Mapping Ecosystem Connectivity

Diamond Head Consulting
Aubrey Butcher

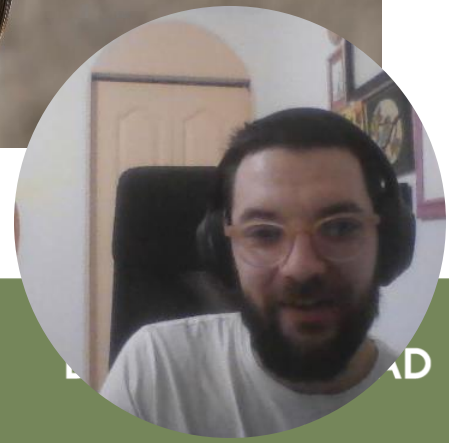
An Ecological Network

- Urbanization and industry has historically focused on lowland/waterfront and resource rich areas which support high levels of biodiversity
- As cities develop, these valuable habitats are lost and become fragmented

1895 – North Arm Road, Granvill

An Ecological Network

- Connectivity is critical for wildlife to access habitat
- Allows for populations to interbreed
- Isolation of populations can impact genetics
- Prey and predator dynamics become unbalanced
- Constraining wildlife movement can increase predation



An Ecological Network - Goals

- Maximizes the value of natural areas and their ability to support as many species as possible with a focus on species that are at risk.
- Protects and connects the most valuable habitat
- Prioritises habitat resources for protection and restoration

An Ecological Network

Biodiversity of a natural area depends on:

- Its size - smaller patches of natural areas have lower biodiversity
- The amount of habitat edges
- How species move
- Their tolerance for and ability to move through urban areas

Who are we managing for?

Urban Adaptors and Exploiters

- Species that can thrive in urbanized context
- Adapted their natural needs
- Use available urban resources, reproduce rapidly, and avoid predation
- Includes non native invasive species

Urban Tolerators

- Require patches of natural plant communities, protection from predators, or food sources that are rarely found in urban contexts.
- Tend to live on the fringes of urban environments

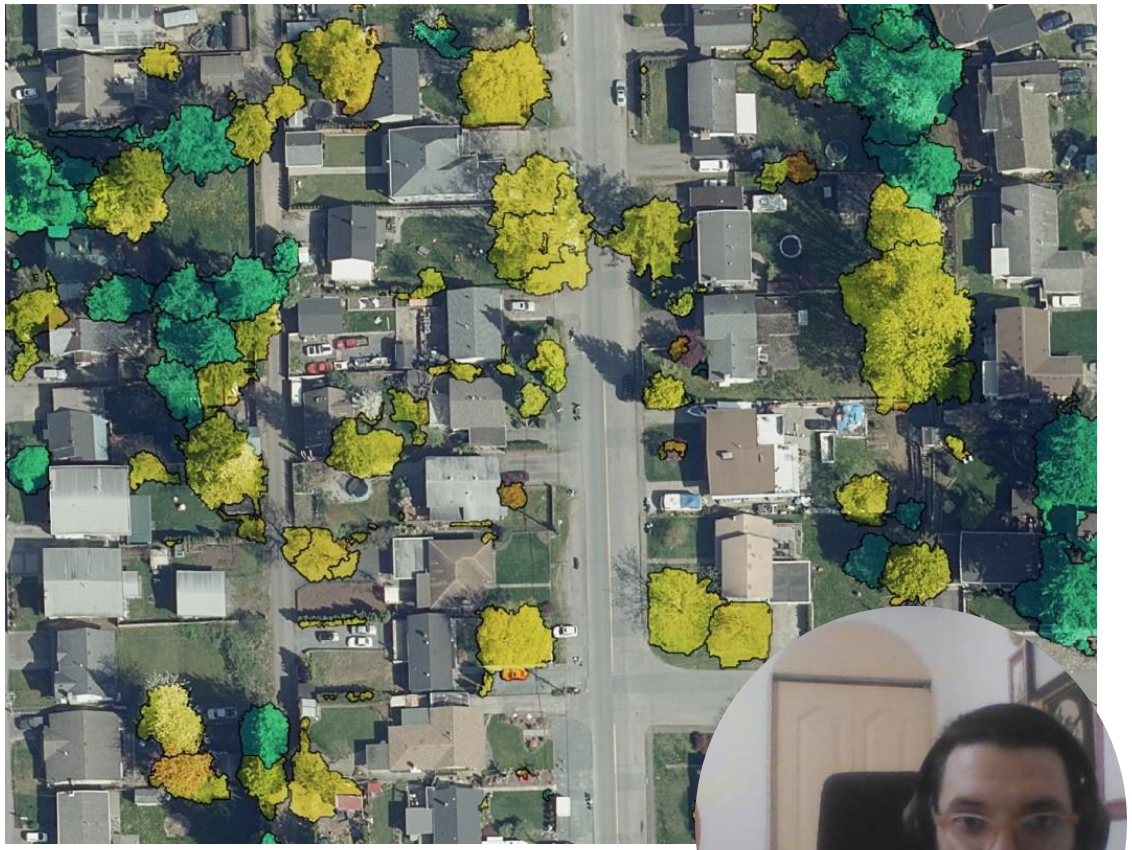
Who are we managing for?

Urban Avoiders

- Low tolerance for urban environments.
- Elusive and have highly specific habitat requirements not common Cities
- Rare in urban settings
- Many are species at risk

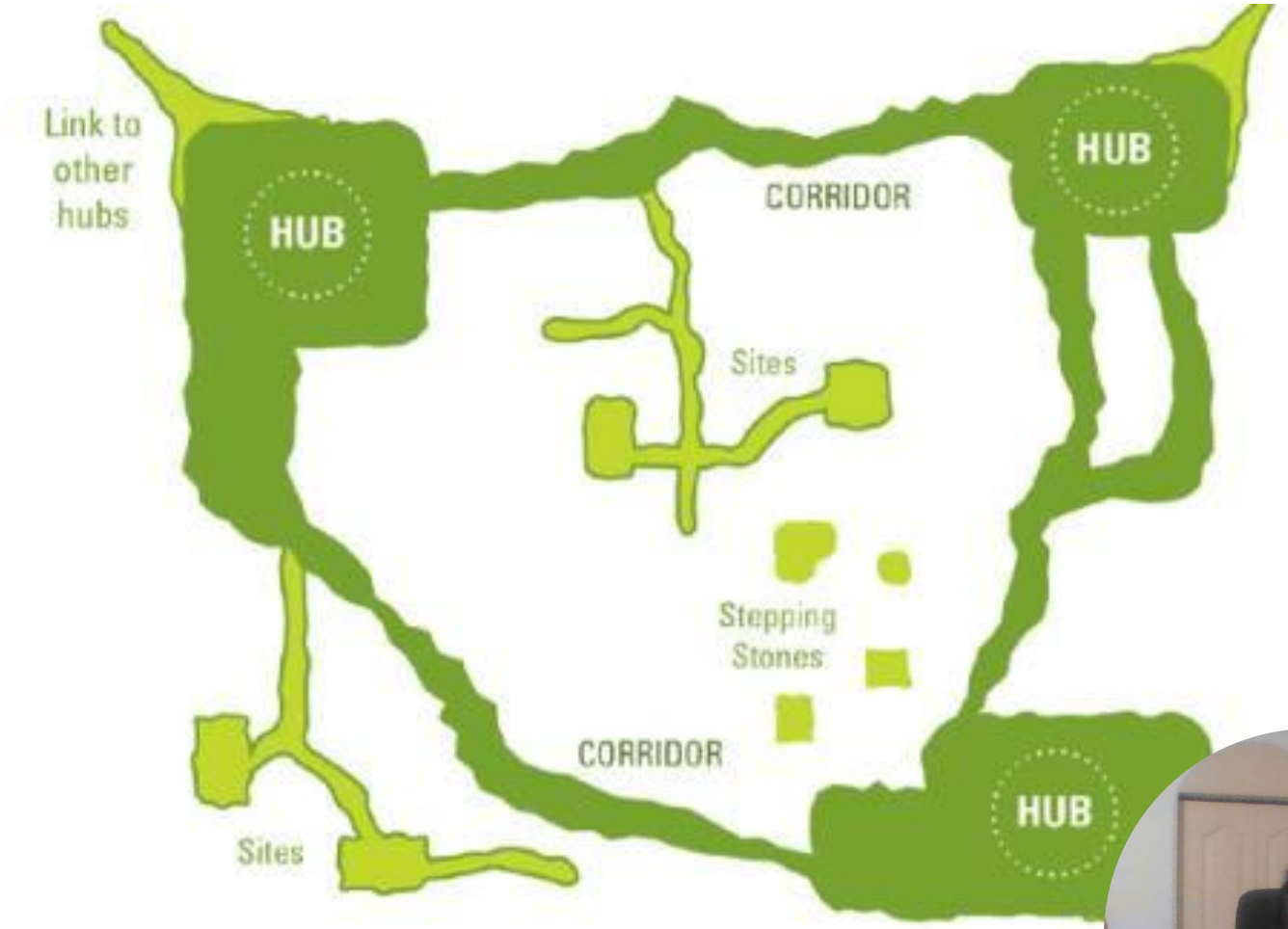
Biodiversity Ranking

Biodiversity Ranking



Components of an EN

- Habitat Hubs
- Habitat Sites
- Movement Corridors



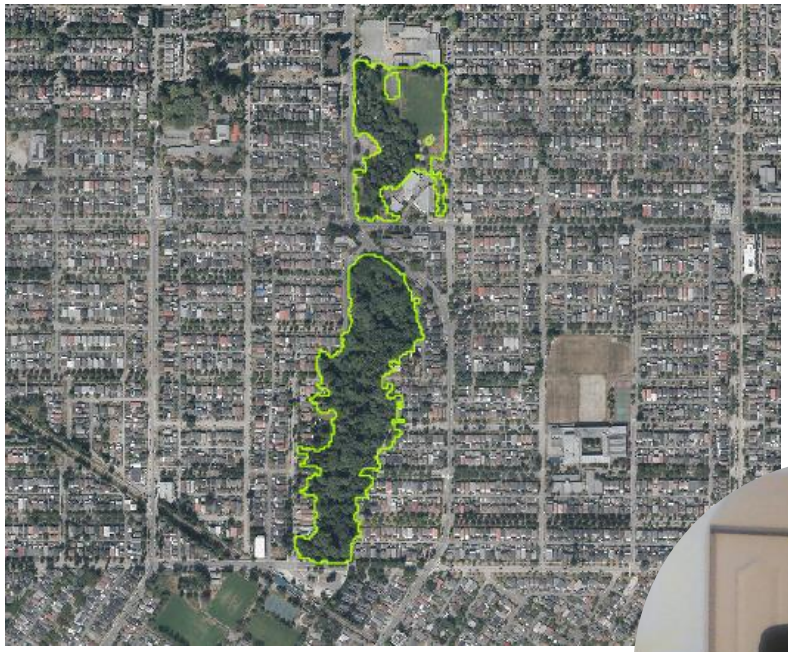
Components of an EN

Core habitat refuge areas

- Large in size (typically >10 ha)
- Provide protected interior habitat
- Refuge areas for wildlife

Stepping stone habitat

- Smaller patches (typically <10 ha)
- More interface edges
- Little refuge areas for wildlife



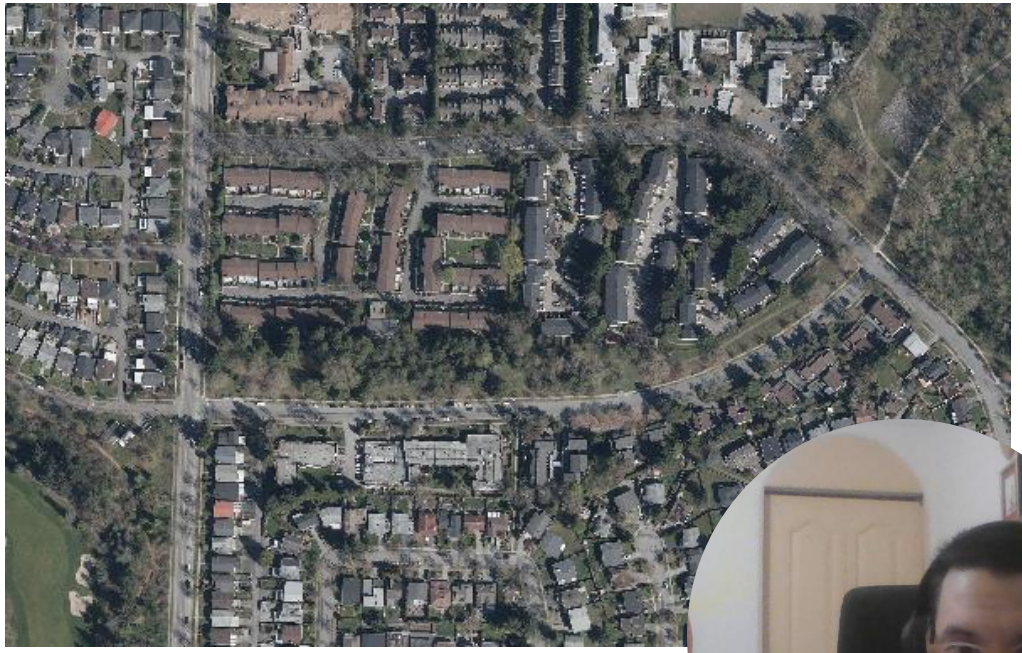
Components of an EN

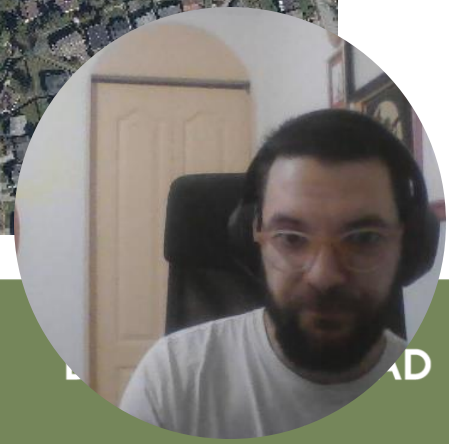
Regional wildlife corridors

- Linear natural habitat
- Connect habitat patches together
- Wide and continuous

Local wildlife corridors

- Narrow and fragmented by urban barriers
- 10-30 m wide
- Provide natural cover for birds, flying insects and mammals tolerant of urban activity





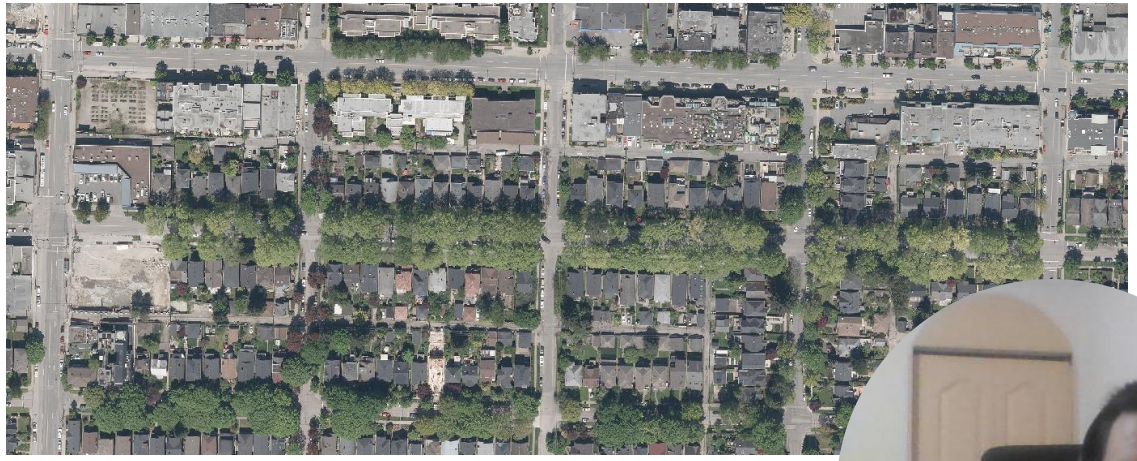
Components of an EN

Greenway corridors

- Multi-use linear pathway network
- narrower with fragmented, inconsistent natural features
- can be improved by planting trees, hedgerows, and pollinator-friendly flowers
- Support urban tolerant wildlife

Aerial corridors

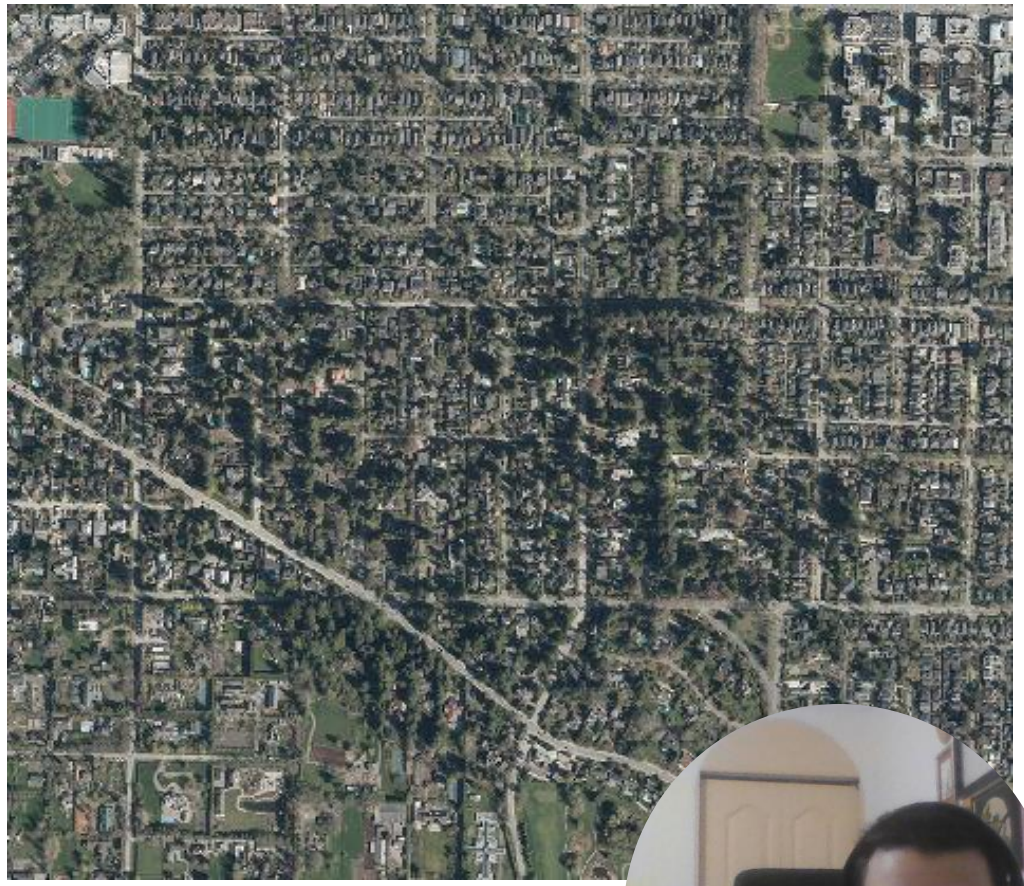
- No easy terrestrial movement
- Connected tree canopies supporting aerial movement through urban landscapes
- Supports flying insect and birds as well as highly tolerant terrestrial wildlife



Components of an EN

The Urban Matrix

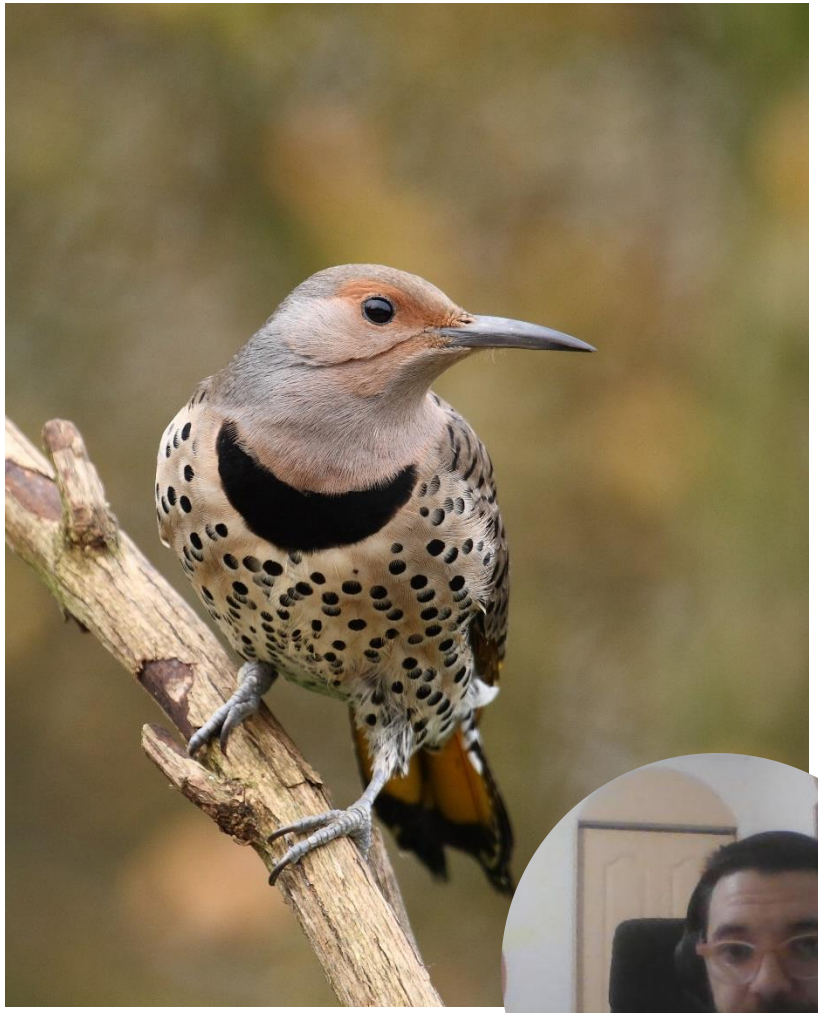
- Natural areas intermixed within an urbanized landscape
- Small patches of habitat
- Single or small groups of trees
- Non-native habitat features such as garden areas
- Habitat for mostly flying and urban tolerant wildlife
- Enhanced engineered assets (e.g. rain gardens, bioswales, green roofs, green walls)



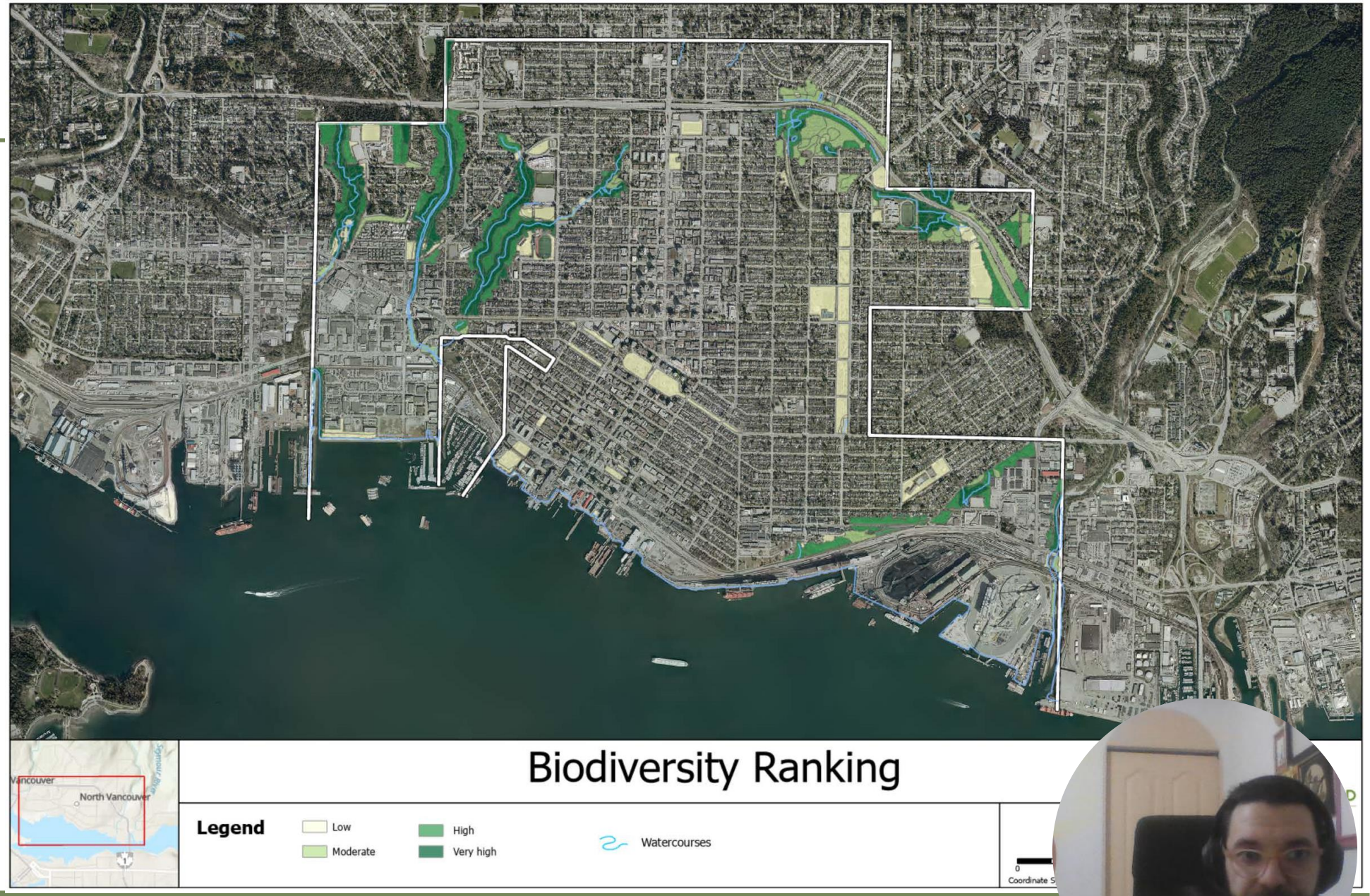
Examples of ENs

There are a wide variety of examples which vary in

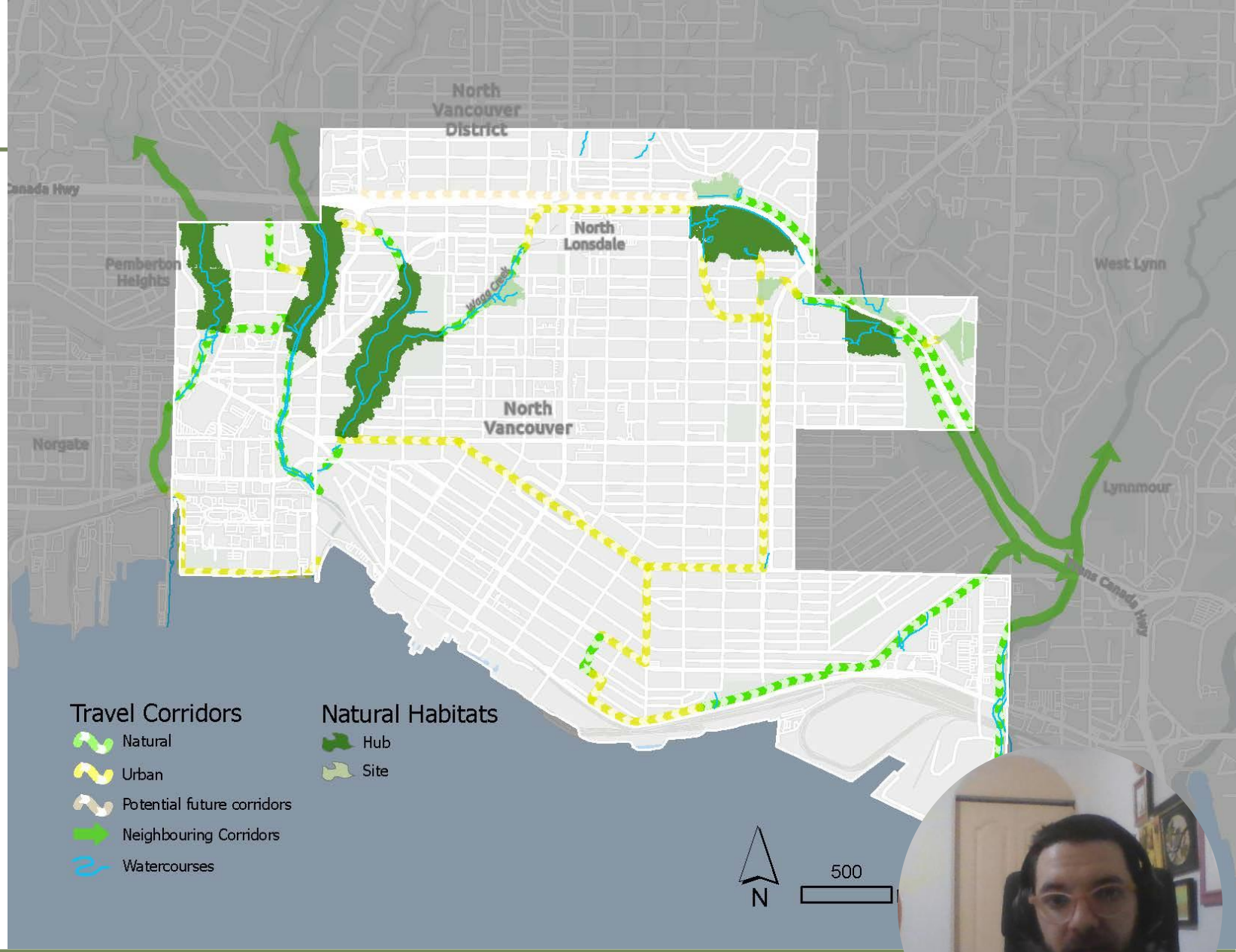
- Scale
- Components
- Terminology



City of North Vancouver Biodiversity Ranking

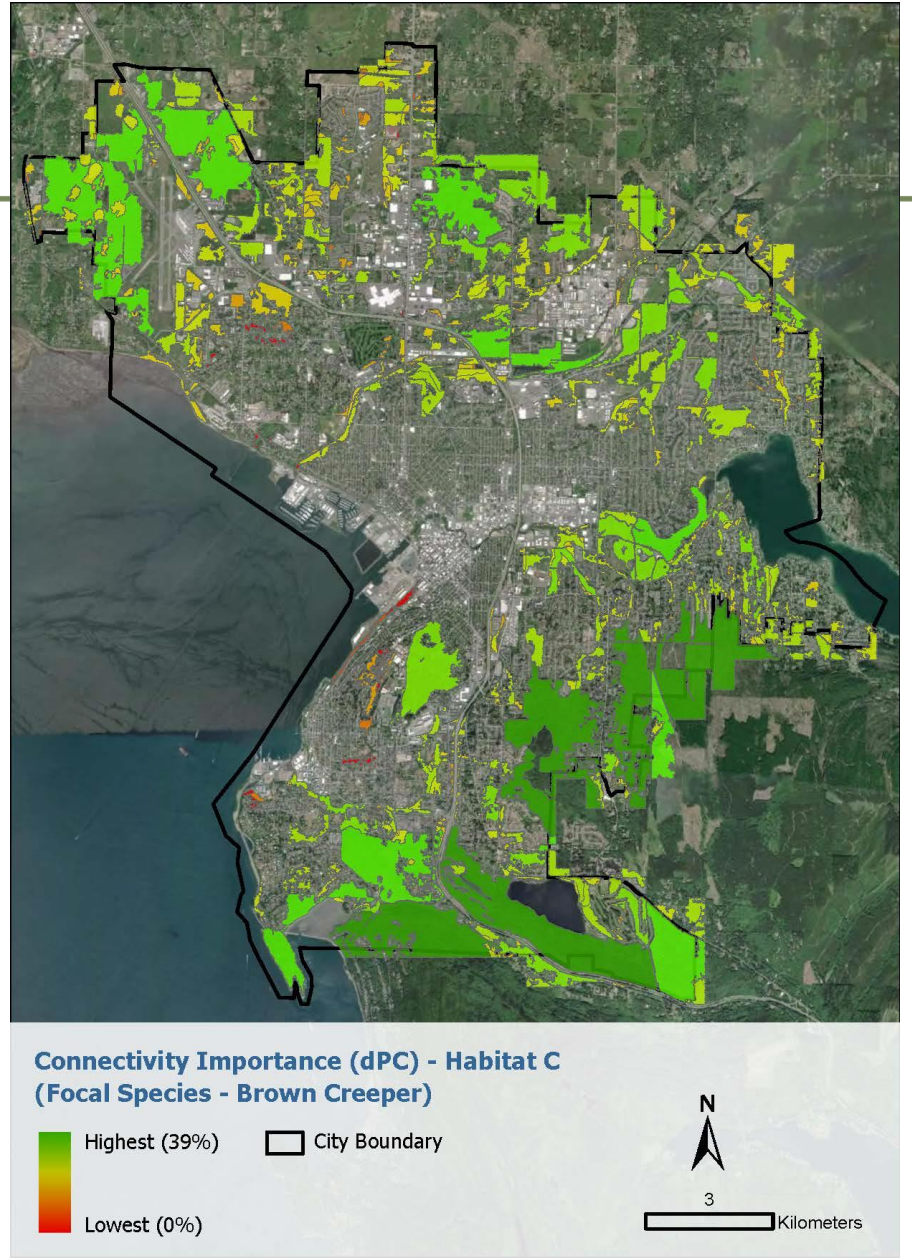


City of North Vancouver Natural Habitat Network

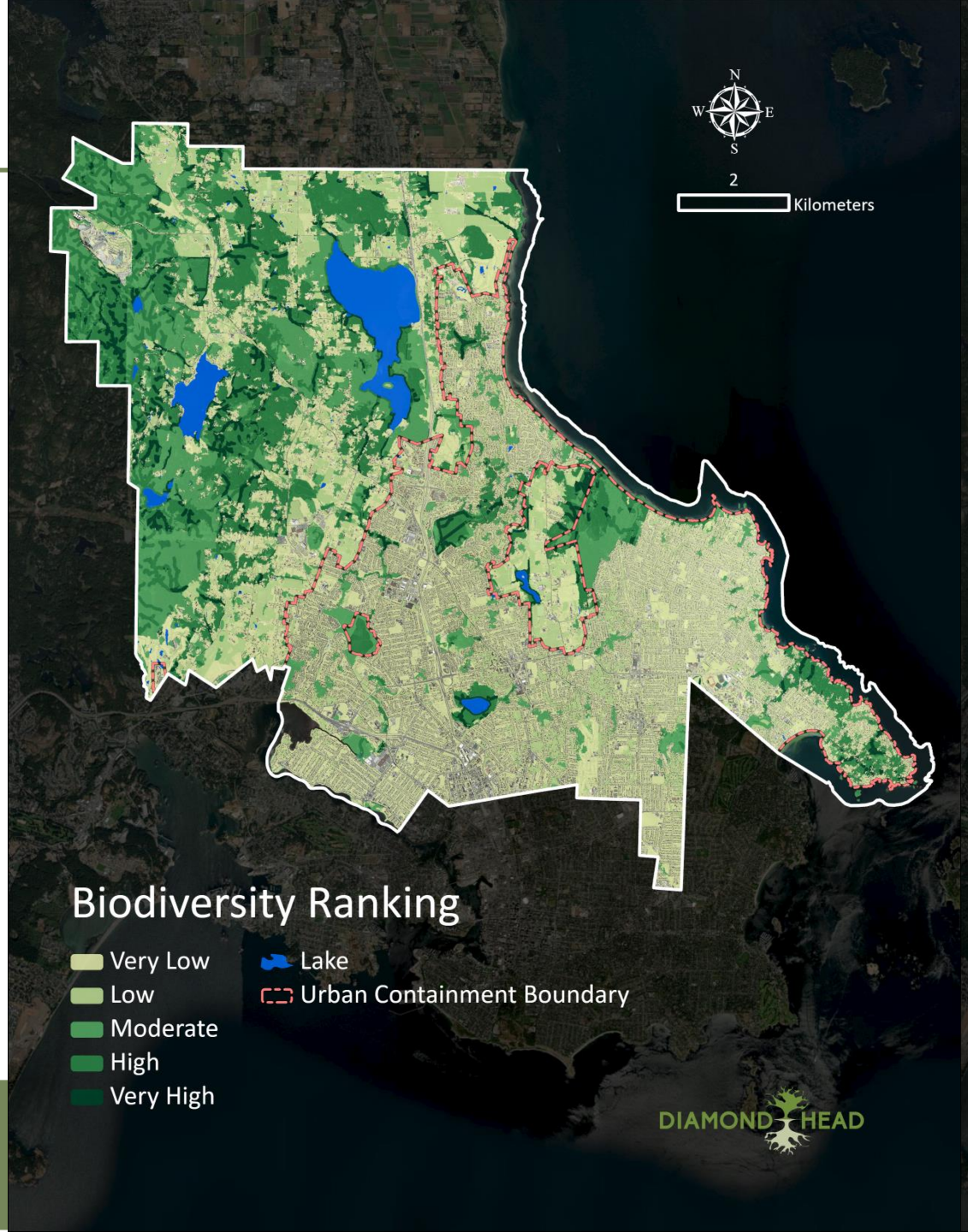


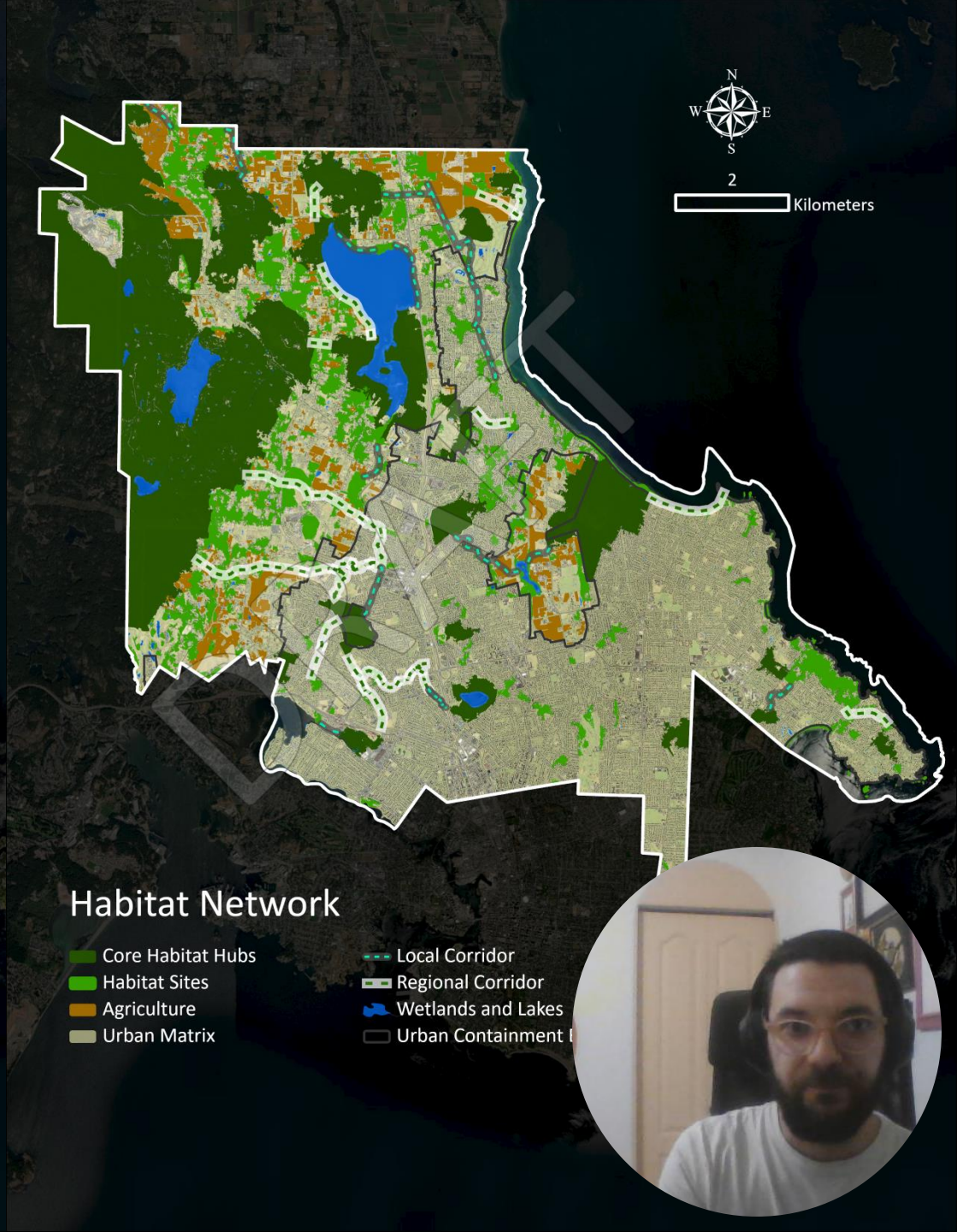
City of Bellingham

Connectivity



District of Saanich

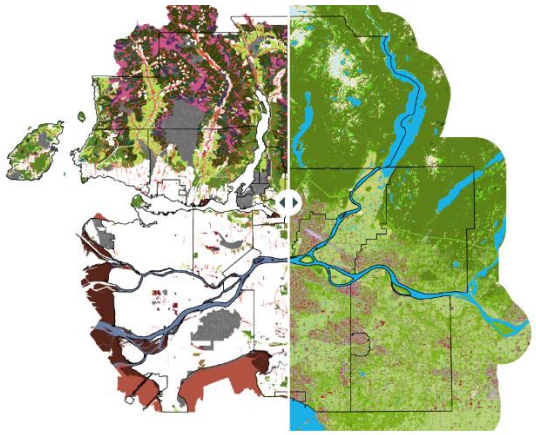


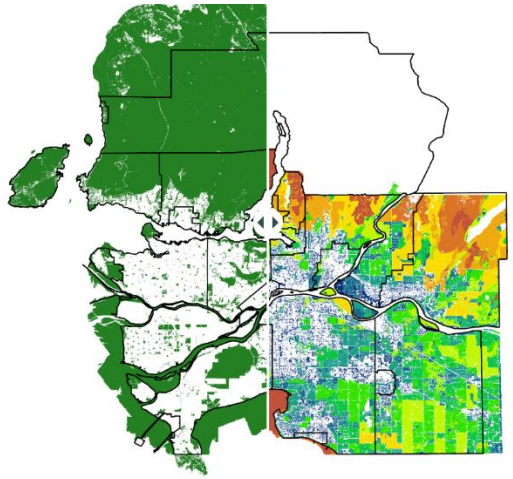


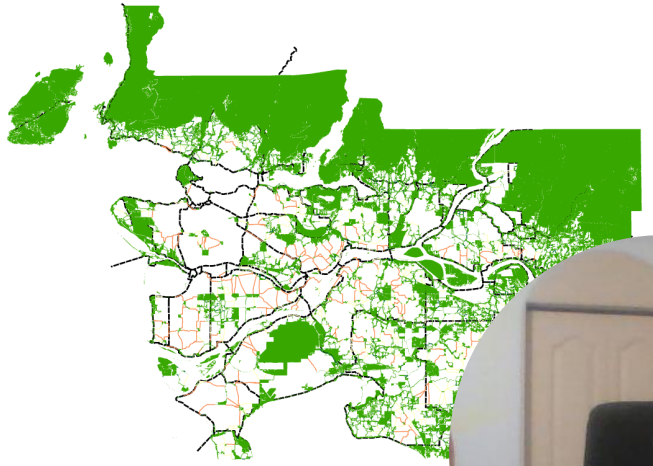
Metro RGIN - Methodology

Automated GIS steps

- Step 1 – Identify the Core Terrestrial Habitat Areas to include in this analysis
- Step 2 – Use the Ecosystem Connectivity Analysis to evaluate these habitat areas for their connectivity importance
- Step 3 – Identify least-cost path travel corridors between this habitat areas



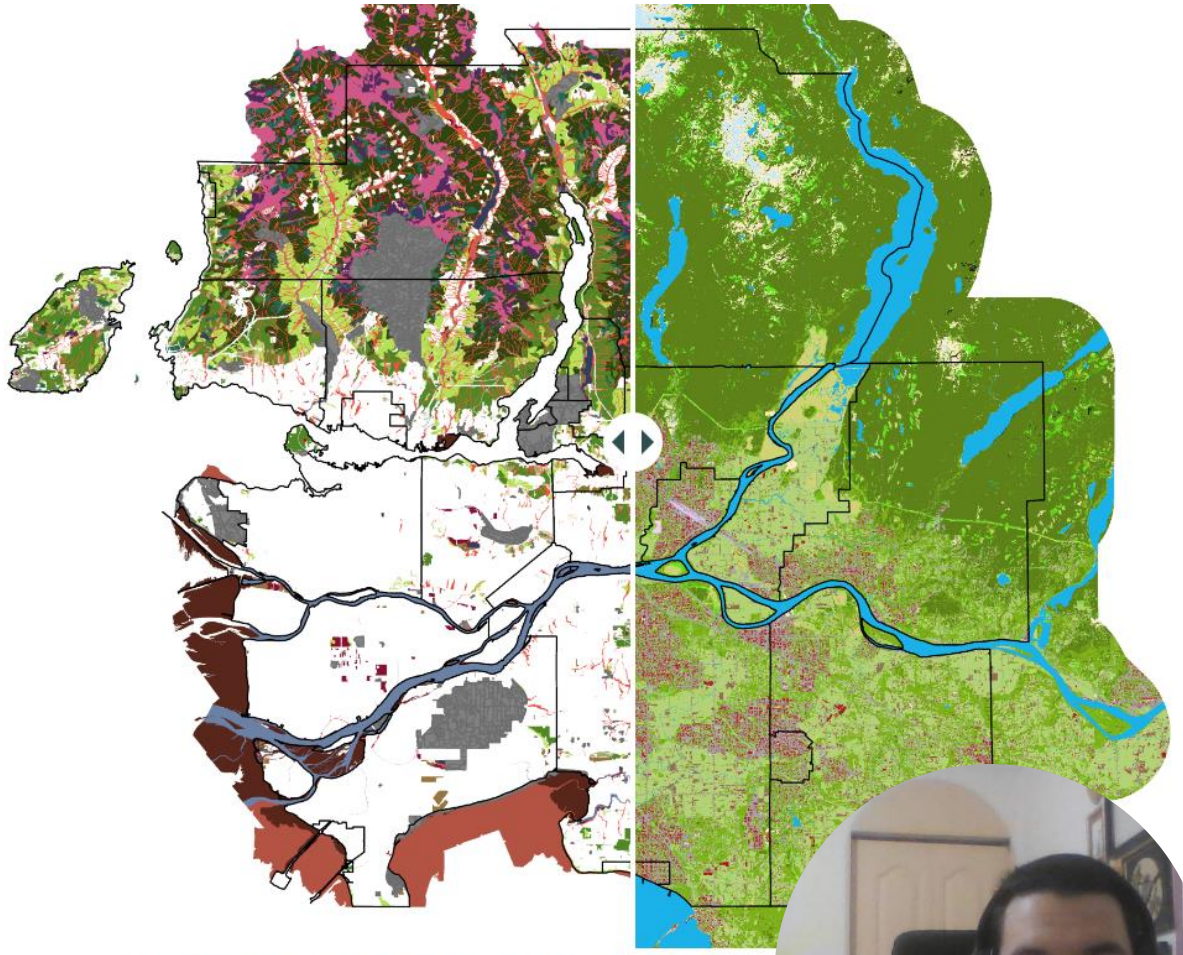




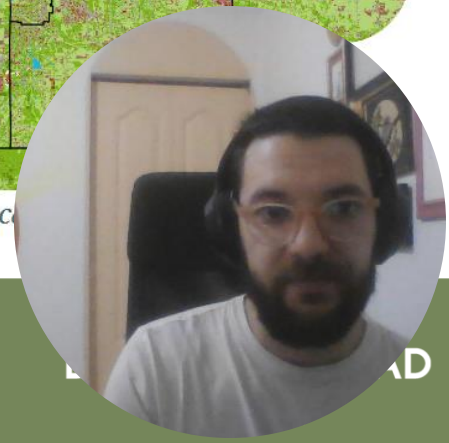
Draft methodology and testing

Step 1 - Identify Core Terrestrial Habitat Areas

- These will be considered when identifying and prioritising a network
- SEI ecosystems - old, mature and young forest, alpine, estuarine, freshwater, herbaceous, old field, riparian, sparsely vegetated, woodland, and wetland.
- Add all land cover classes for terrestrial habitat that are adjacent/contiguous or within 30m from the SEI polygons and are greater than 0.5 hectares in size.



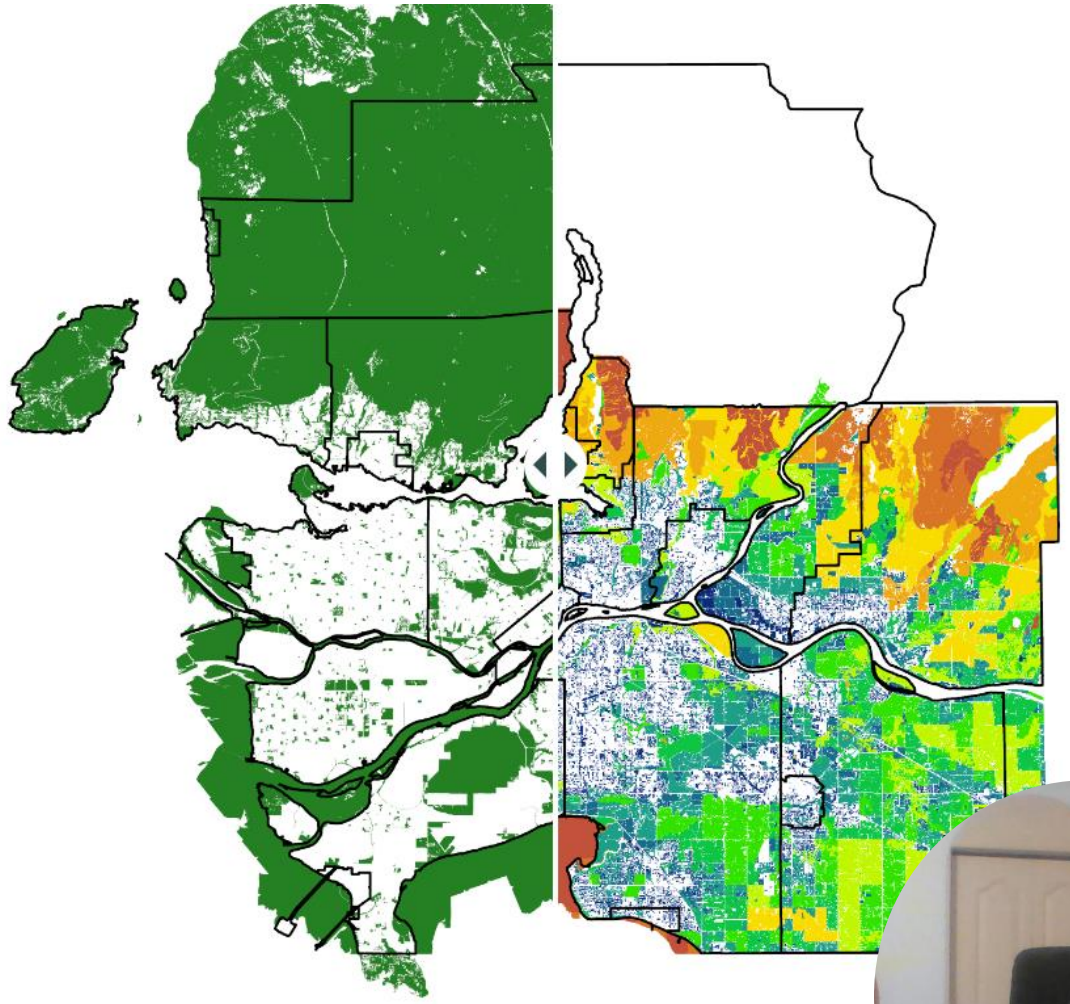
Metro Vancouver 2020 Sensitive Ecosystem Inventory and Land C

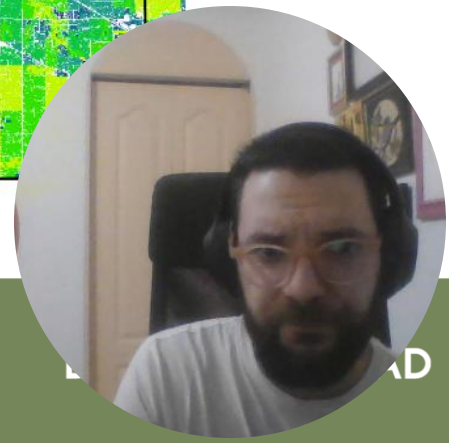


Draft methodology and testing

Step 2 – Analyze patches to determine which are most important

- Overlay core patches with connectivity metrics to determine patch importance for connectivity

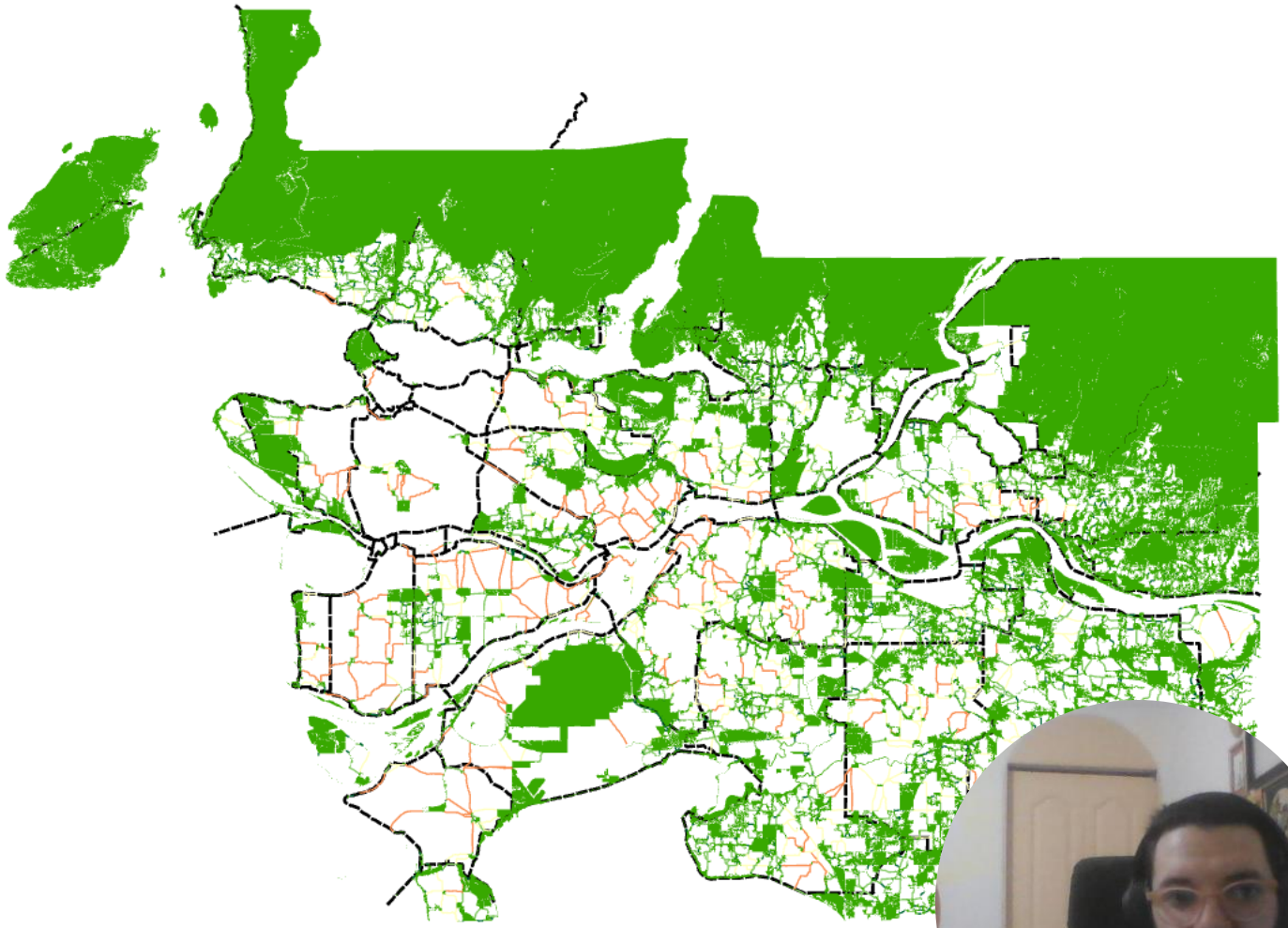




Draft methodology and testing

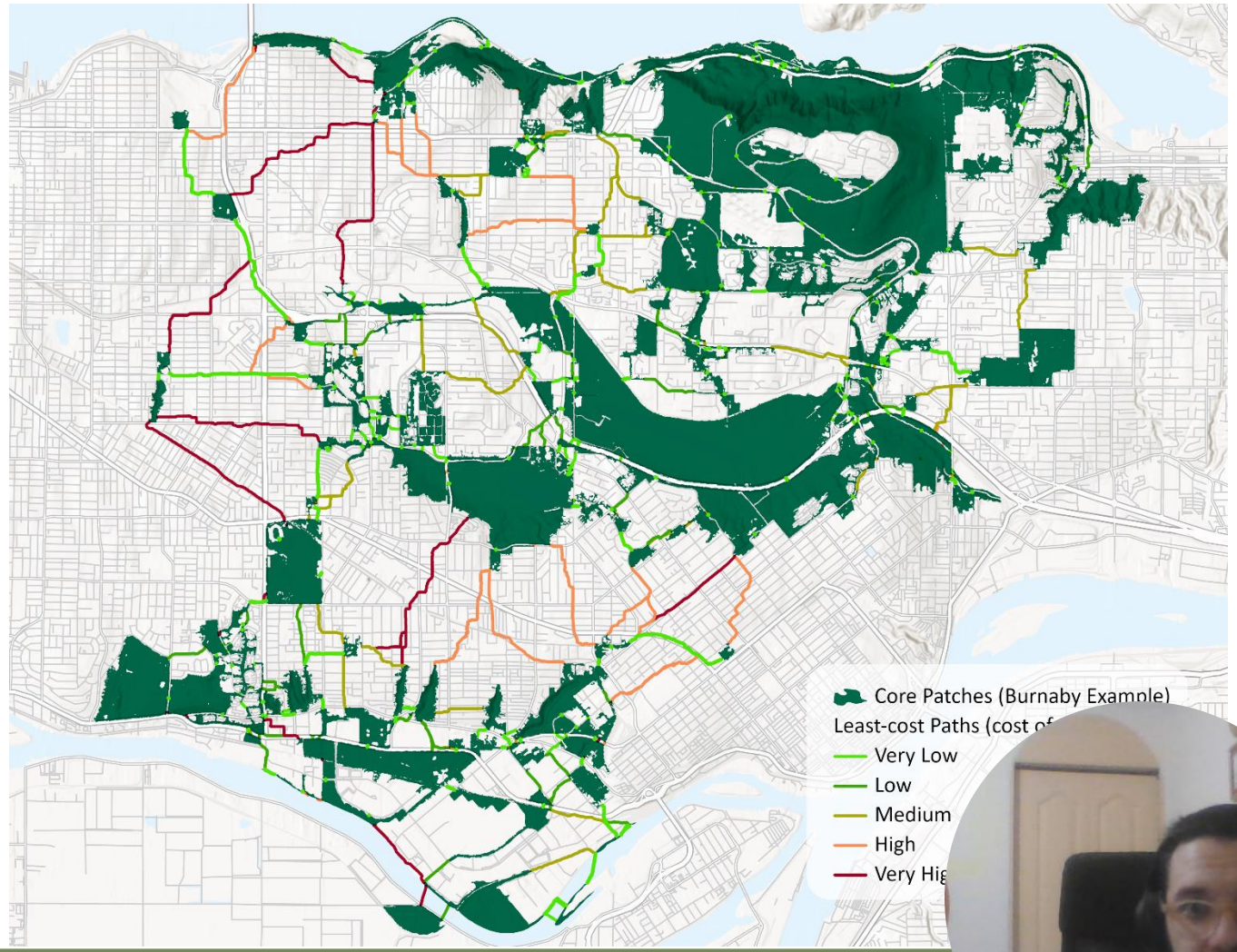
Step 3 – Identify important corridors that connect core habitat areas

- Use the analysis tool “Optimal Region Connections” to identify least-cost paths connecting the core terrestrial habitat areas
- Uses a cost of movement raster based on land cover data
- Analyse excludes patches that have a low connectivity score



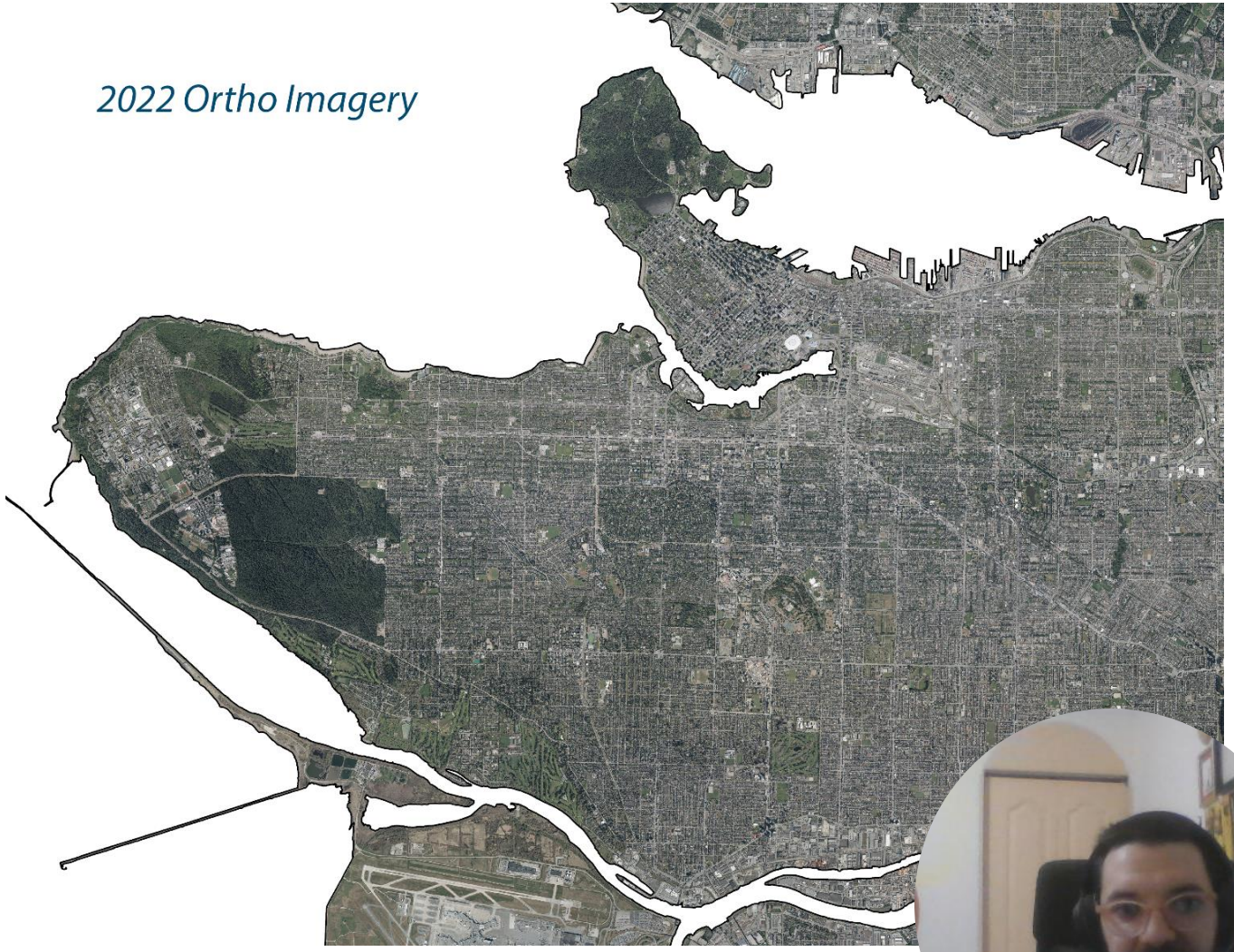
Draft methodology and testing

Step 3 – Identify important corridors that connect core habitat areas



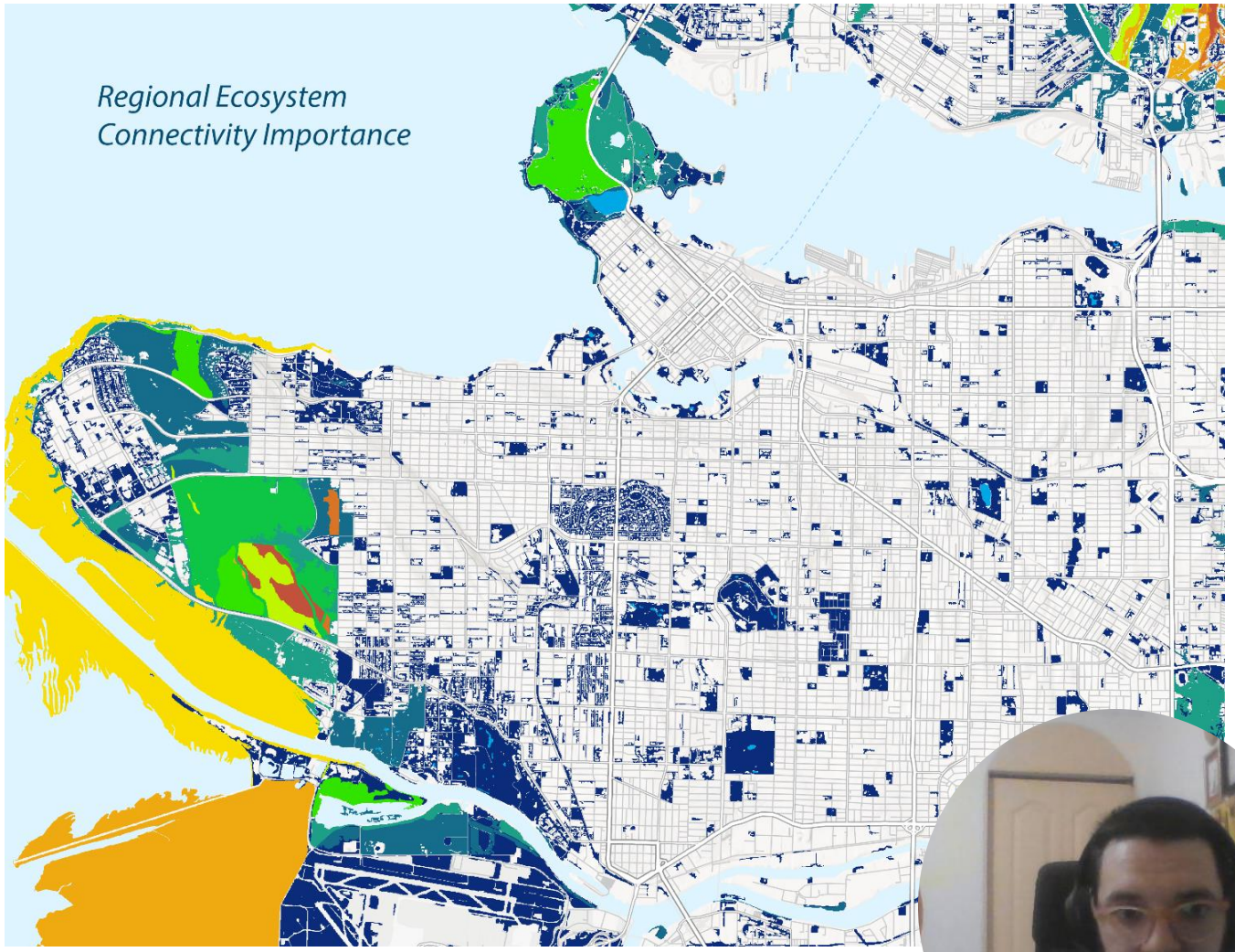
Case Study – City of Vancouver

2022 Ortho Imagery



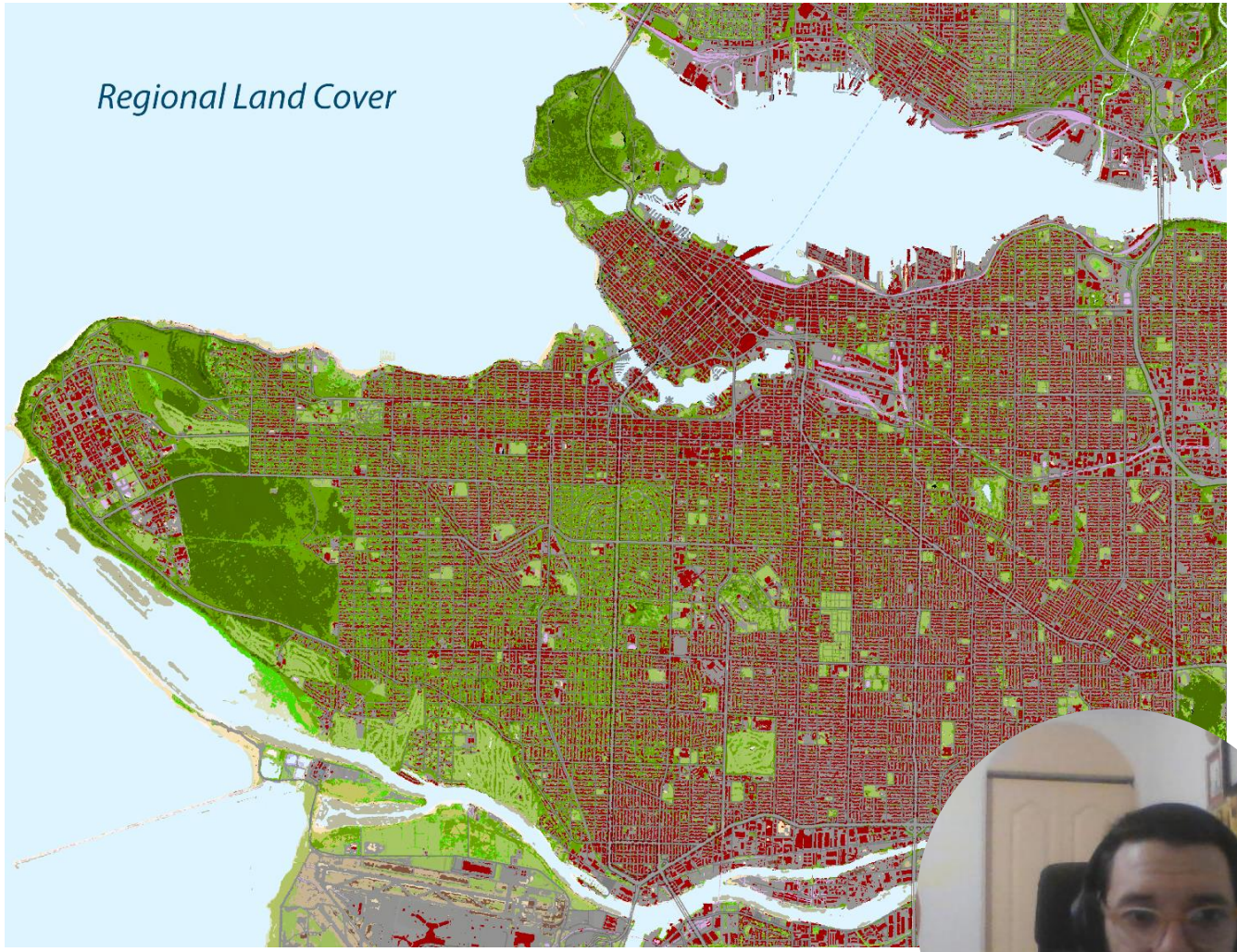
Case Study – City of Vancouver

Metro Vancouver Ecosystem Connectivity



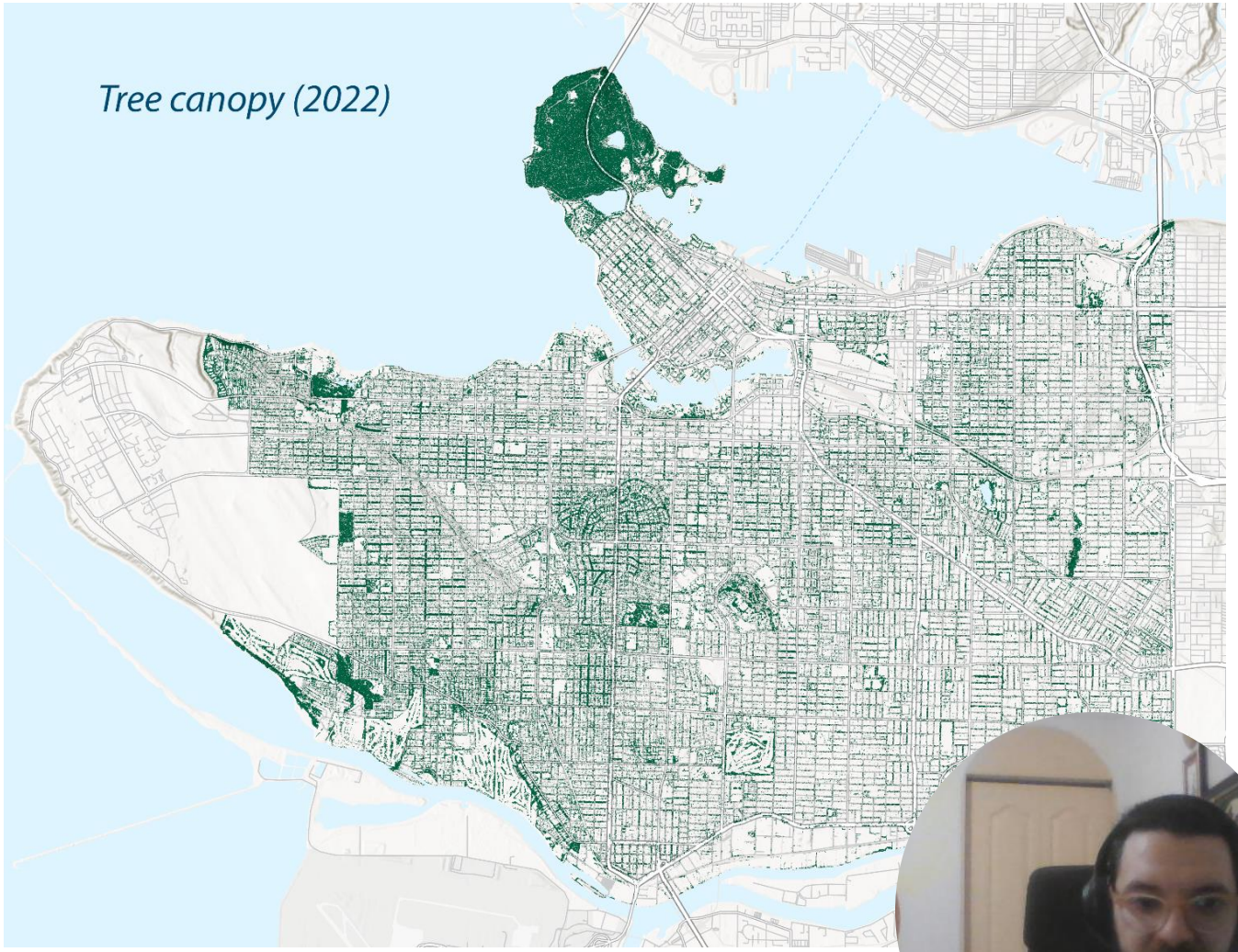
Case Study – City of Vancouver

Metro Vancouver Land Cover



Case Study – City of Vancouver

Tree canopy

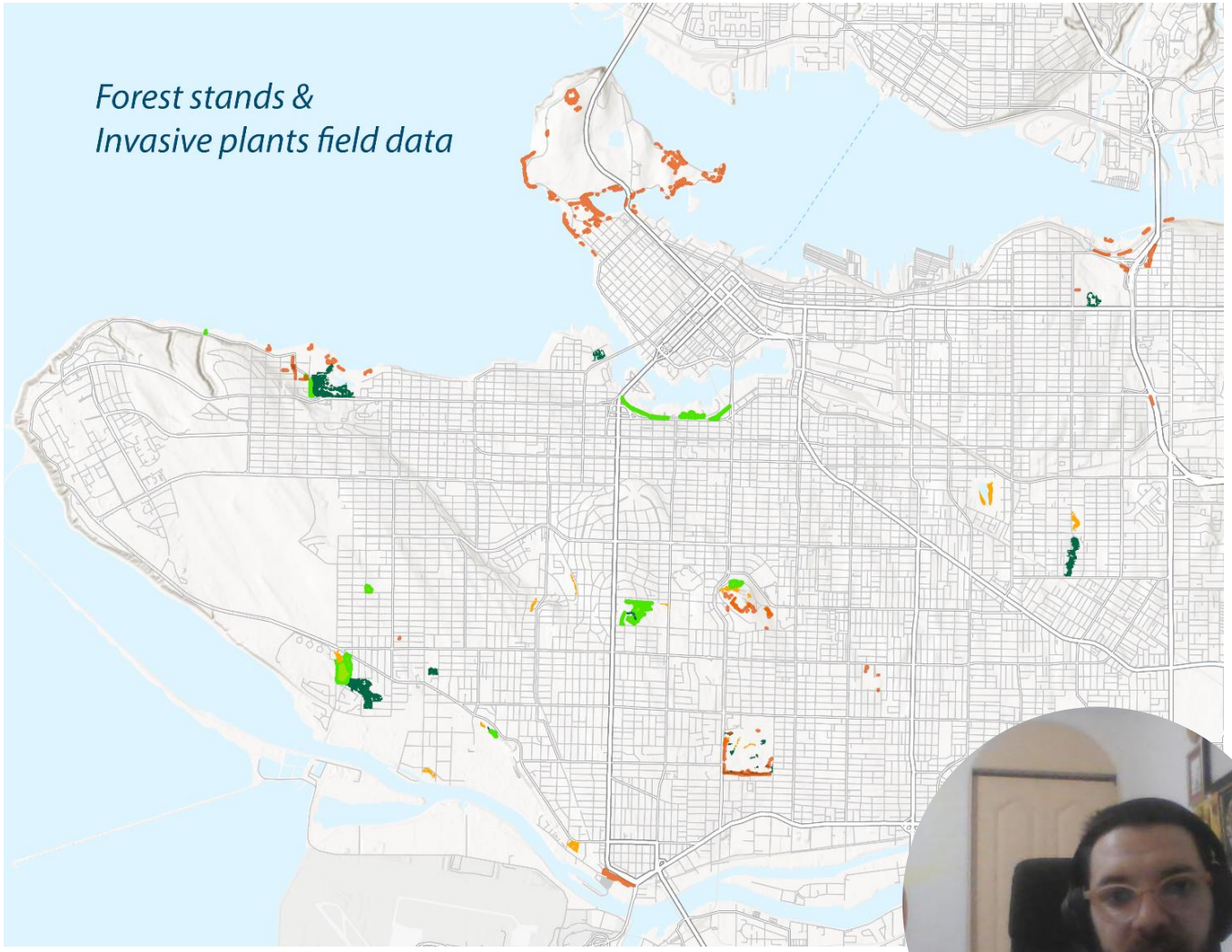


Case Study – City of Vancouver

Metro Vancouver SEI

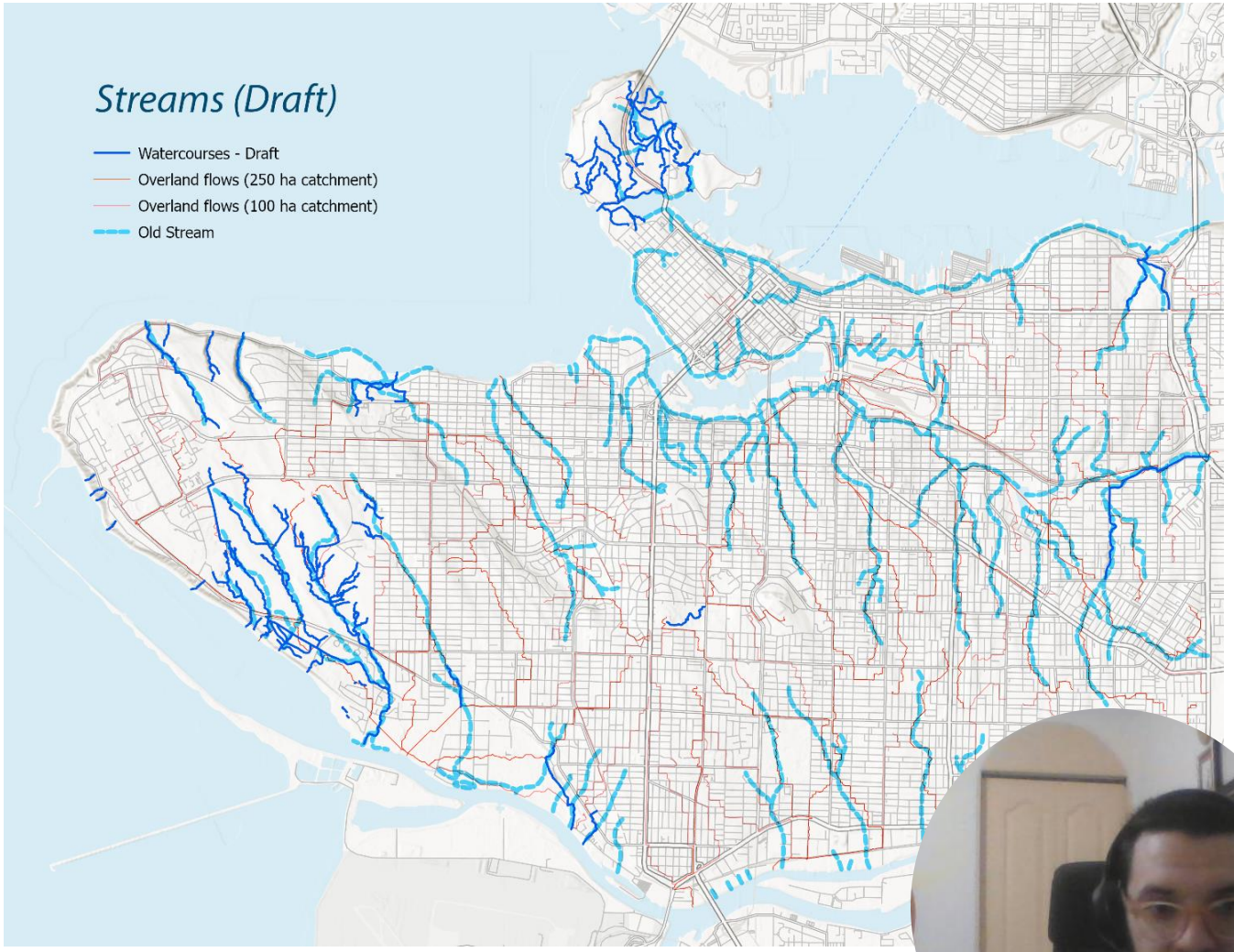
Case Study – City of Vancouver

Parks - Invasive Plant Inventory



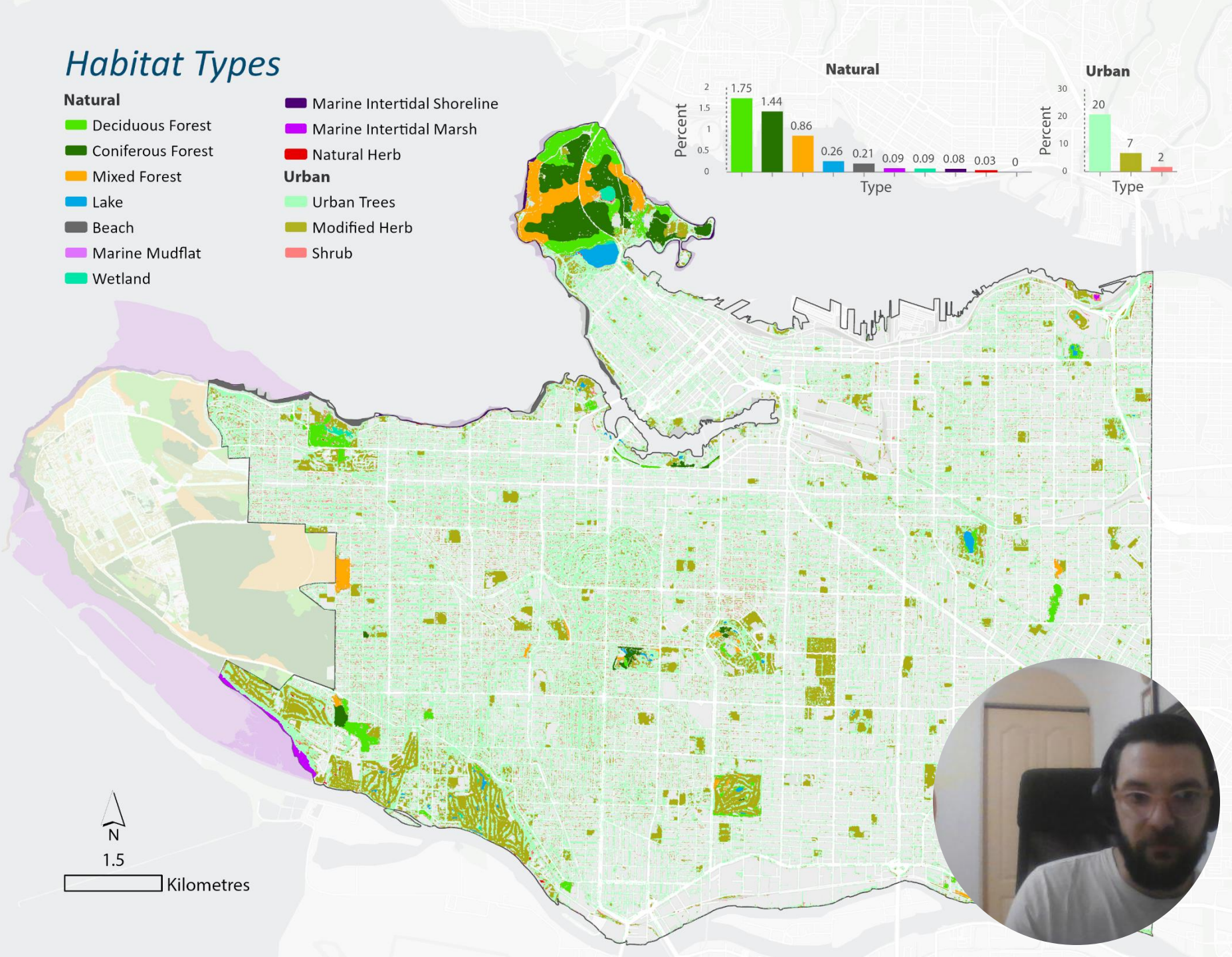
Case Study – City of Vancouver

Streams



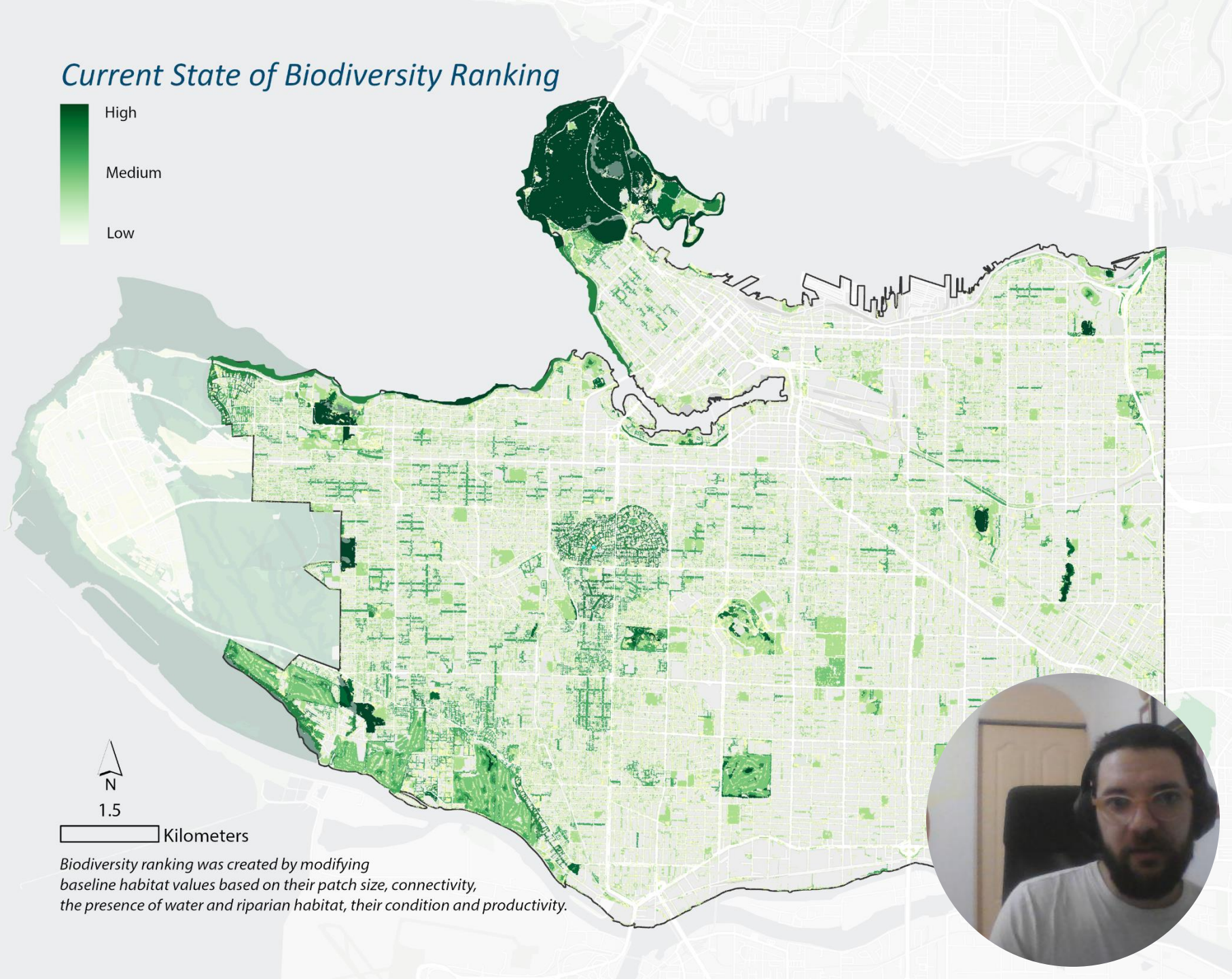
Mapping

Habitat types



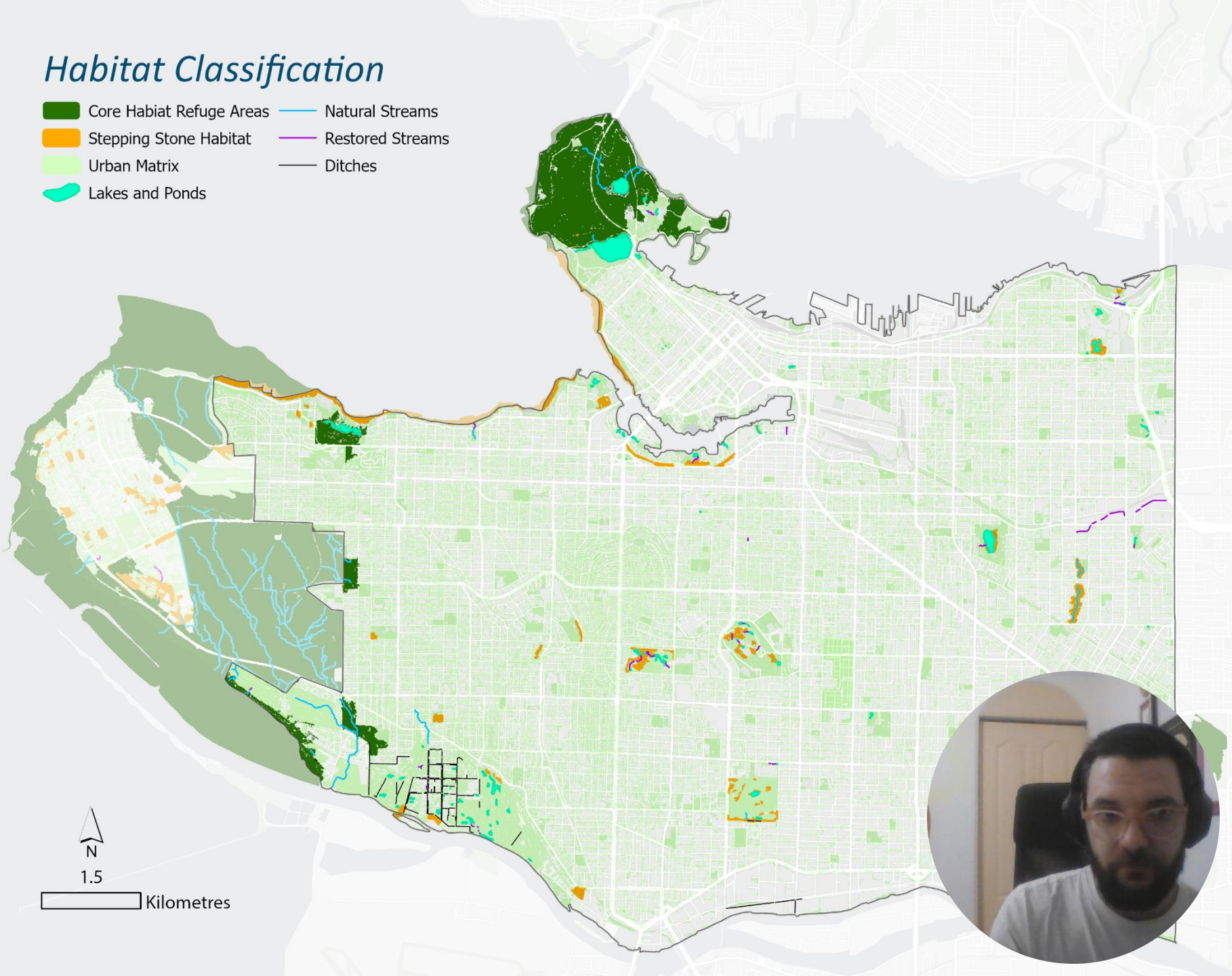
Mapping

Biodiversity Ranking



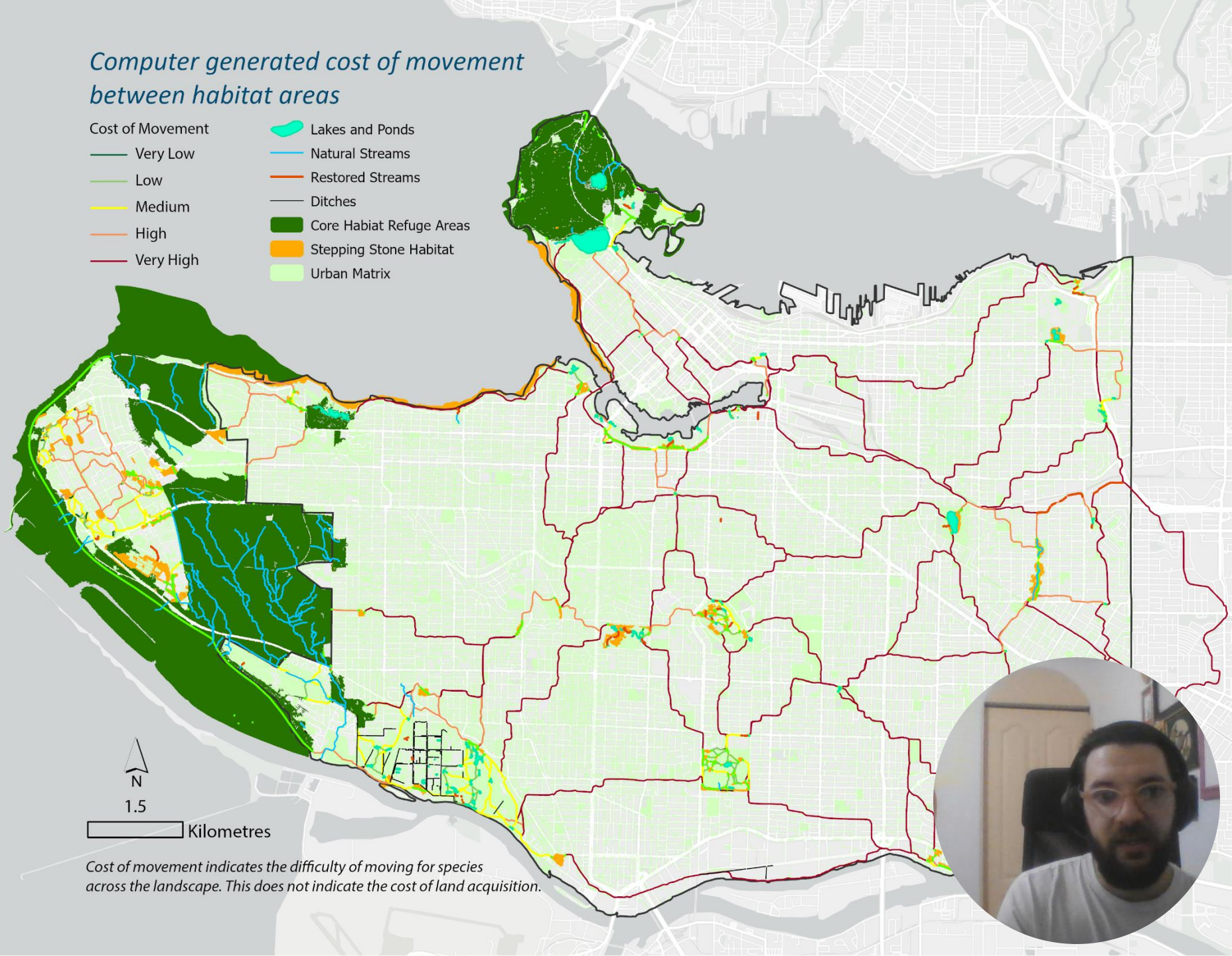
Mapping

Habitat Classification



Mapping

Computer generated cost of movement corridors



Thank you!