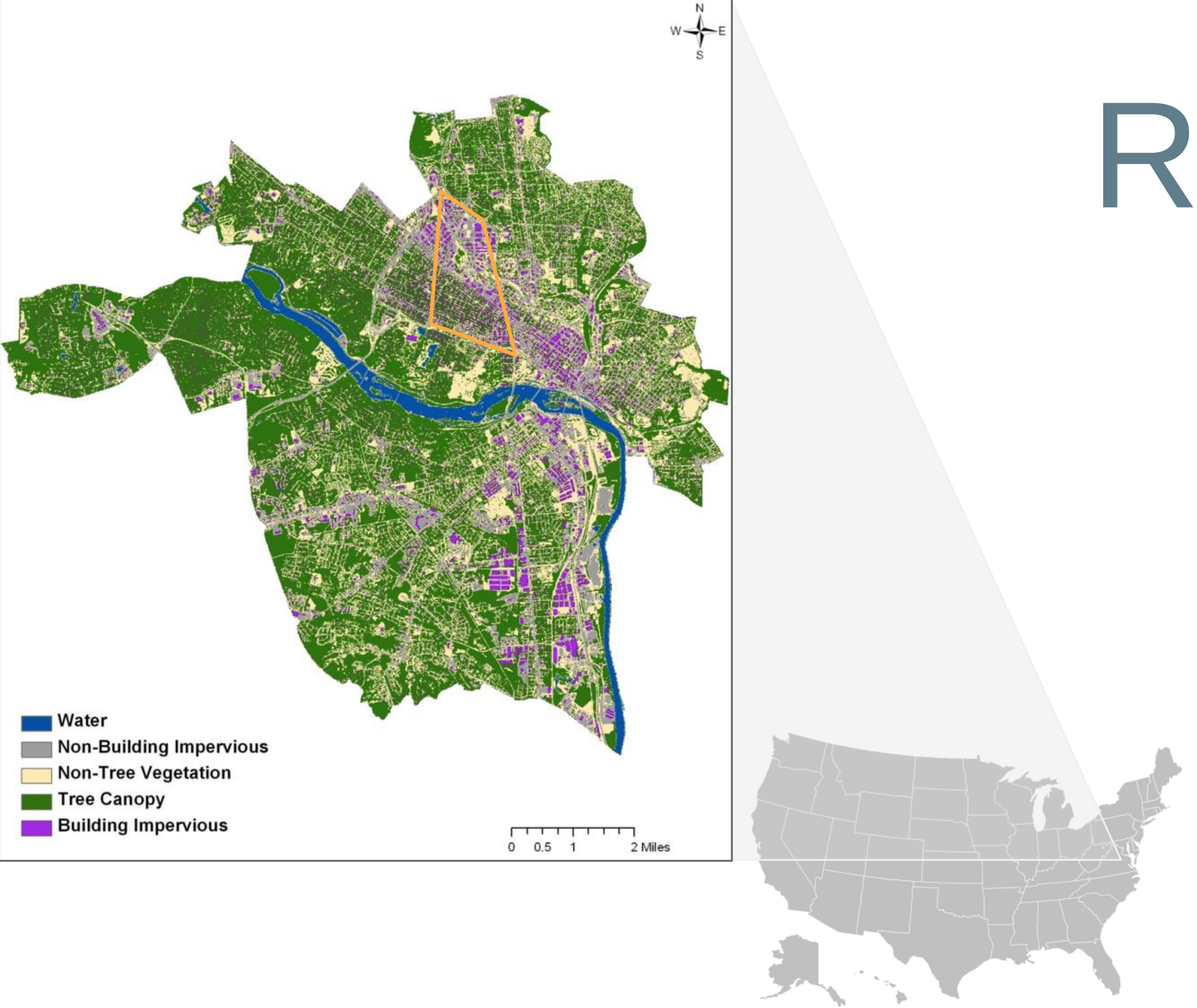


Map by Thrillist.com

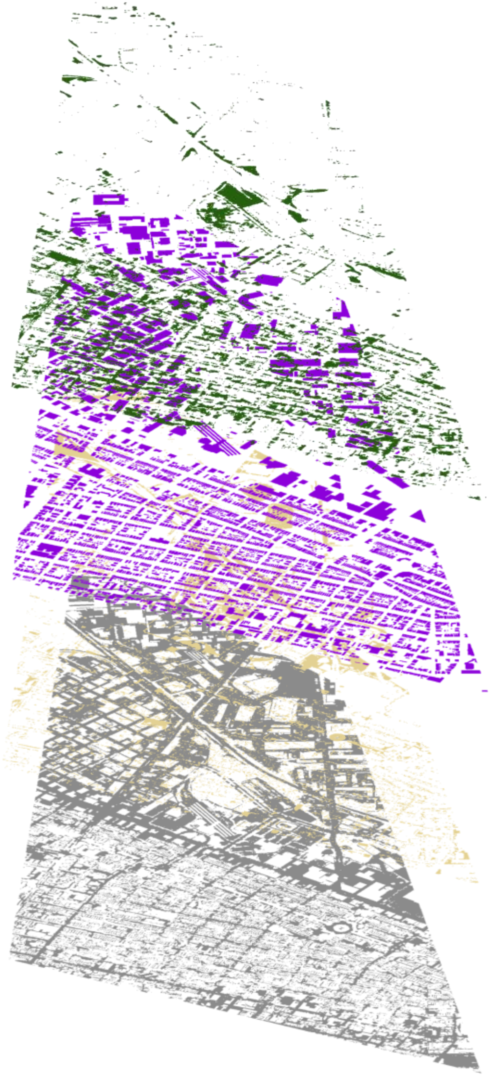
Pollination

Unknown (unknowable?) networks

ACTCGGCATCAGTA
TGAGCCGTAGTCAT



Richmond Virginia



Richmond Virginia

	Feature	Area
	Tree Canopy	15%
	Building Impervious	25%
	Non-Tree Vegetation	13%
	Non-Building Impervious	46

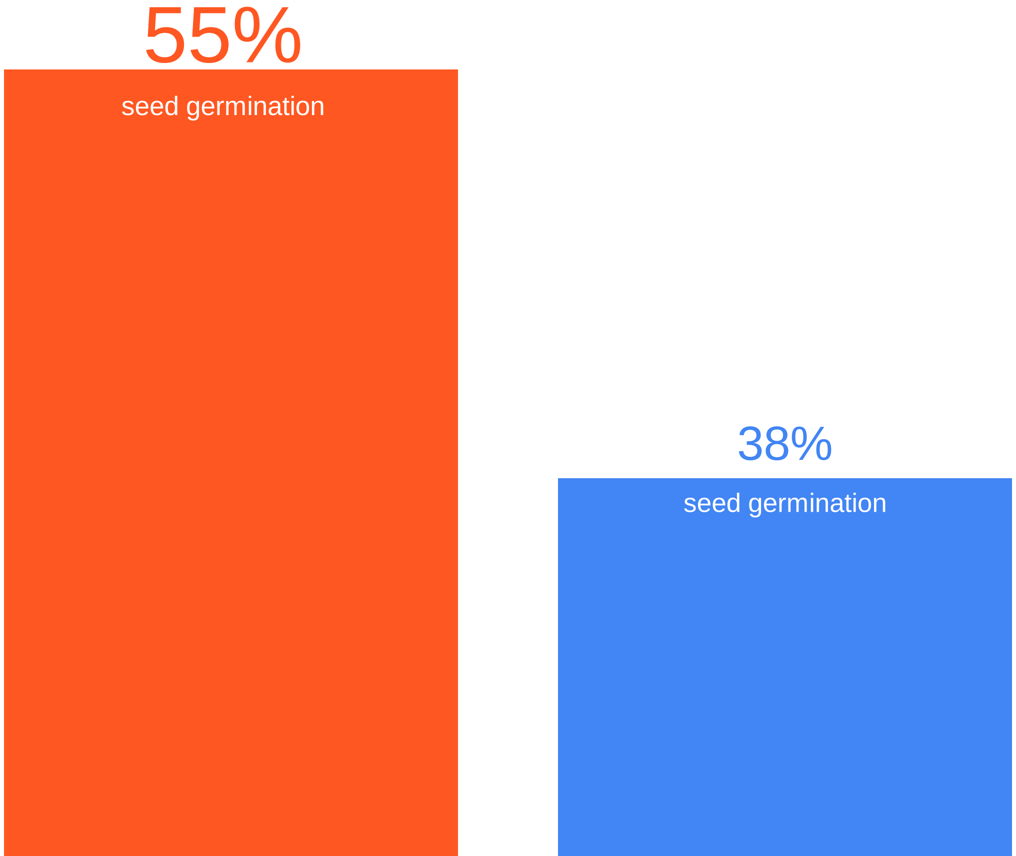
Relative Attractiveness

Heterogeneity in suitability.

Dogwood

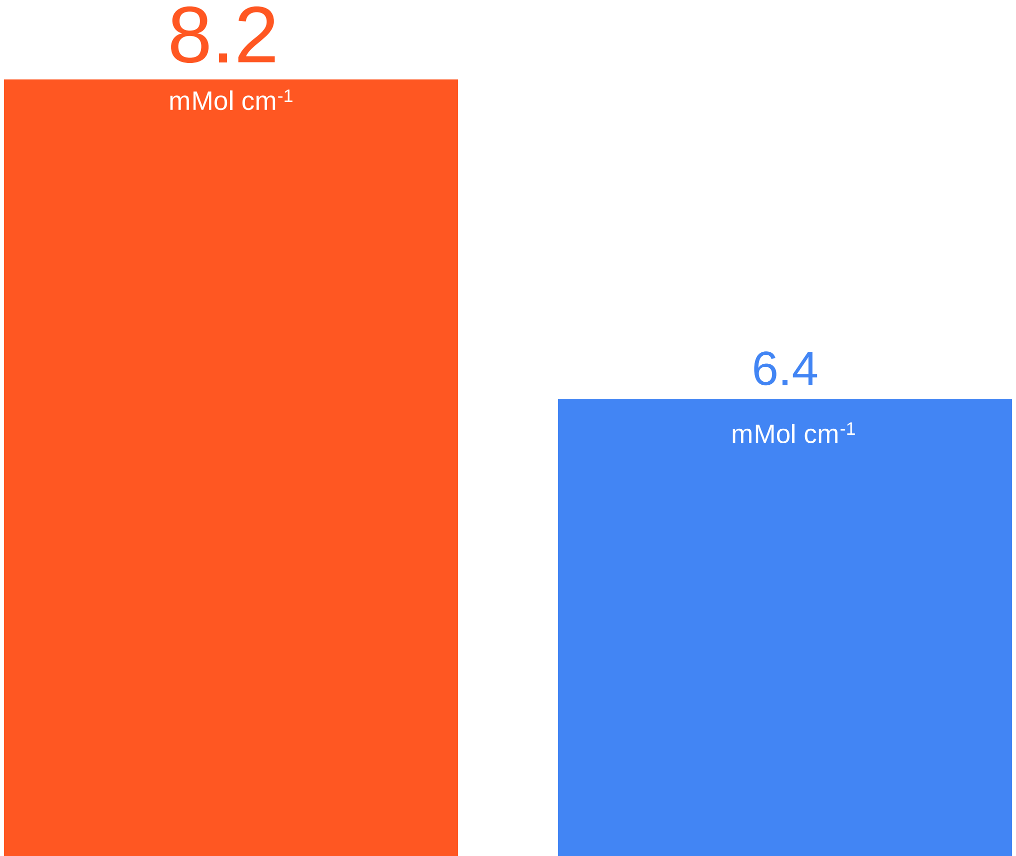
Common urban cultivar and tree species native to eastern North America

Recruitment



Native

Performance



Native

Survival

76%

seedling survival

16%

seedling survival

Native

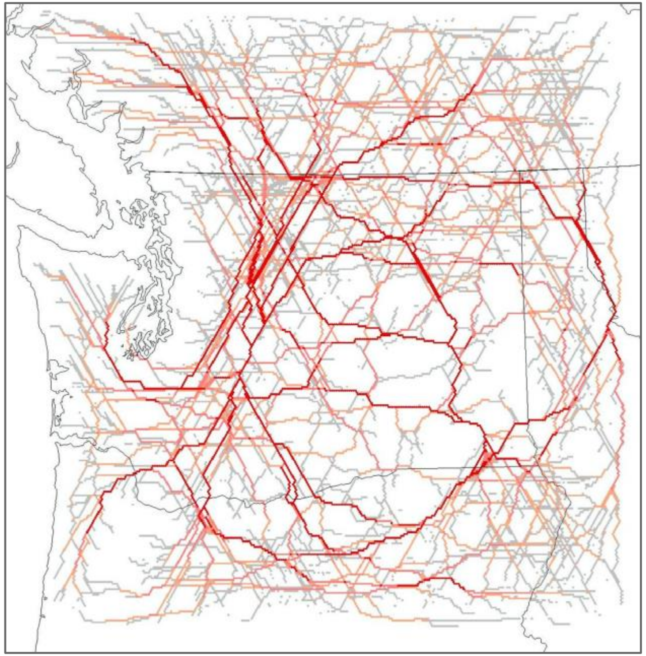
Question: Features & Permeability

What **features** are important in predicting genetic connectivity?

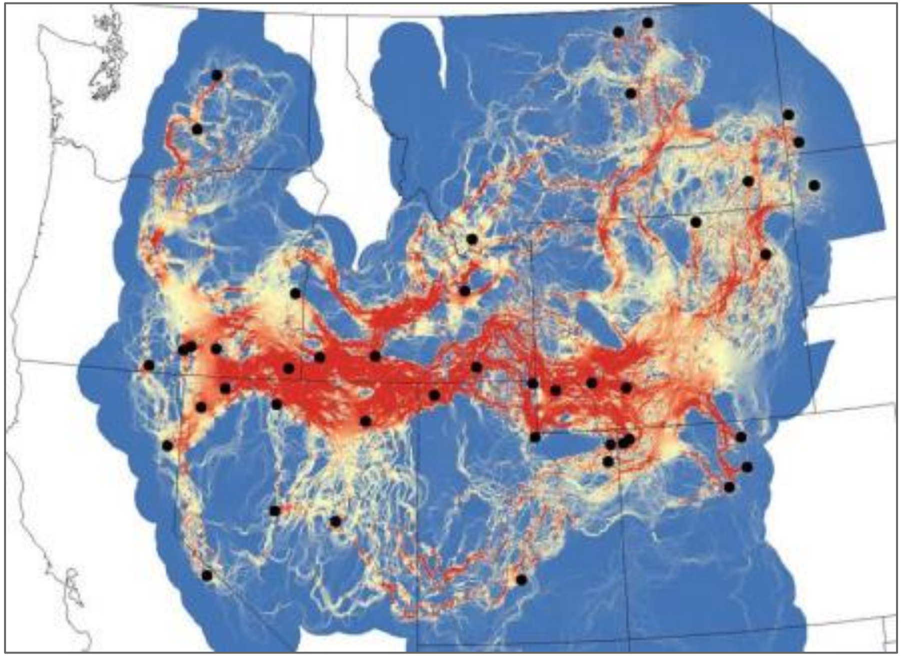
At what strength does each influence landscape **permeability**?

Distance Algorithms

Shortest paths



Random paths

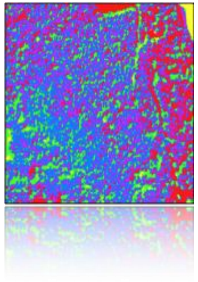


Vegetation classification:

- Hyperspectral classification 10 bands (520.6 - 2209.7nm)

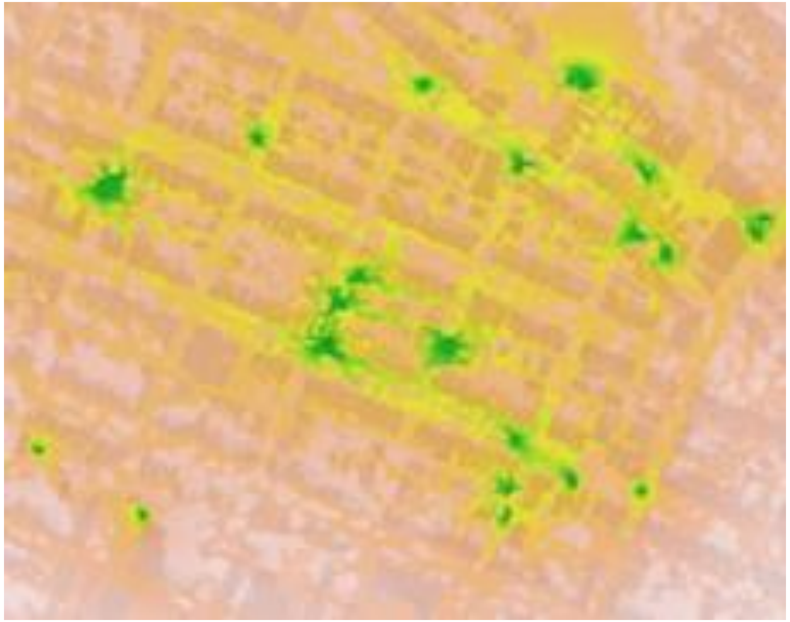
Unsupervised clustering

- Canopy types:
- Understory & green vegetation



LiDAR

Reproductive Connectivity

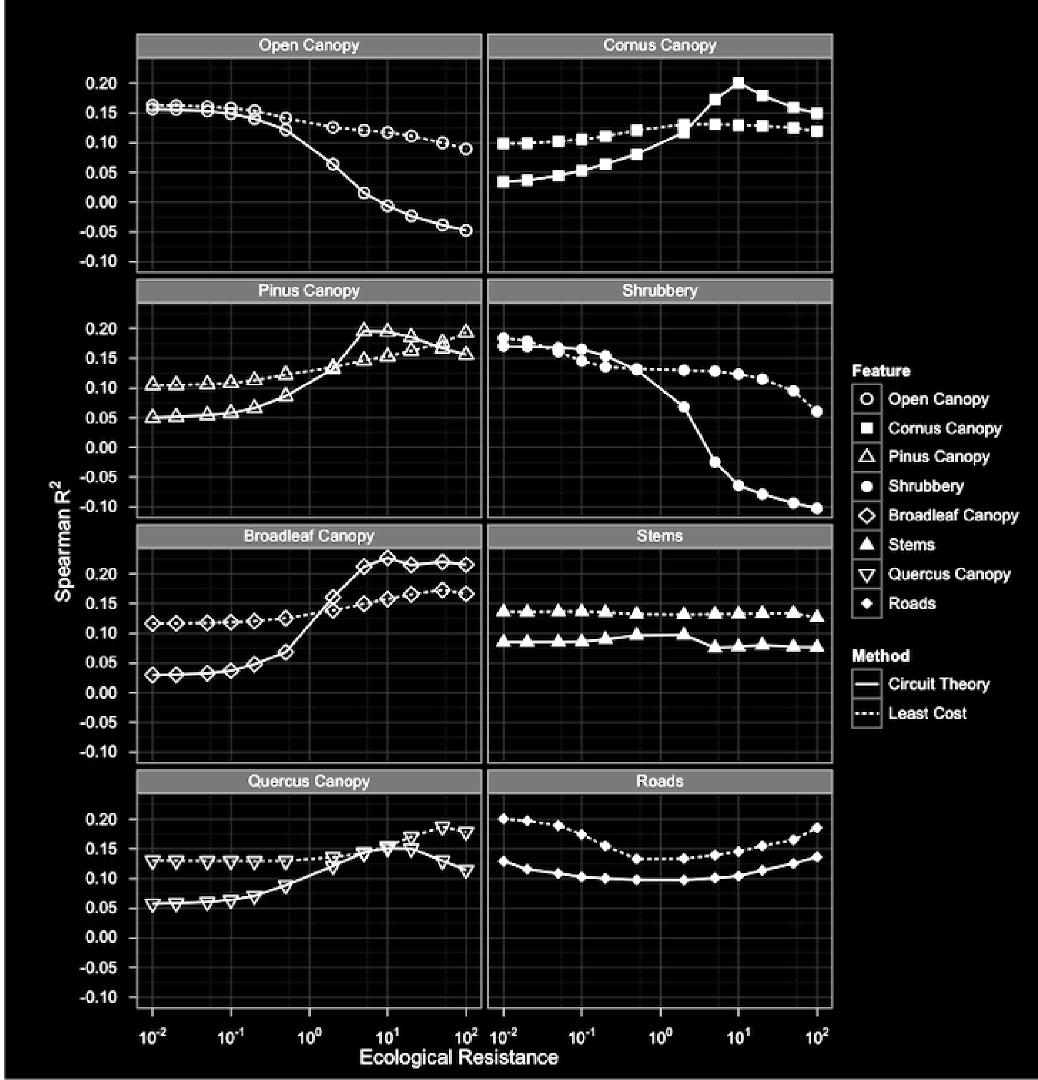


Estimated connectivity from reproductive output

Gene Flow Permeability

Ecological resistance influenced by:

- Methodology
- Feature
- Strength of resistance

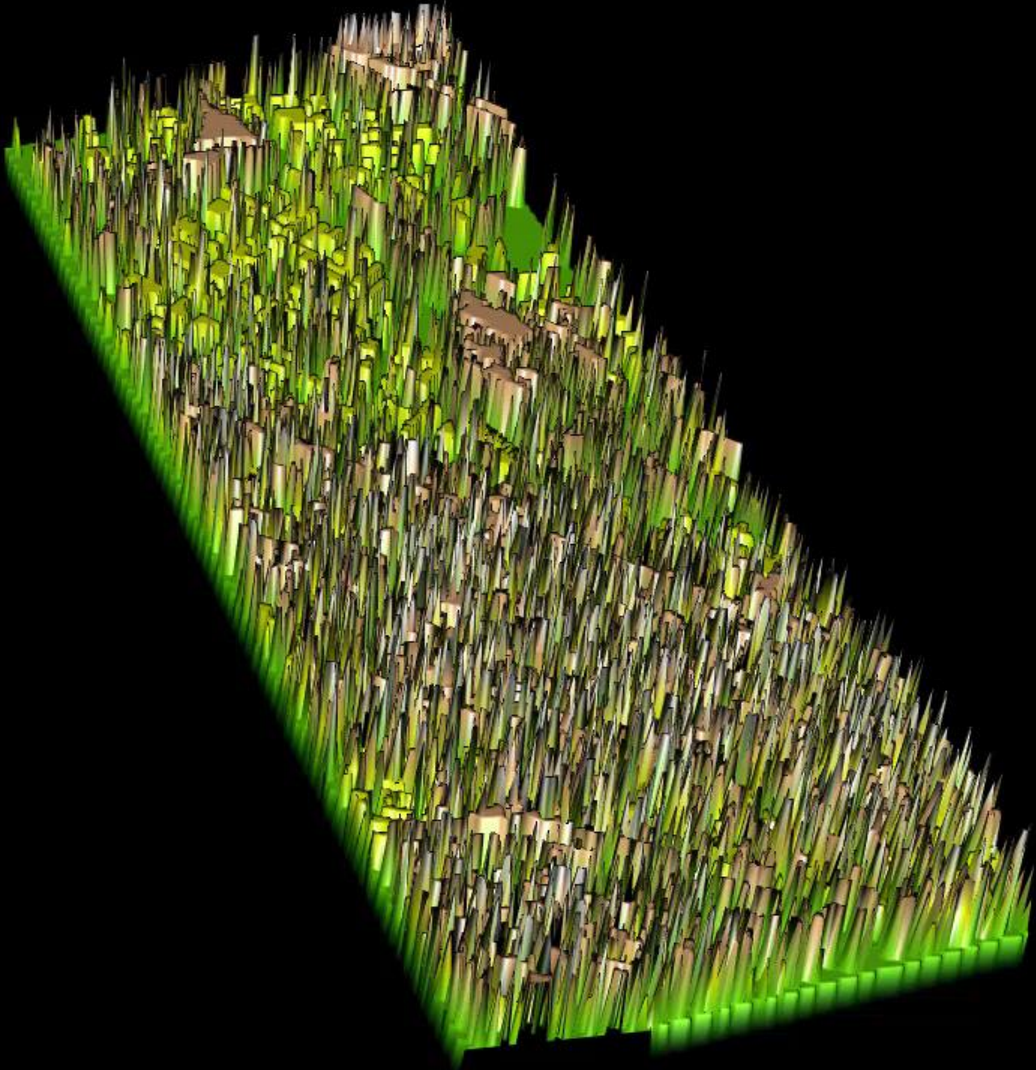


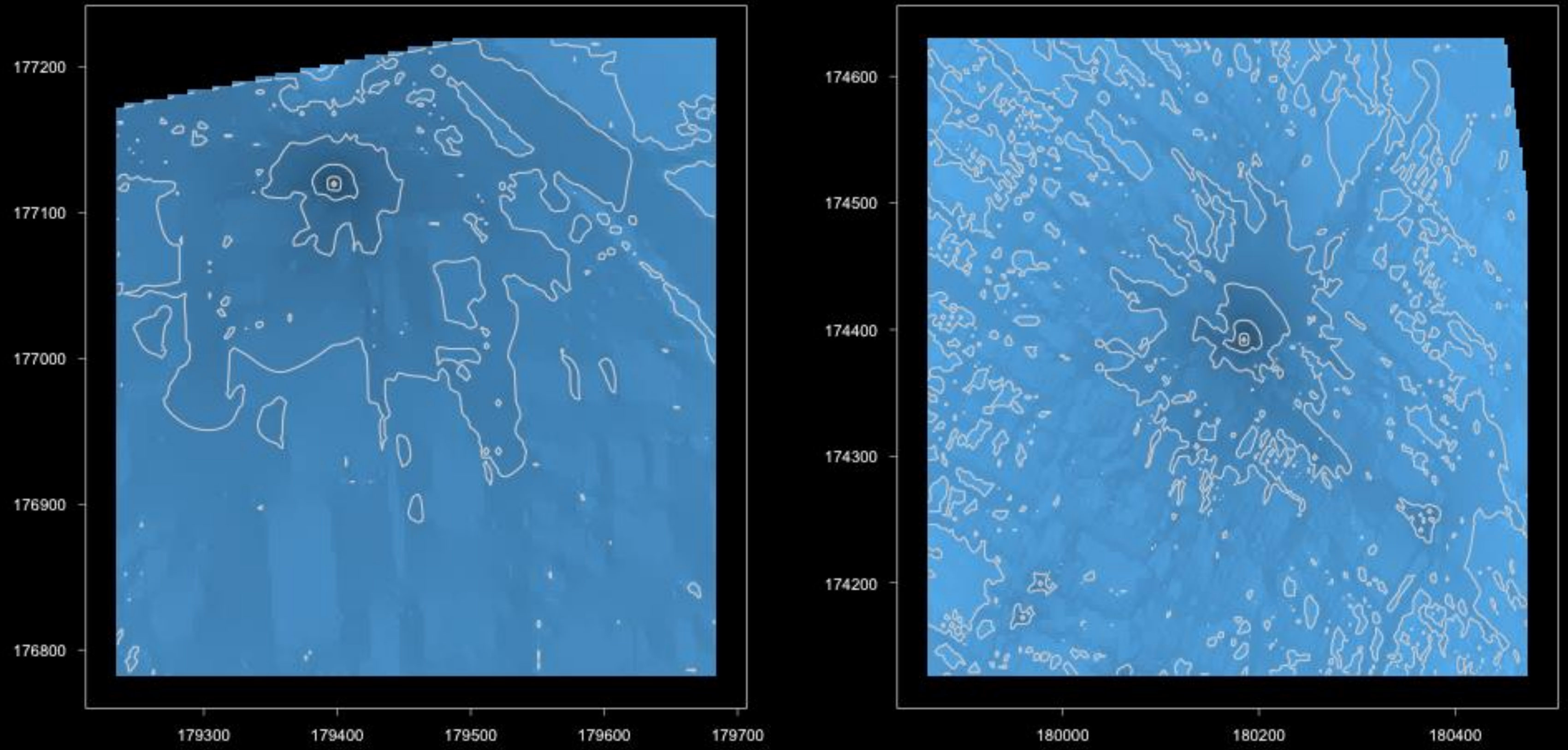
Pollen Network

Dispersal route based on genetic connectivity.

Integrates both physical features (roads, buildings, etc)

And biotic landscape features





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Take Home Messages

1. Genetic connectivity influence by **physical matrix**

2. **Not** all ‘greenspace’ species are equal for functional connectivity

3. Genetic ‘neighborhoods’ are a **heterogeneous functional** unit

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