Lunch Session 3 Presented by the GPSC:

Urban Biodiversity, Natural Capital Accounting, and Nature-based Infrastructure

Singapore, Edmonton, London, and Sao Paulo approaches

May 9, 2019 | 12:30 – 14:00 | MC 9 – 100

BIODIVERSITY CONSERVATION IN DENSELY POPULATED CITIES: SINGAPORE'S APPROACH

Lena Chan

Senior Director, International Biodiversity Conservation Division,
National Parks Board

Global Platform for Sustainable Cities Lunchtime Talk
World Bank, Washington DC
9 May 2019

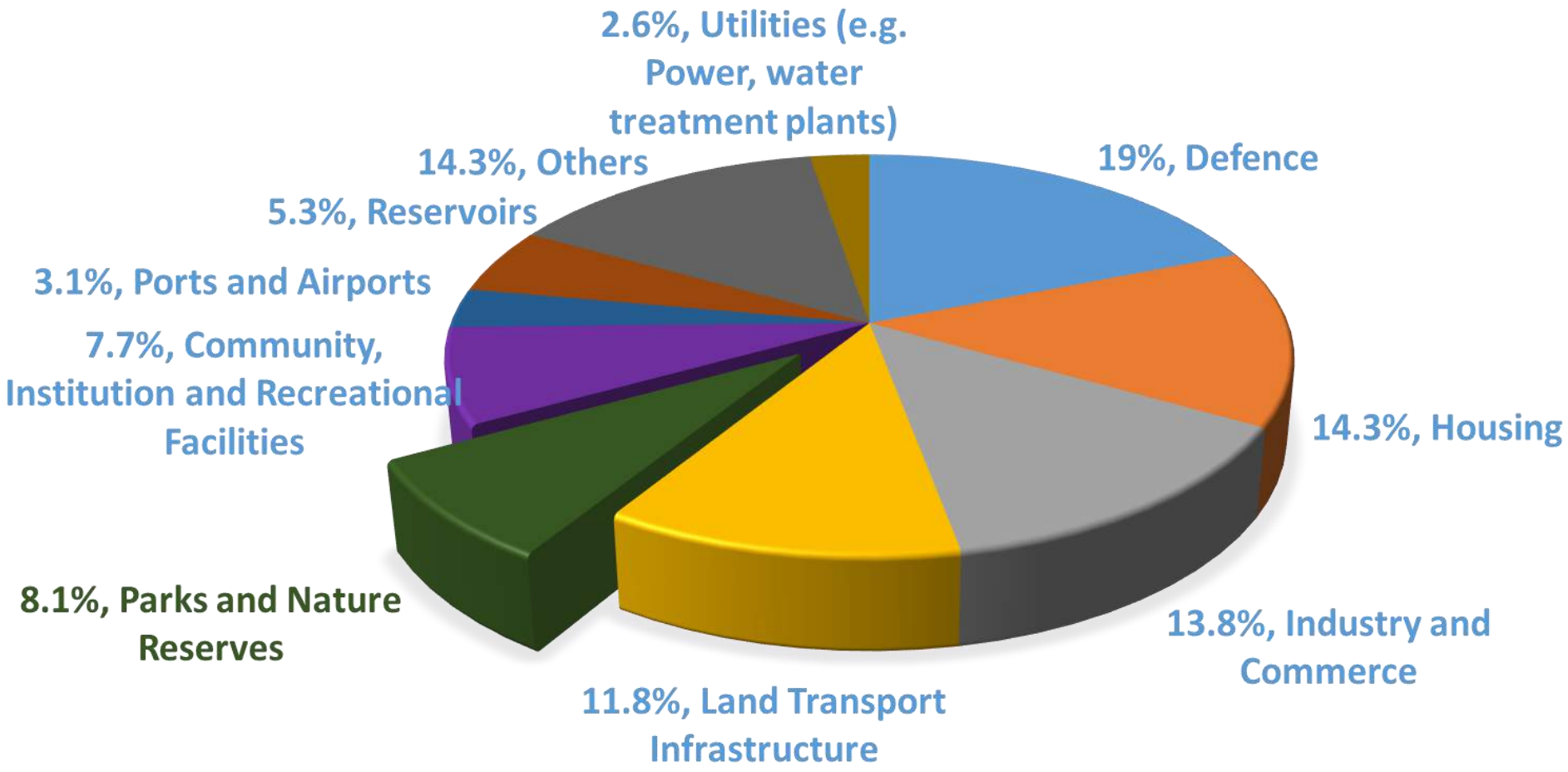
Singapore on the Equator

- Climate of perpetual summer and high rainfall
- Rich diversity of flora and fauna

Comparing Statistics

	WASHINGTON DC	SINGAPORE
PHYSICAL AREA	61 sq miles 158 sq km	278 sq miles 720 sq km
POPULATION	672,391 persons	5.8 million persons
POPULATION DENSITY	11,023 persons/sq mile 4,256 persons/sq km	20,863 persons/sq mile 8,056 persons/sq km

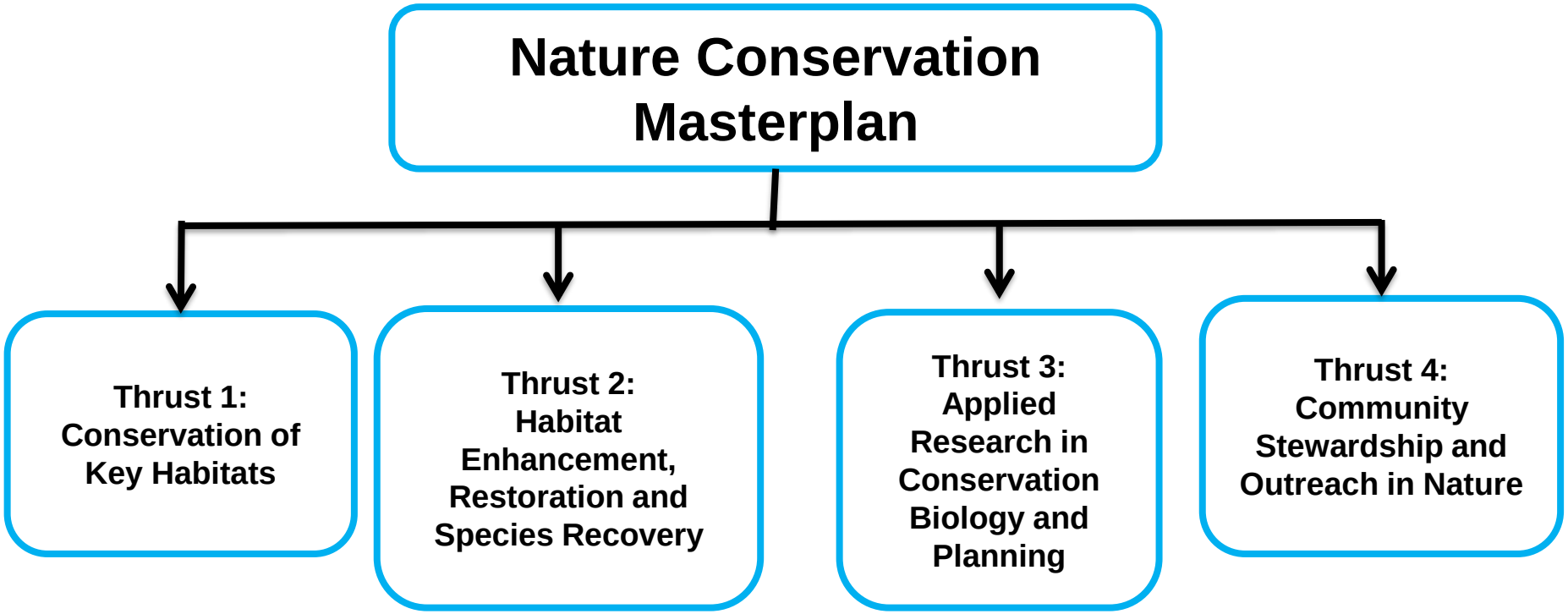
Singapore's landuse



Is There Biodiversity in Singapore?

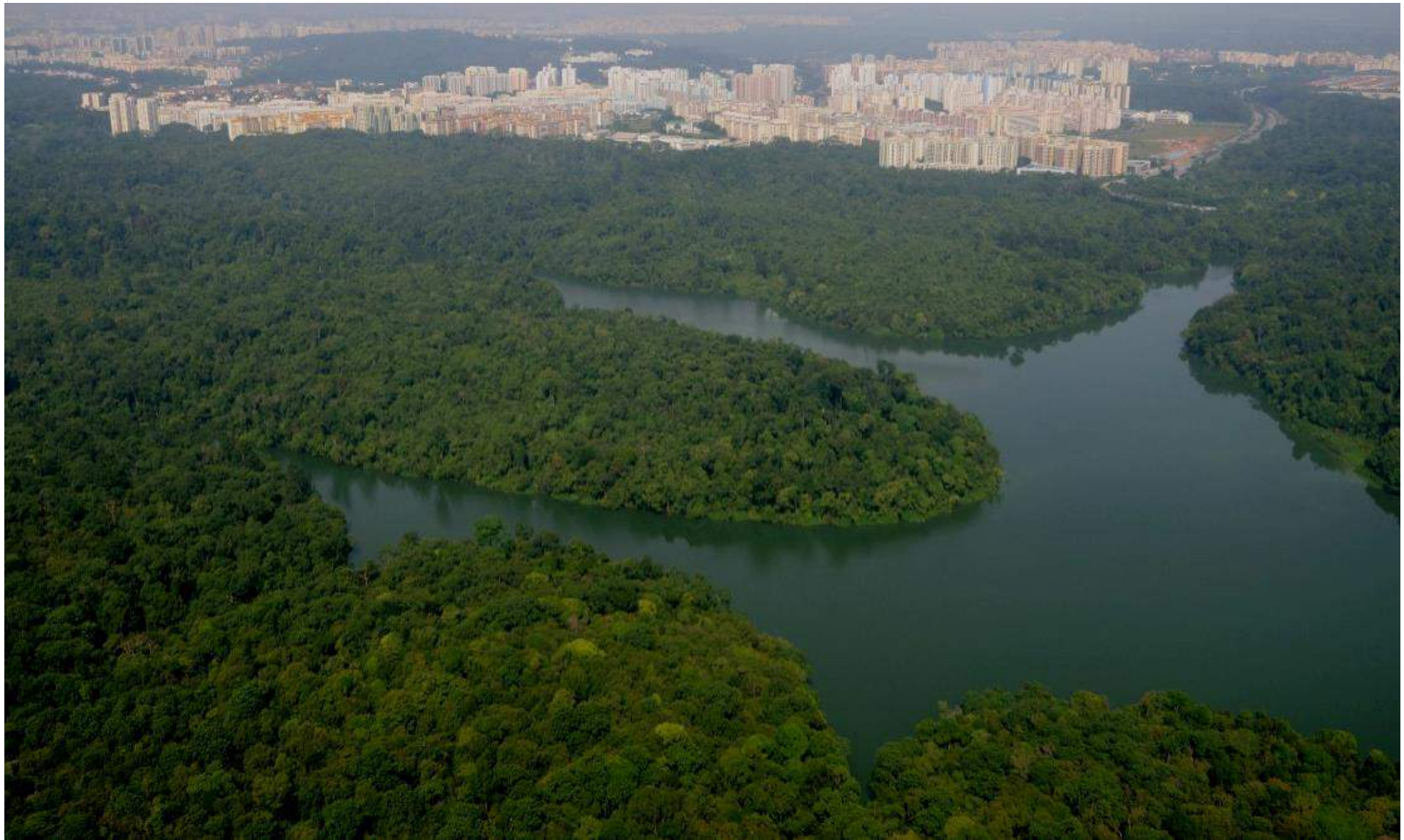
A list of Singapore's native biodiversity

- **2215** native vascular plant species
- **403** bird species
- **102** reptile species
- **85** freshwater fish species
- **334** butterfly species
- **131** dragonfly species
- more than **800** spider species
- **35** true mangrove tree species
- **12** seagrass species
- **255** hard coral species
- **50** sea anemone species


Nature Conservation Masterplan
Thrust 1: Conservation of Key Habitats
Thrust 2: Habitat Enhancement, Restoration and Species Recovery
Thrust 3: Applied Research in Conservation Biology and Planning
Thrust 4: Community Stewardship and Outreach in Nature

1a Safeguard and strengthen core areas

1a Safeguard and strengthen core areas



1a Safeguard and strengthen core areas

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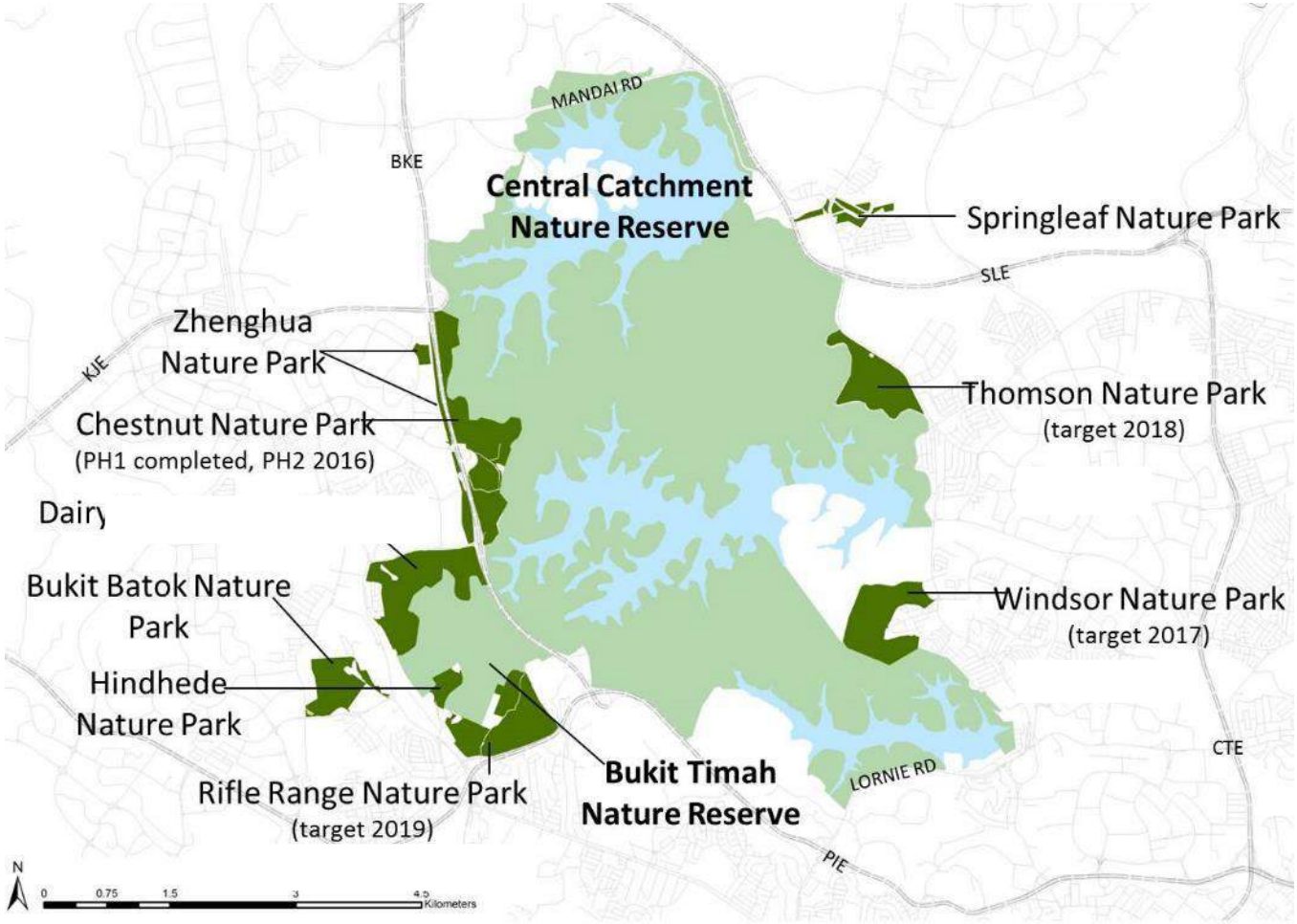
1a Safeguard and strengthen core areas

Sisters' Islands Marine Park

1b Secure and Enhance Buffer Areas



Launch of Chestnut Nature Park

Springleaf Nature Park - aerial view

1d Develop ecological connections

1d Develop ecological connections

Roadside trees

1d Develop ecological connections

1d Develop ecological connections

Yishun Central (Parkway Treatment)

1d Develop ecological connections

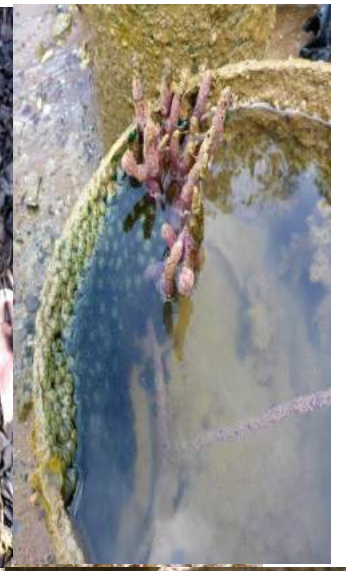
1d Develop ecological connections

2a Habitat Enhancement and Restoration

Bishan-Ang Mo Kio Park

2a Habitat Enhancement and Restoration

Pulau Tekong Mangrove Project



2a Habitat Enhancement and Restoration

Marina at Keppel Bay

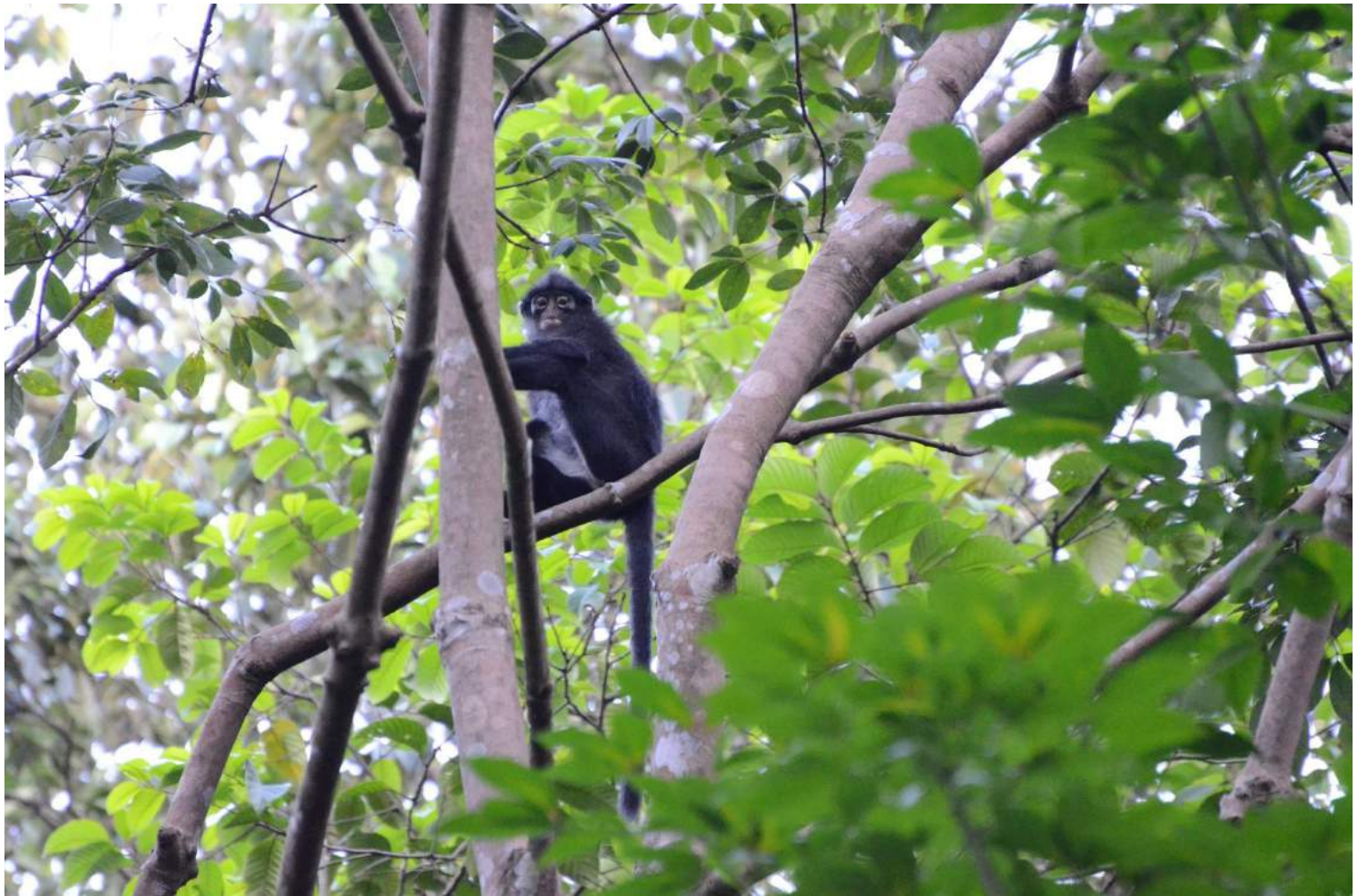
2a Habitat Enhancement and Restoration

2a Habitat Enhancement and Restoration

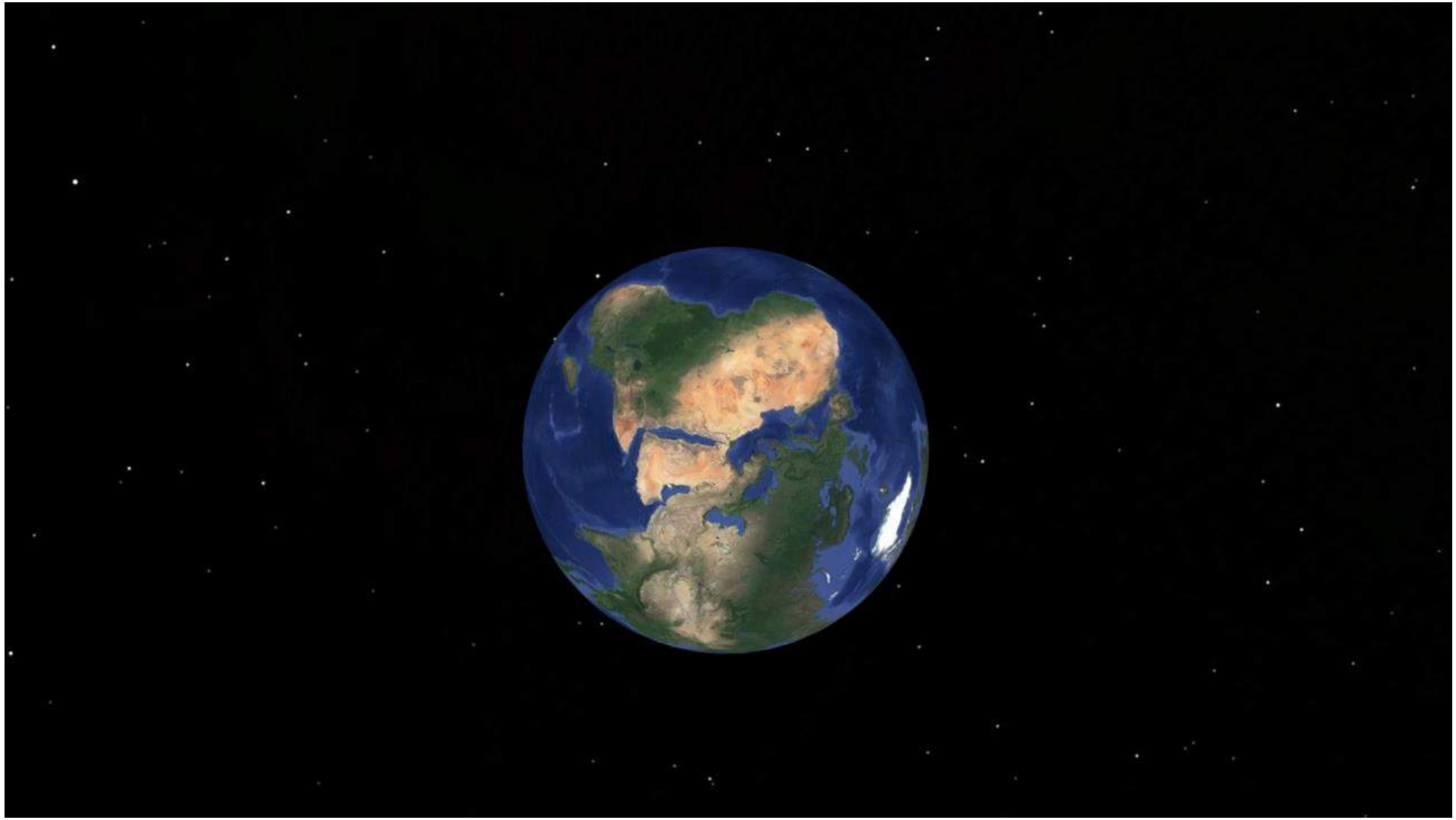
After

2b Species Recovery

Raffles' Banded Langur (*Presbytis femoralis femoralis*)

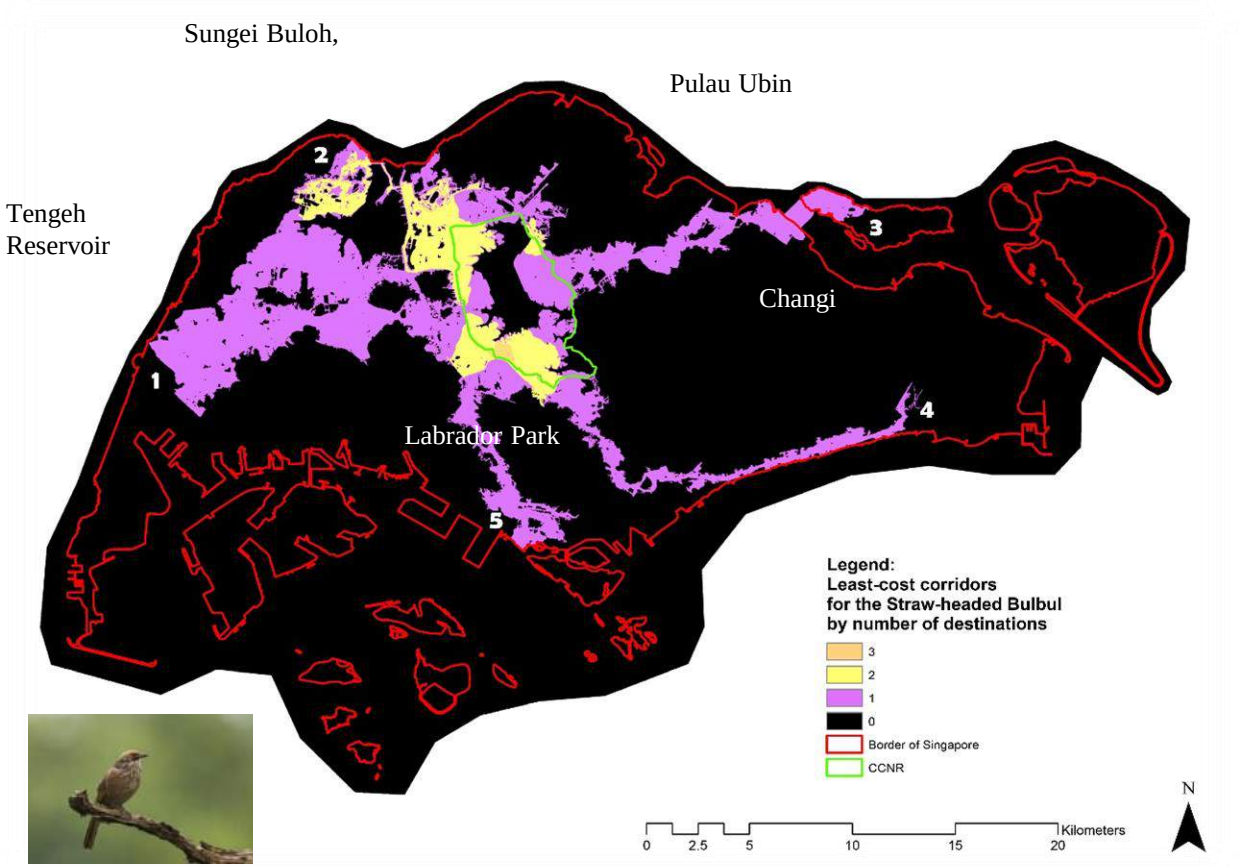


3a Applied Research in Conservation Biology & Planning

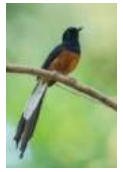


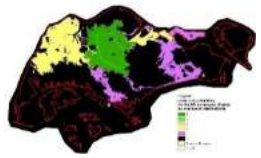
Satellite-level Research - Ecological Modeling for Conservation

Individual least-cost corridors of selected birds

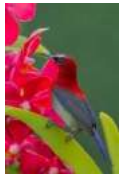


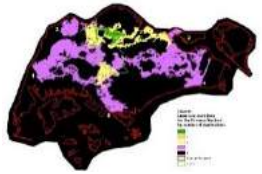
Straw-headed Bulbul



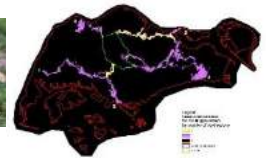


White-rumped Shama

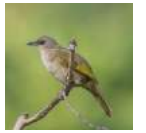


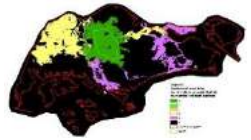


Crimson Sunbird

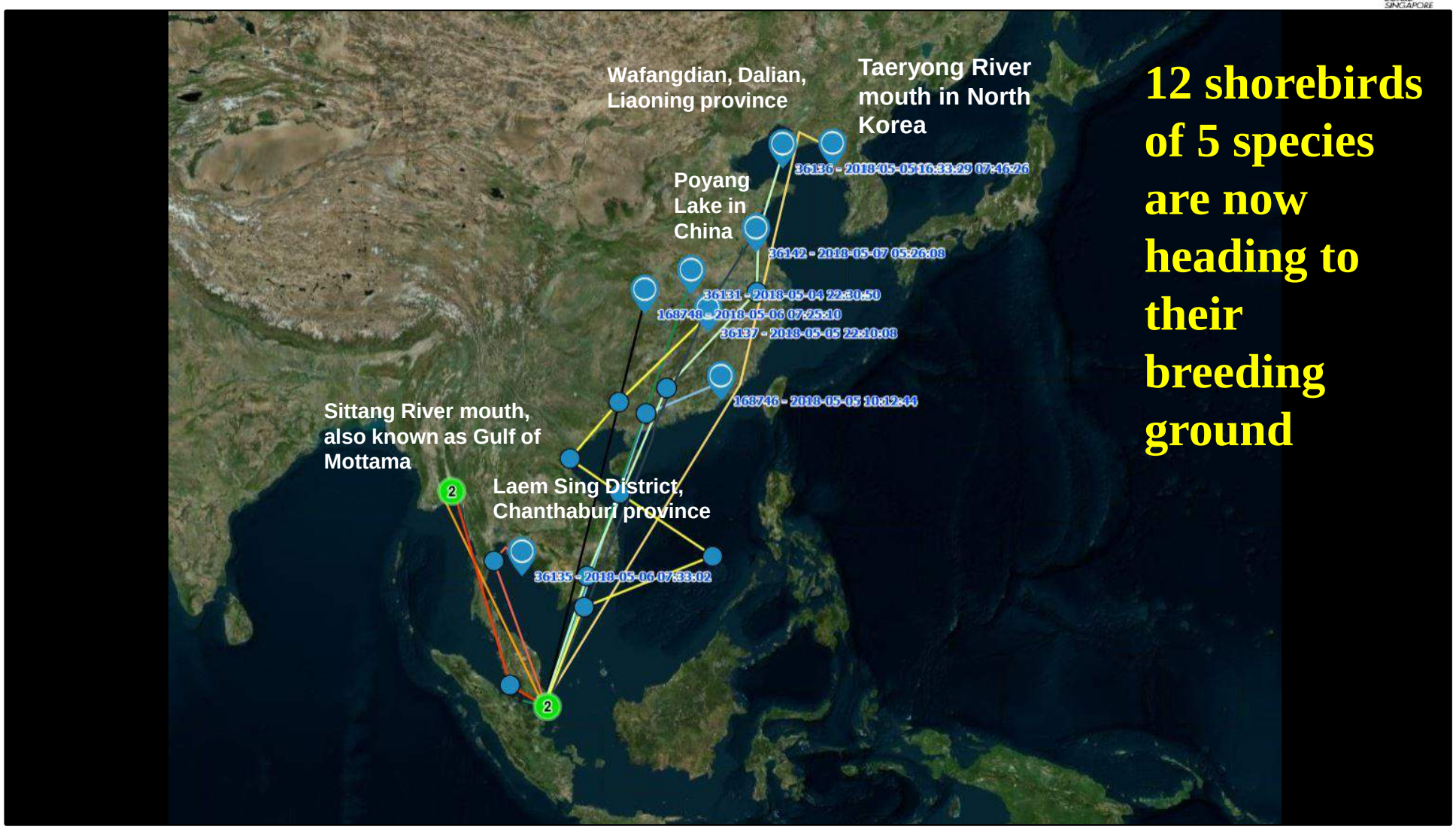


Magpie Robin





Olive-winged Bulbul

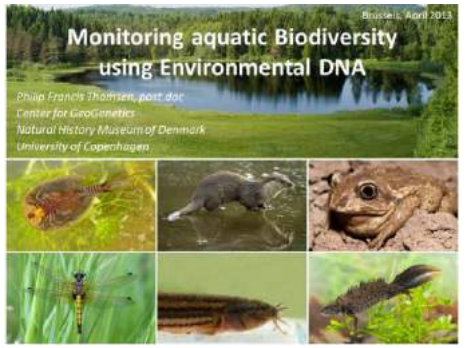


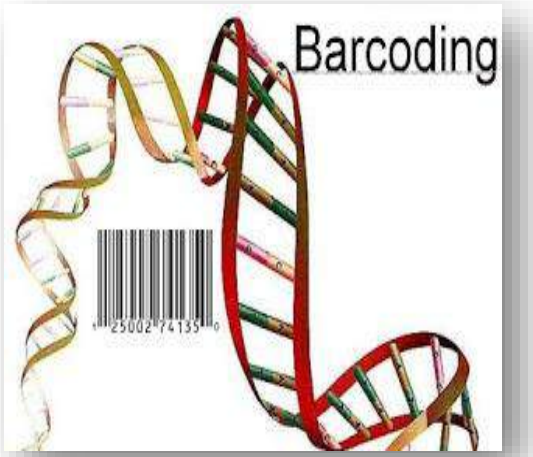
12 shorebirds of 5 species are now heading to their breeding ground

Ground-level research – Flora and Fauna Surveys

Camera Trap

Micro-level research – Micropropagation and genomics





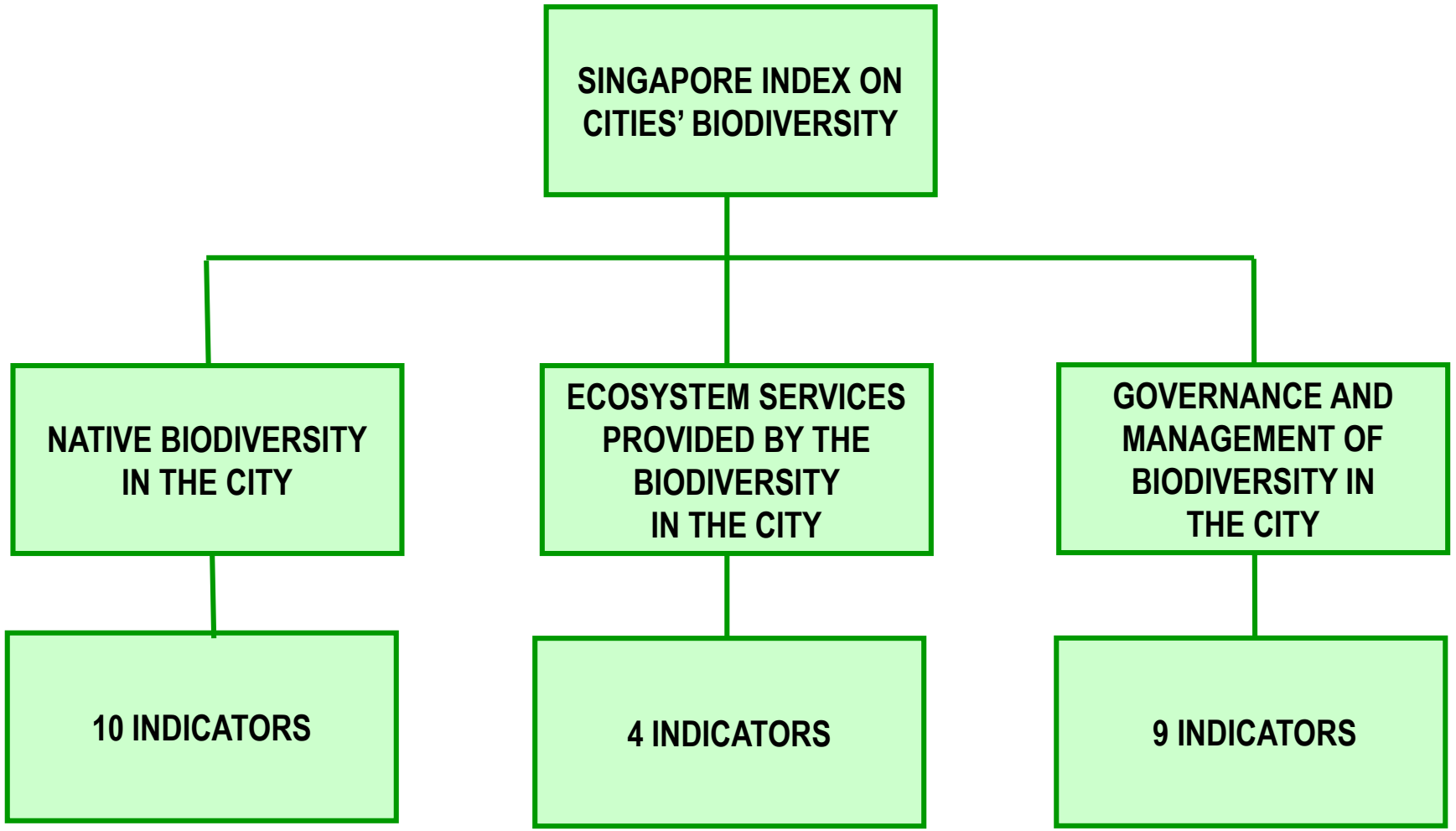
4 Community Stewardship and Outreach in Nature

How did the SI develop?

3 components for the Index:

- Native biodiversity in the city
- Ecosystem services provided by native biodiversity in the city
- Governance and management of native biodiversity in the cities

Singapore Index On Cities' Biodiversity (SI)



Singapore Index – Application World-wide

26 city governments have applied the SI:

Auckland/Waitakere	Krabi
Bandung/West Java	La Antigua Guatemala
Bangkok	Lisbon
Brussels	London
Chiang Mai	Mira-Bhayandar
Curitiba	Montreal
Durban	Nagoya
Edinburgh	Phuket
Edmonton	Porto
Hamilton	Singapore
Heidelberg	Tallinn
Helsinki	Vitoria-Gasteiz
Hyderabad	Los Angeles

Singapore Index – Application World-wide

12 cities in the process of applying:

Calgary	Iloilo
Costa Rica	Ourense
Cuenca	Paris
Galle City	Stockholm
Hong Kong	Thane
Kaoshiung	Wellington

SI applied by academics to 14 cities:

Chiba	Kyoto
Frankfurt	Neubrandenburg
Fukuoka	Osaka
Hiroshima	Sapporo
Kawasaki	Sendai
Kitakyusyu	Tokyo
Kobe	Yokohama

Other Applications of the SI

- Guidelines on how to enhance native biodiversity
- Provision of biodiversity inputs into the master planning of cities
- Basis for calculation of economic value of biodiversity and ecosystem services
- As the biodiversity component of other indices

SINGAPORE, A GREEN & BLUE BIOPHILIC CITY IN A GARDEN

by

THANK YOU

Oriental Pied

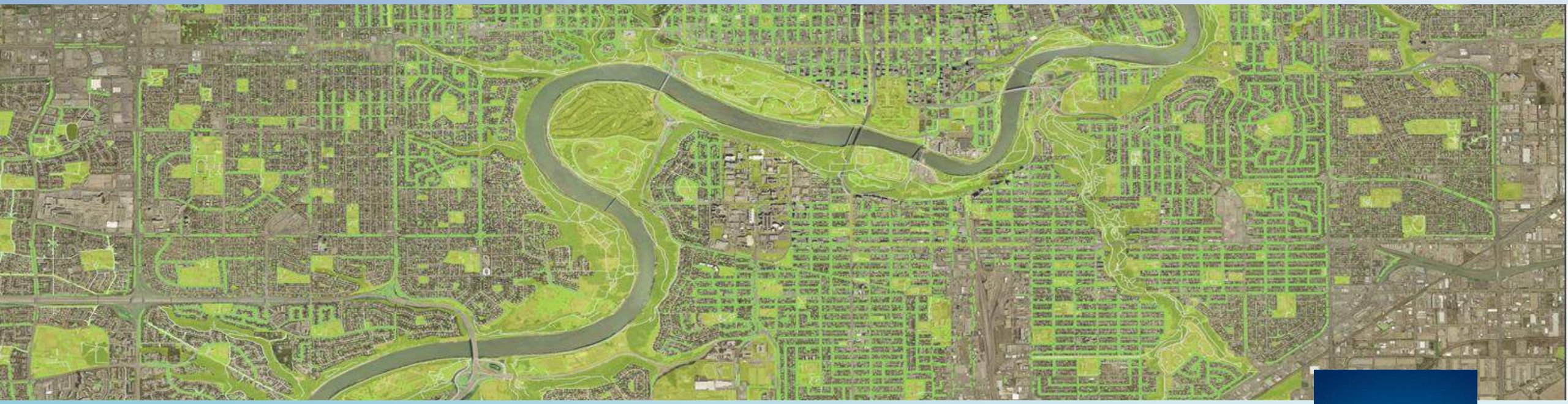
Photo credit: Alvin

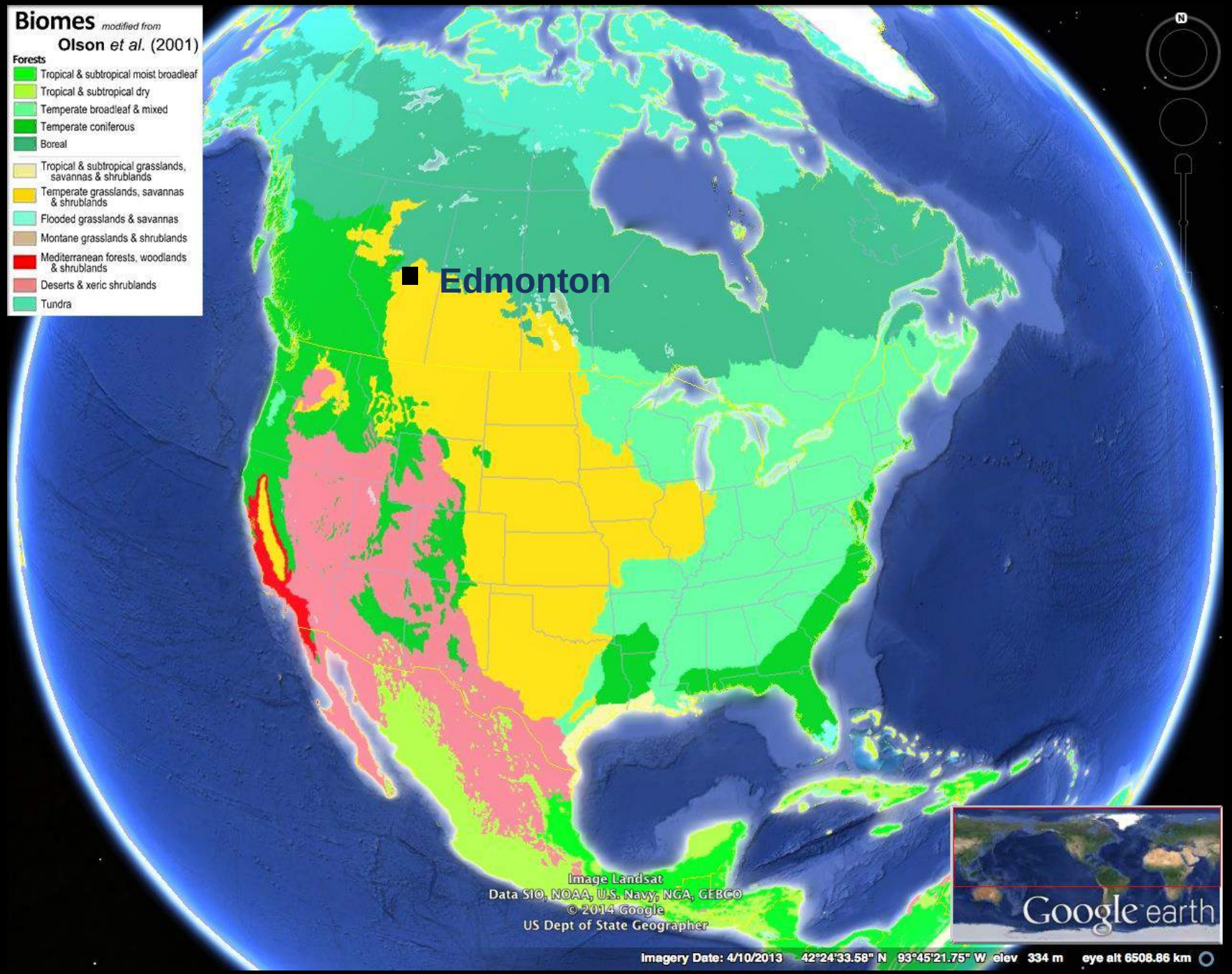
Designing for urban wildlife passage in an increasingly fragmented world

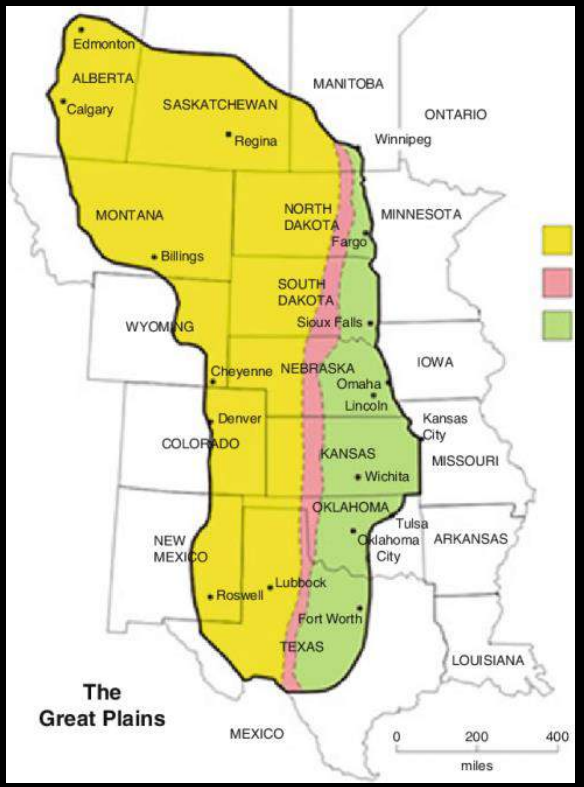
World Bank BBL Presentation on Urban Biodiversity, Natural Capital Accounting, and Nature Based Infrastructure

Grant Pearsell

May 9, 2019




Biomes modified from Olson et al. (2001)
Forests
Tropical & subtropical moist broadleaf
Tropical & subtropical dry
Temperate broadleaf & mixed
Temperate coniferous
Boreal
Tropical & subtropical grasslands, savannas & shrublands
Temperate grasslands, savannas & shrublands
Flooded grasslands & savannas
Montane grasslands & shrublands
Mediterranean forests, woodlands & shrublands
Deserts & xeric shrublands
Tundra
Edmonton
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2014 Google
US Dept of State Geographer
Google earth
Imagery Date: 4/10/2013 42°24'33.58" N 93°45'21.75" W elev 334 m eye alt 6508.86 km


Edmonton
ALBERTA
Calgary
SASKATCHEWAN
Regina
MANITOBA
Winnipeg
ONTARIO
MONTANA
Billings
NORTH DAKOTA
Fargo
MINNESOTA
SOUTH DAKOTA
Sioux Falls
WYOMING
Cheyenne
NEBRASKA
Omaha
Lincoln
IOWA
Denver
COLORADO
Kansas City
KANSAS
Wichita
MISSOURI
OKLAHOMA
Tulsa
Oklahoma City
ARKANSAS
NEW MEXICO
Roswell
Lubbock
Fort Worth
TEXAS
LOUISIANA
The Great Plains
MEXICO
0 200 400
miles


The Boreal Forest
Boreal Forest biome, Canada
Boreal Forest biome, around the world
JAPAN
CHINA
PACIFIC OCEAN
Bering Sea
ASIA
RUSSIA
Gulf of Alaska
Alaska
ARCTIC OCEAN
Beaufort Sea
NORTH POLE
SIBERIA
CANADA
Greenland Sea
FINLAND
Baffin Bay
GREENLAND
SWEDEN
Hudson Bay
Norwegian Sea
NORWAY
U.S.A.
ICELAND
EUROPE
U.K.
ATLANTIC OCEAN
IRELAND
FRANCE
SPAIN
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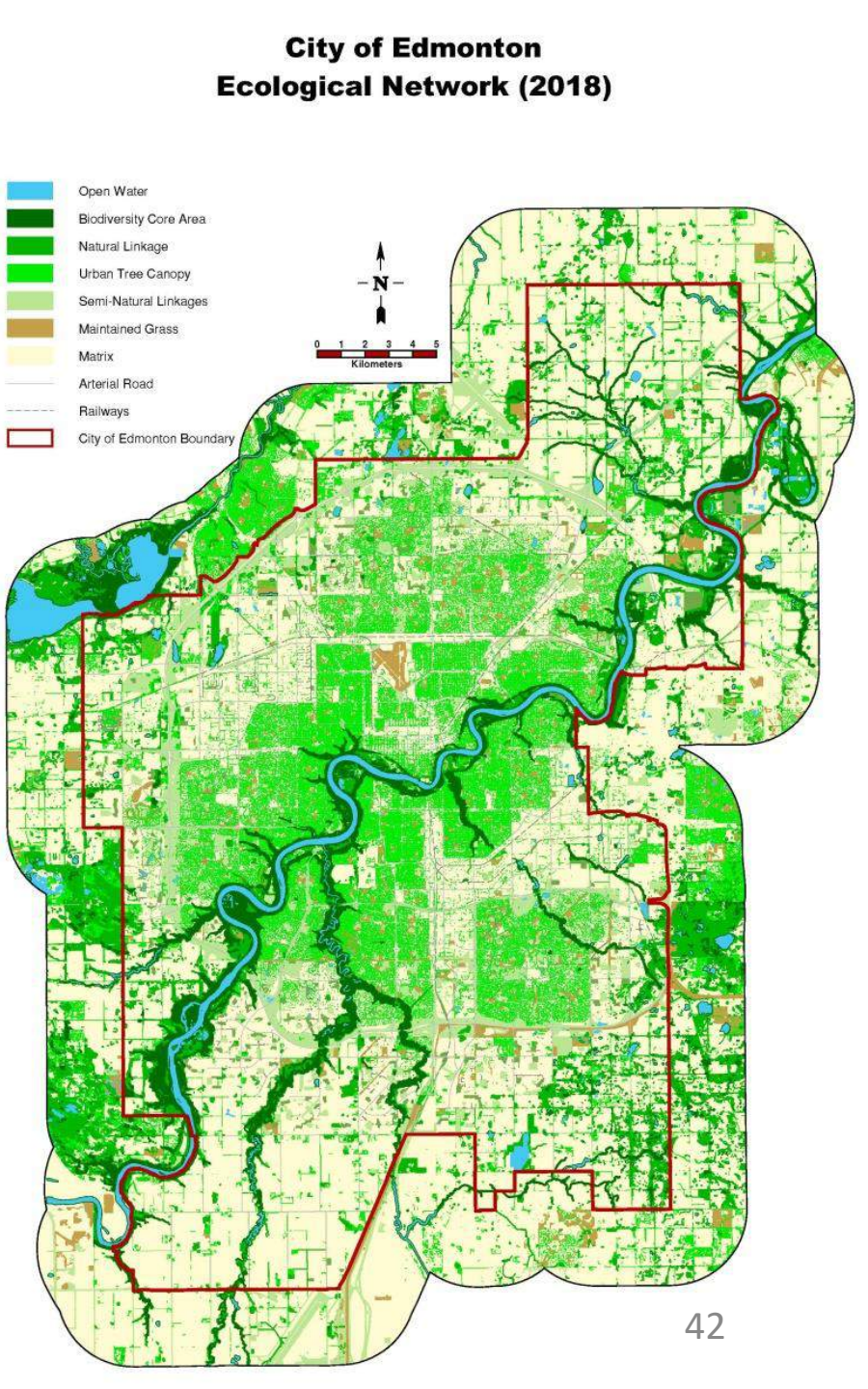
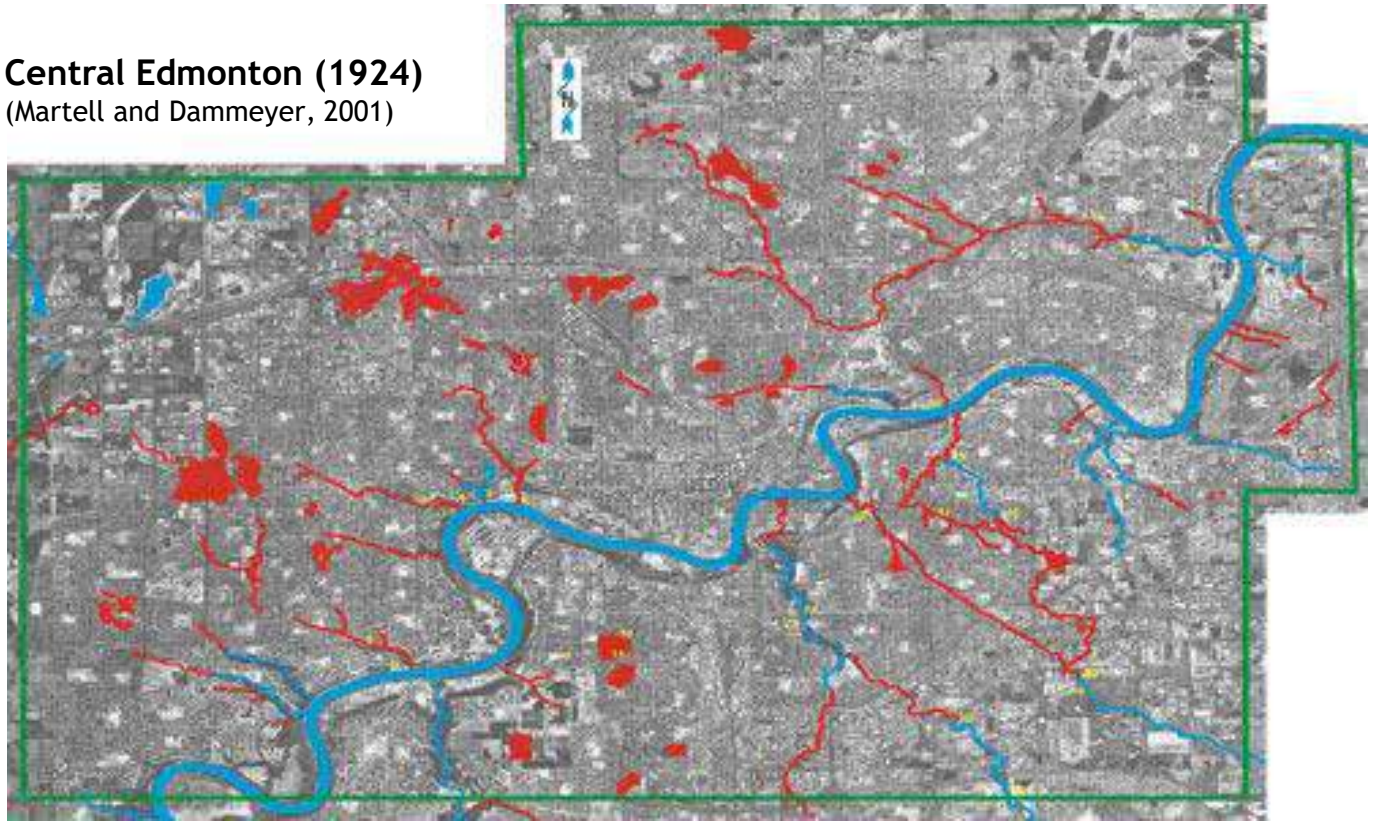

City of Edmonton
Ecological Network (2018)
Open Water
Biodiversity Core Area
Natural Linkage
Urban Tree Canopy
Semi-Natural Linkages
Maintained Grass
Matrix
Arterial Road
Railways
City of Edmonton Boundary
N
0 1 2 3 4 5
Kilometers

Threats to Urban Biodiversity

Habitat loss and fragmentation is the single largest threat to biodiversity conservation in an urban area

Central Edmonton (1924)
(Martell and Dammeyer, 2001)



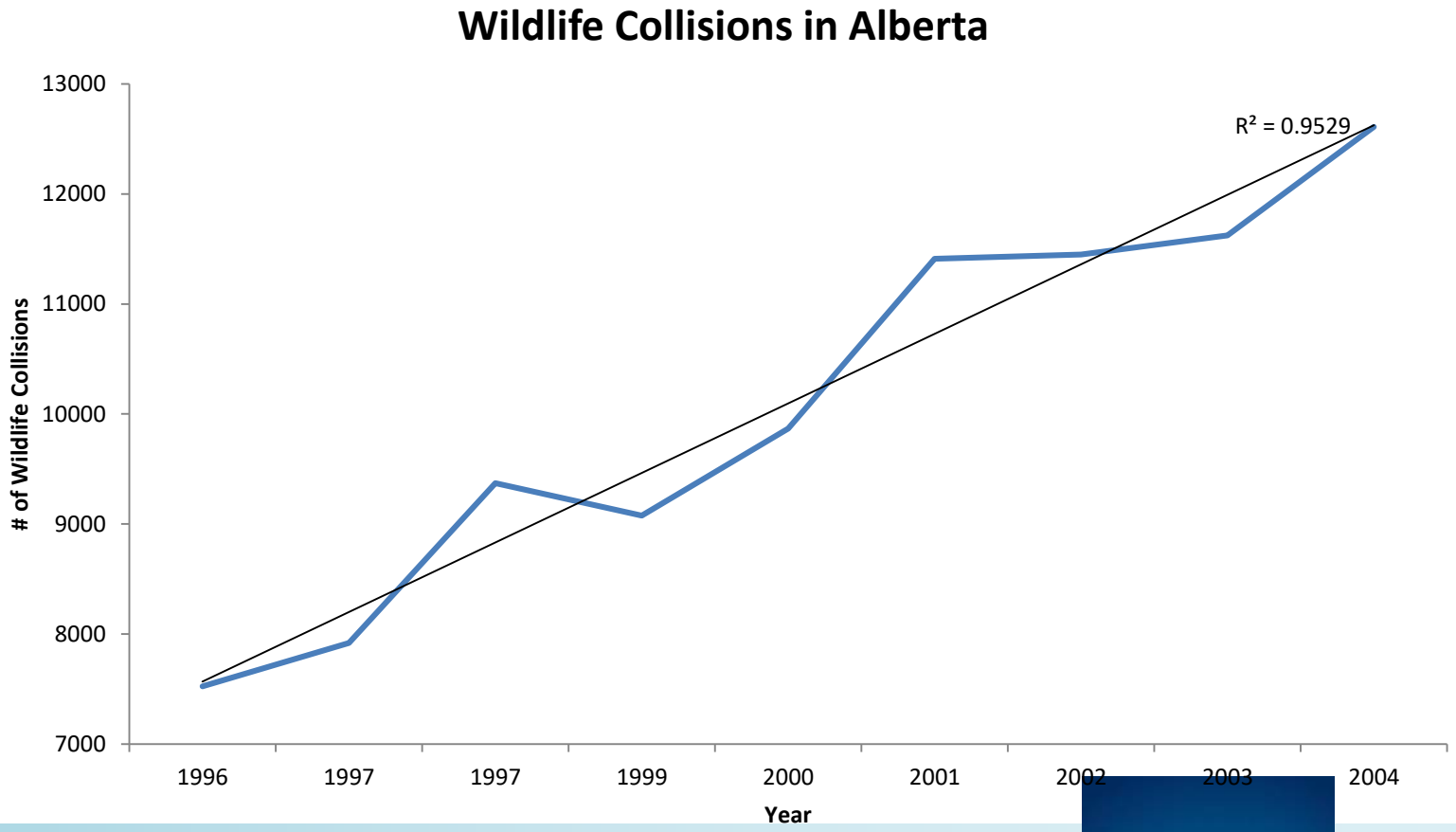
Lost wetlands and drainage courses

Barriers to the movement of wildlife are created as development constrains the ecological network.

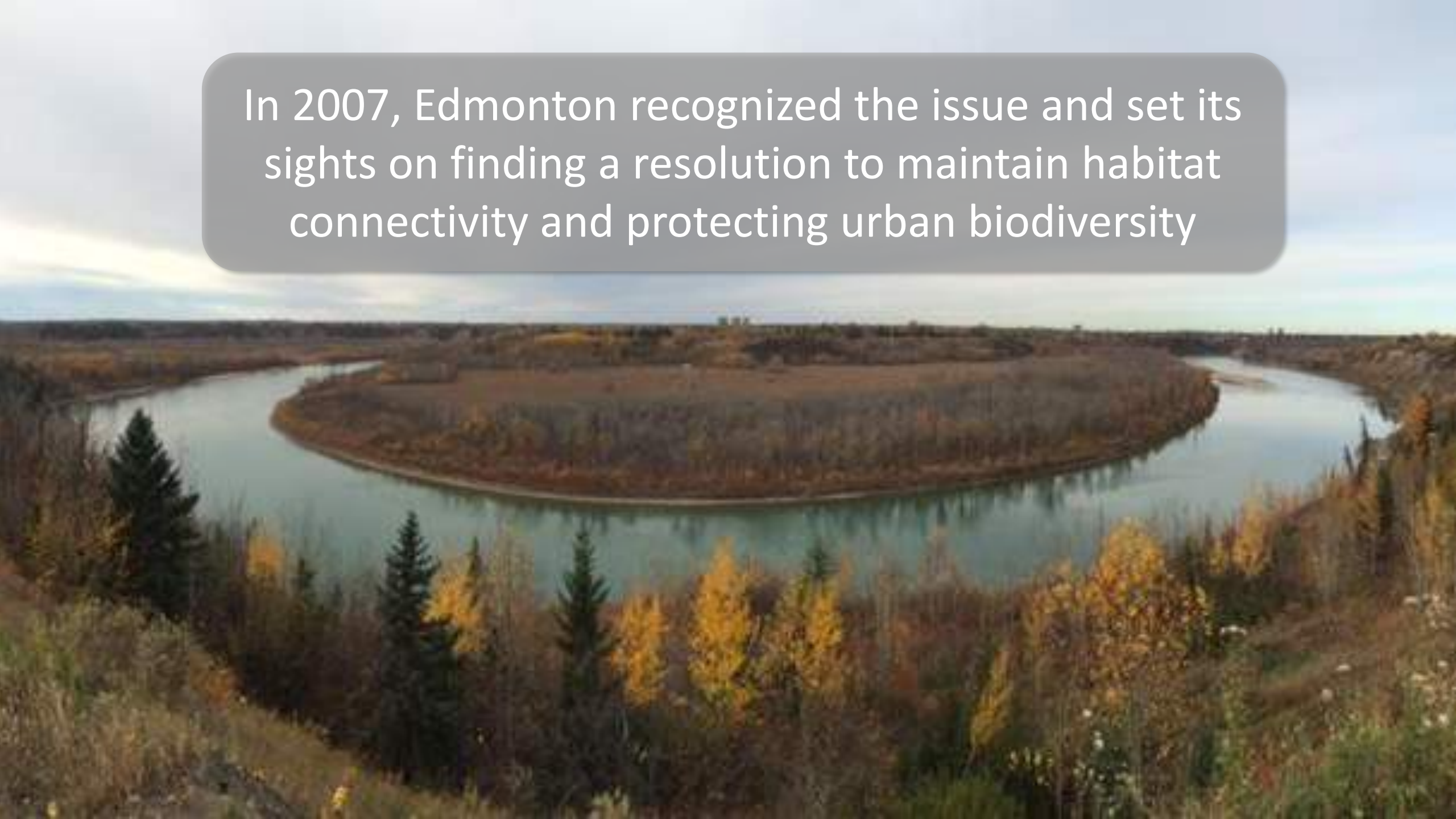
Development creates barriers to movement – specifically Edmonton's transportation network

A Growing Alberta Trend

From 2011 to 2014 there were over 70,453 wildlife collisions in Alberta



In 2007, Edmonton recognized the issue and set its sights on finding a resolution to maintain habitat connectivity and protecting urban biodiversity



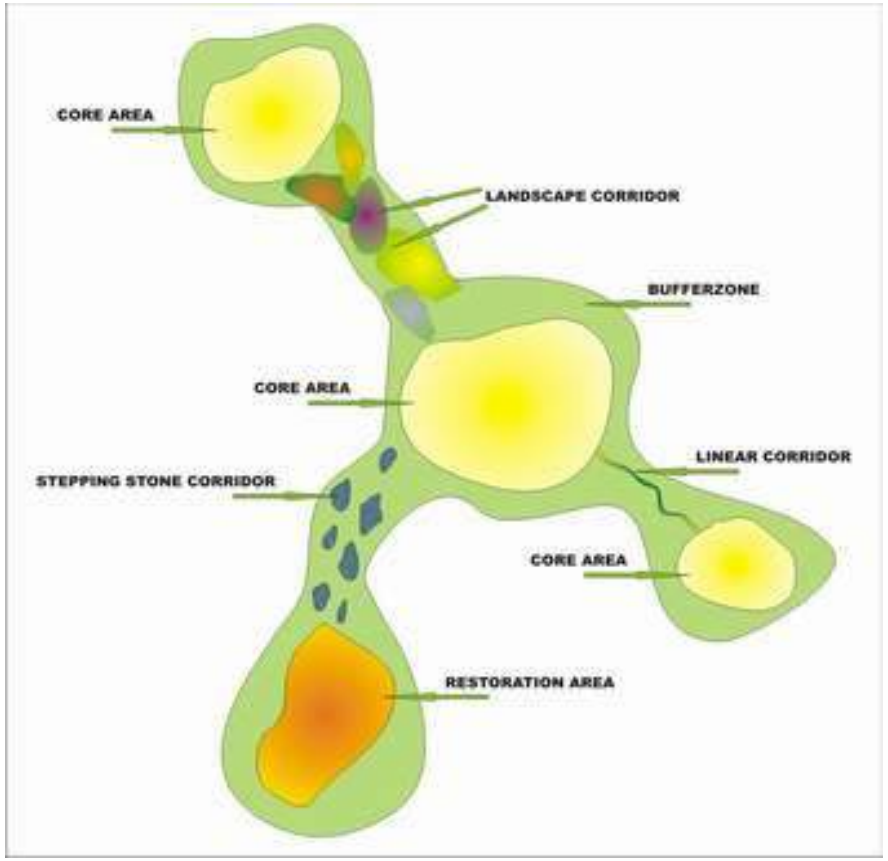
Natural Connections Strategic Plan, 2007

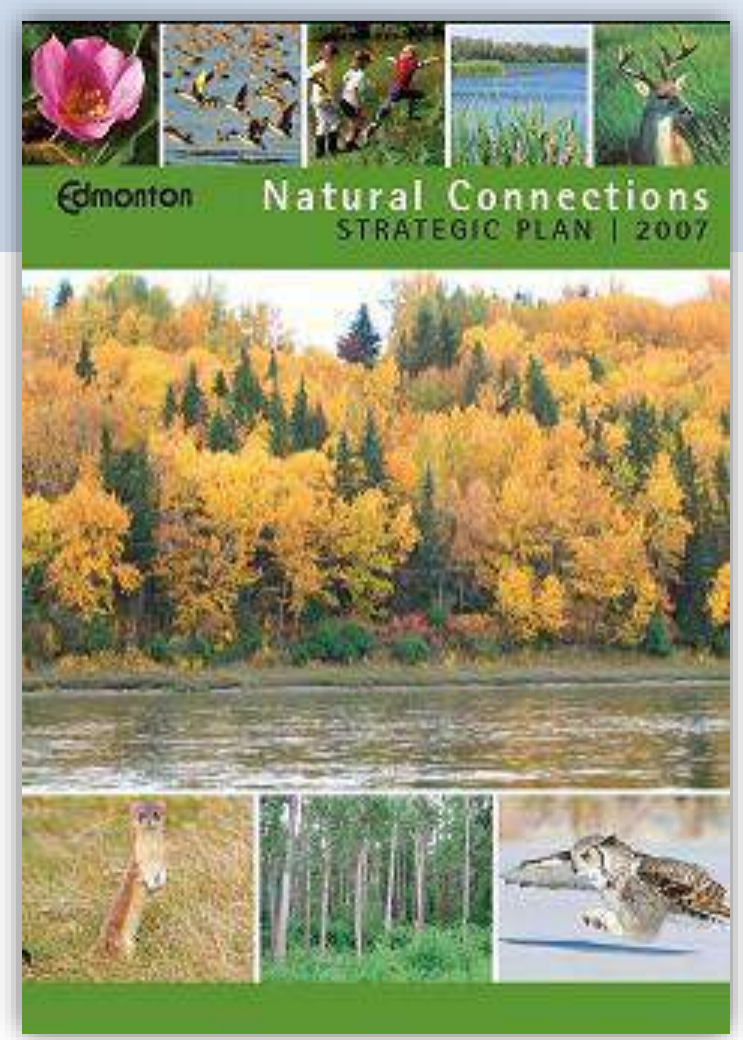
Natural Area system to be designed around:

ecological connections,

not

isolated protected areas





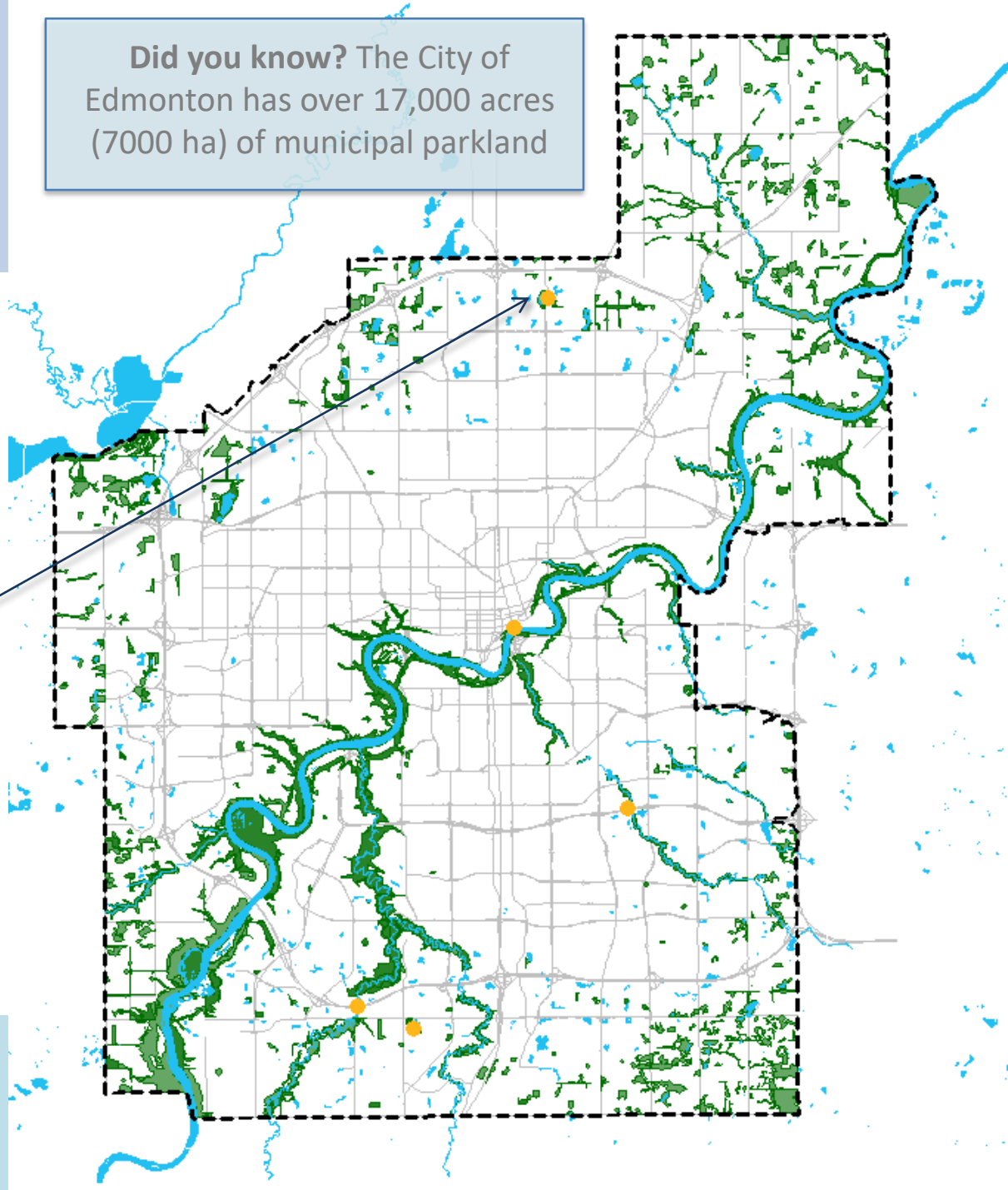
Our 1st purpose designed suburban wildlife passage

2007

First dedicated wildlife passage.

Designed for small mammals.

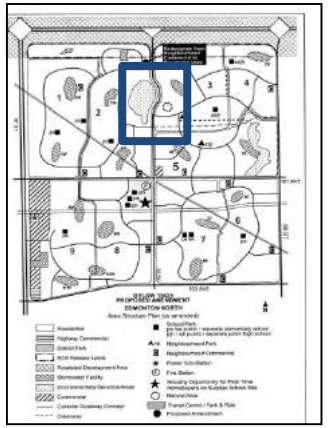
Did you know? The City of Edmonton has over 17,000 acres (7000 ha) of municipal parkland

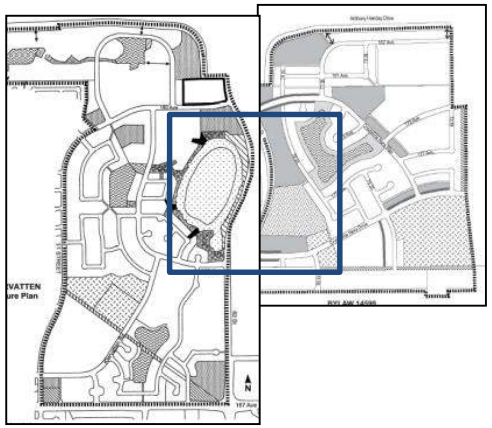


Edmonton

2007

Planning for wildlife passages occurred at last stage of municipal planning process





Strategic Plans, Policies + Guidelines

Area Structure Plans

Neighbourhoood Structure Plans

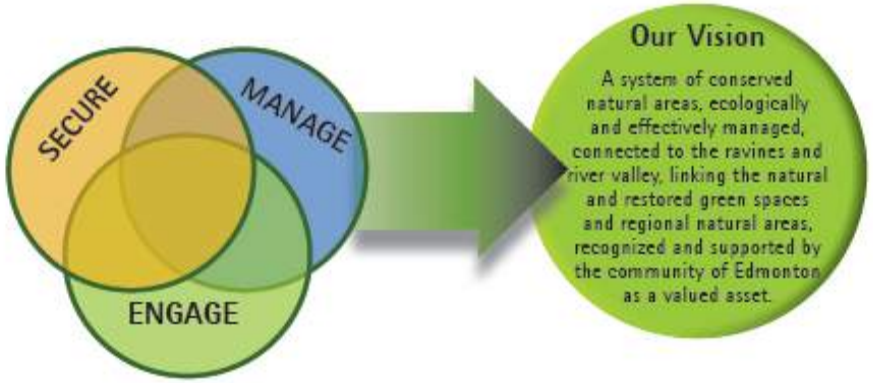
Zoning + Subdivision + Servicing Agreements

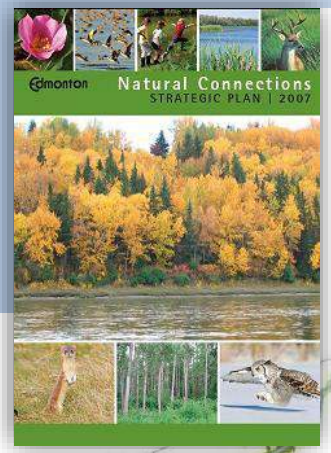
Development + Building Permits and Detailed Design

2007 Paradigm shift

The City moves from focusing on the protection of isolated habitat patches to that of an **Ecological Network Approach**.

Natural Area system to be designed around ecological connections.

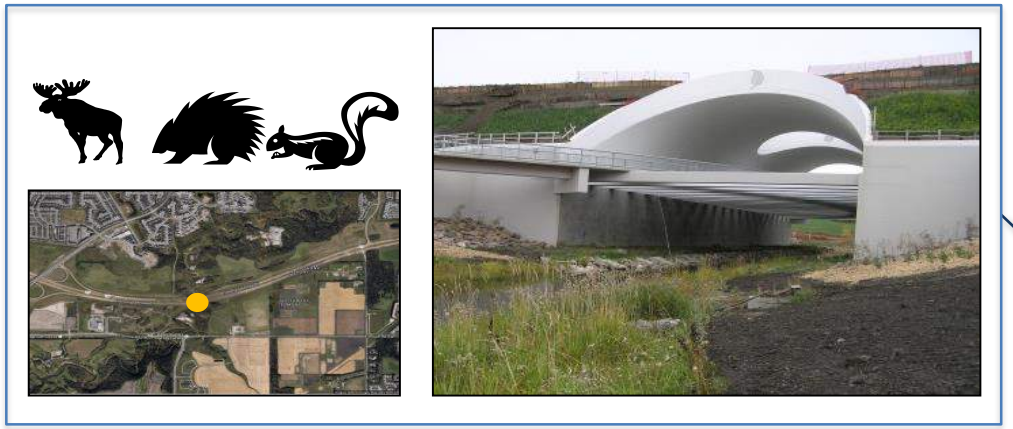


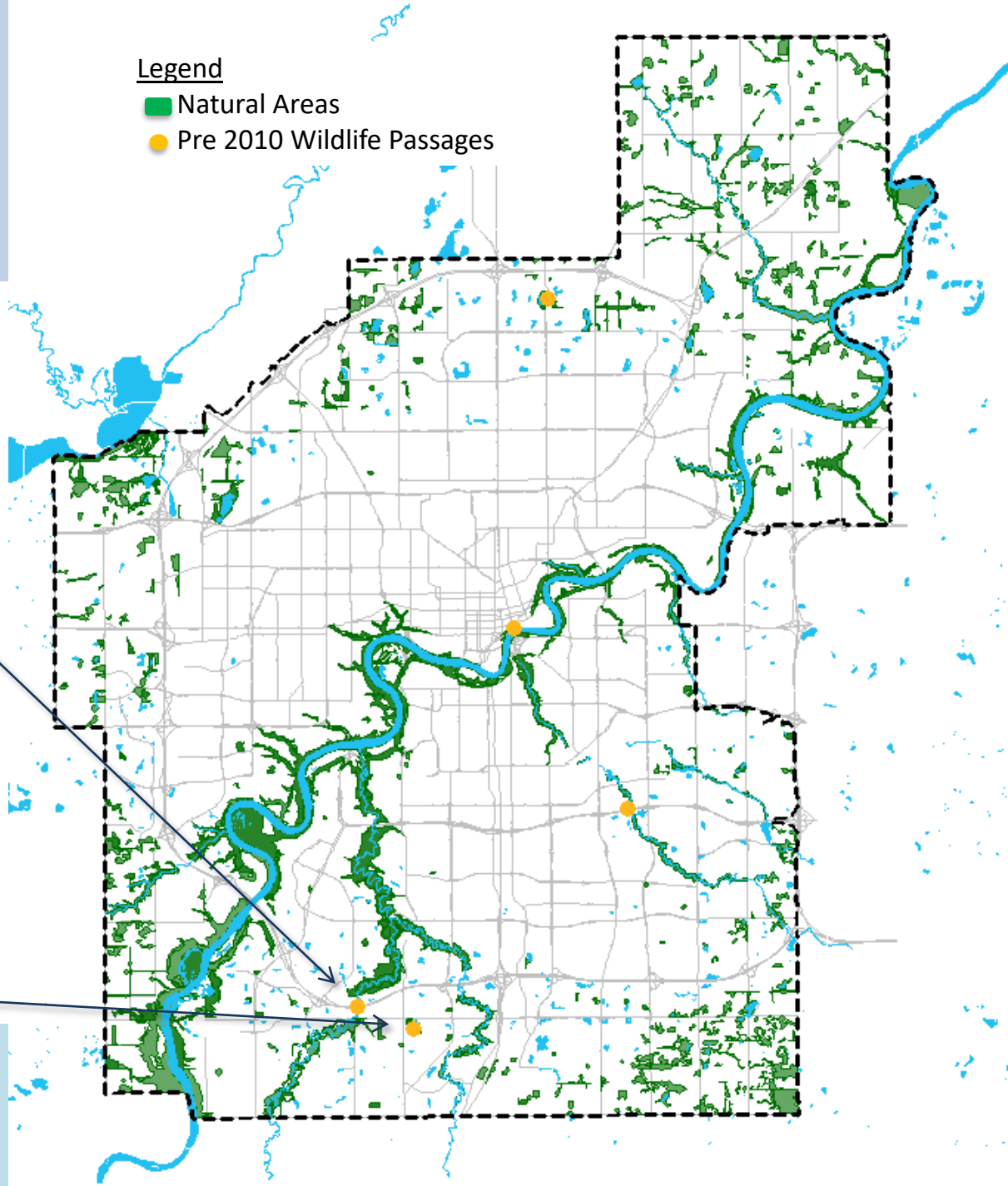


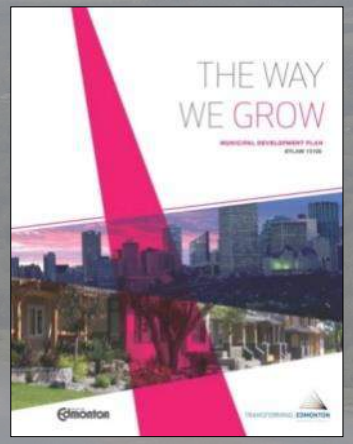
Pre-2010

Five passages constructed

Five dedicated wildlife passages constructed ranging from a large mammal underpass to a rolled curve







In 2010, Edmonton embedded its ecological network goal into its highest municipal planning document: Municipal Development Plan

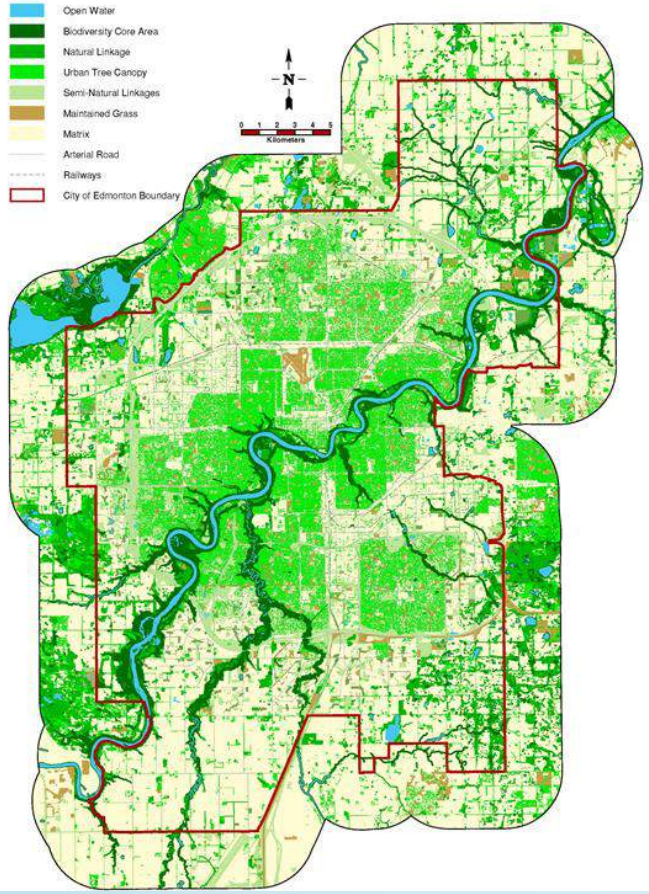
"Edmonton protects, preserves, and enhances its natural environment by… maintaining a ***functional ecological network****"*

- 1 of only 9 strategic goals, The Way We Grow

Protecting Edmonton's Ecological Network

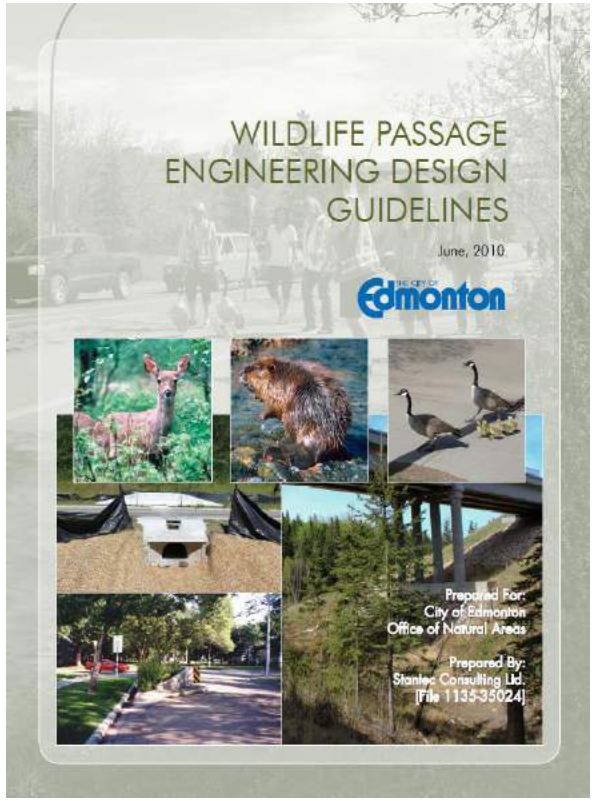
Landscape Characteristics:

- Steep and deep ravines – pre-glacial waterways and melt channels
- 178 species of birds (32 sensitive/at risk)
- 47 species of mammals (4 sensitive/at risk
- Many wild animals present – including within the Downtown Core
- Animals include: moose, deer, lynx, beavers, skunks, porcupines to name a few.
- Edmonton is a biodiversity hotspot for fish in Alberta



2010

Wildlife Passage Engineering Design Guidelines (WPEDG) created by engineers for engineers



Project Objectives:

1) Maintenance of biodiversity and regional ecological connectivity within a fragmented urban landscape
2) Create a manual that is “engineer friendly”

Outcomes:

1) To maintaining habitat connectivity and reduce genetic isolation among the city’s wildlife populations, and
2) Reduce human/wildlife conflict

Edmonton





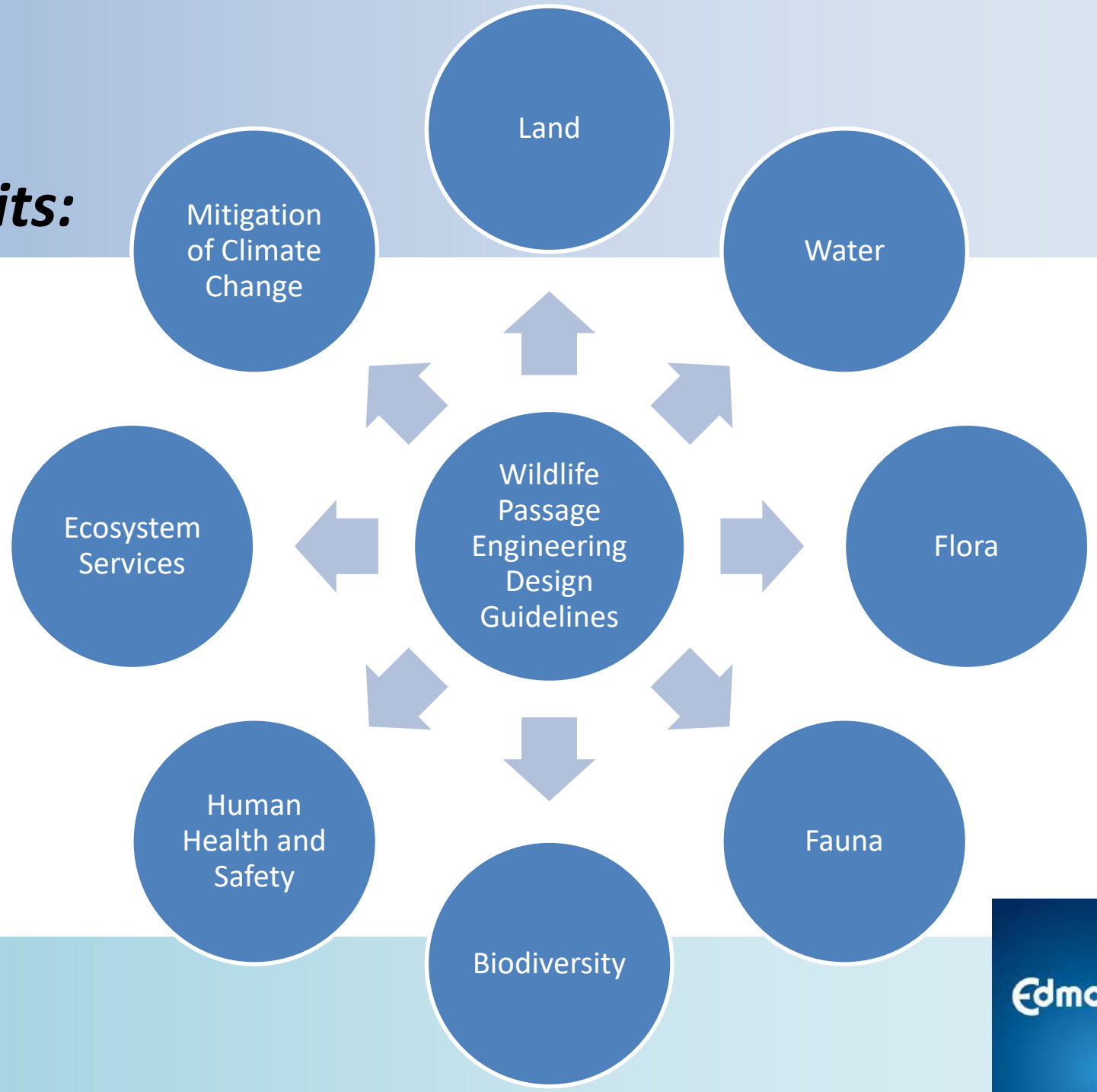






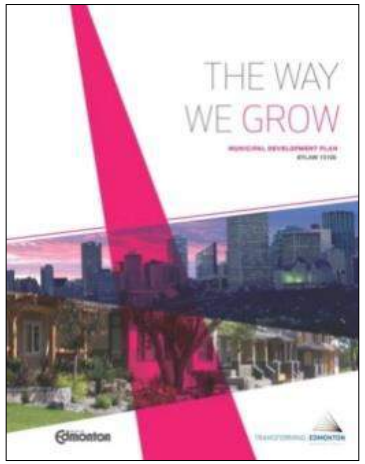
WPEDG multiple benefits:

The City is working to ensure that ecological connectivity remains on the land base to provide multiple benefits



2014

Passage identification incorporated earlier into planning process

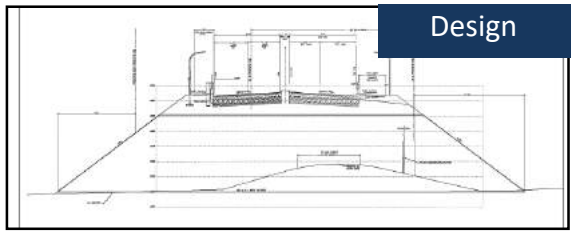


Incorporation of planning for wildlife passages in high level plans that are informed by ecological network studies

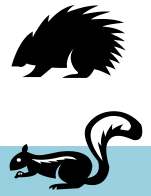
2010-2019

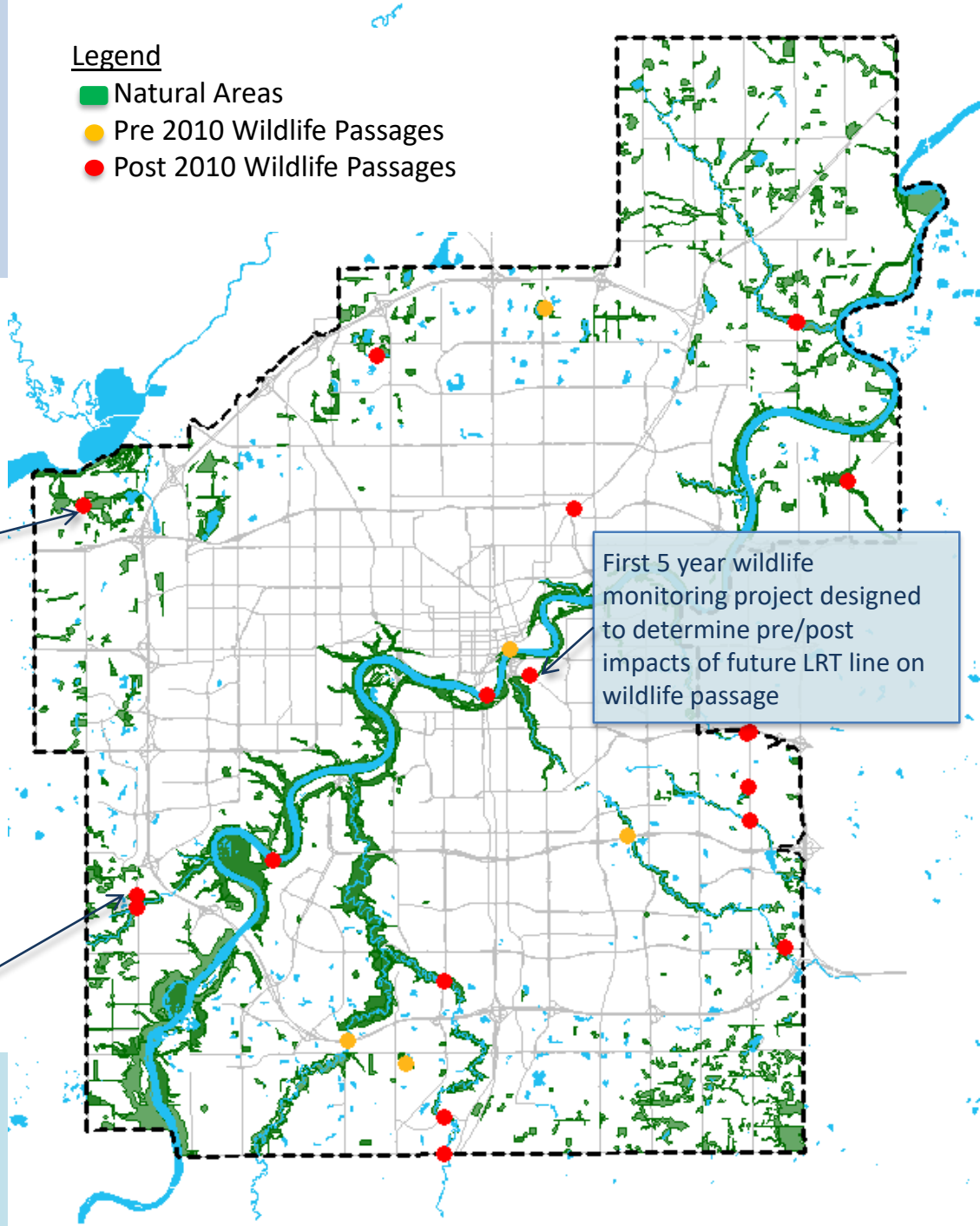
27 more wildlife passages

Hawks Pass: 1st bridge structure in a non-ravine environment

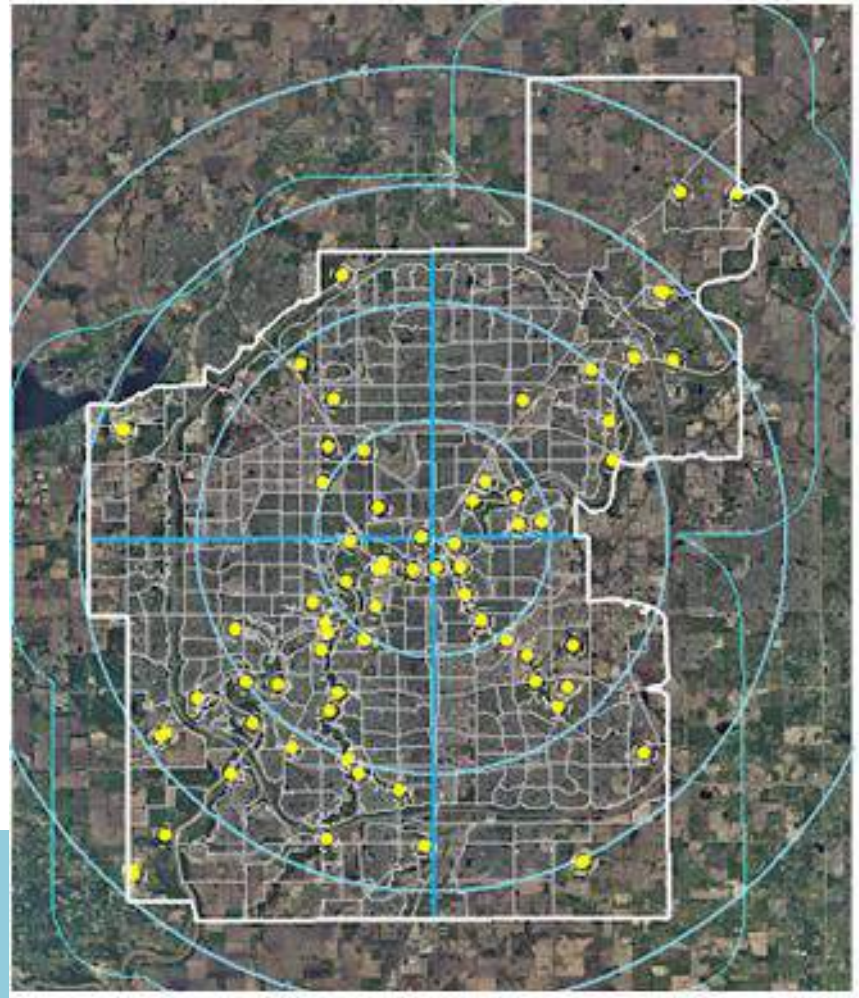


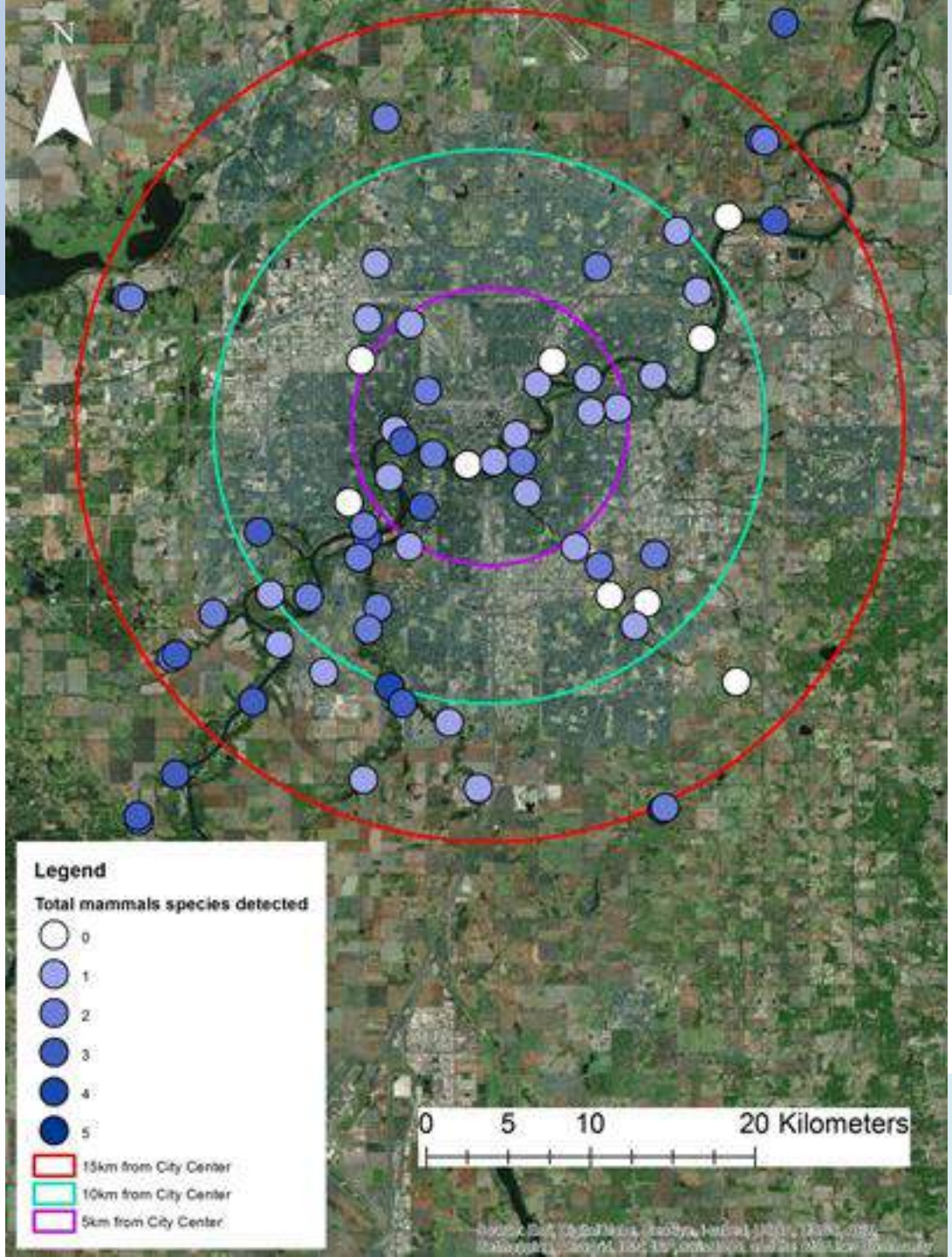
Dual culvert: to connect tributary with creek



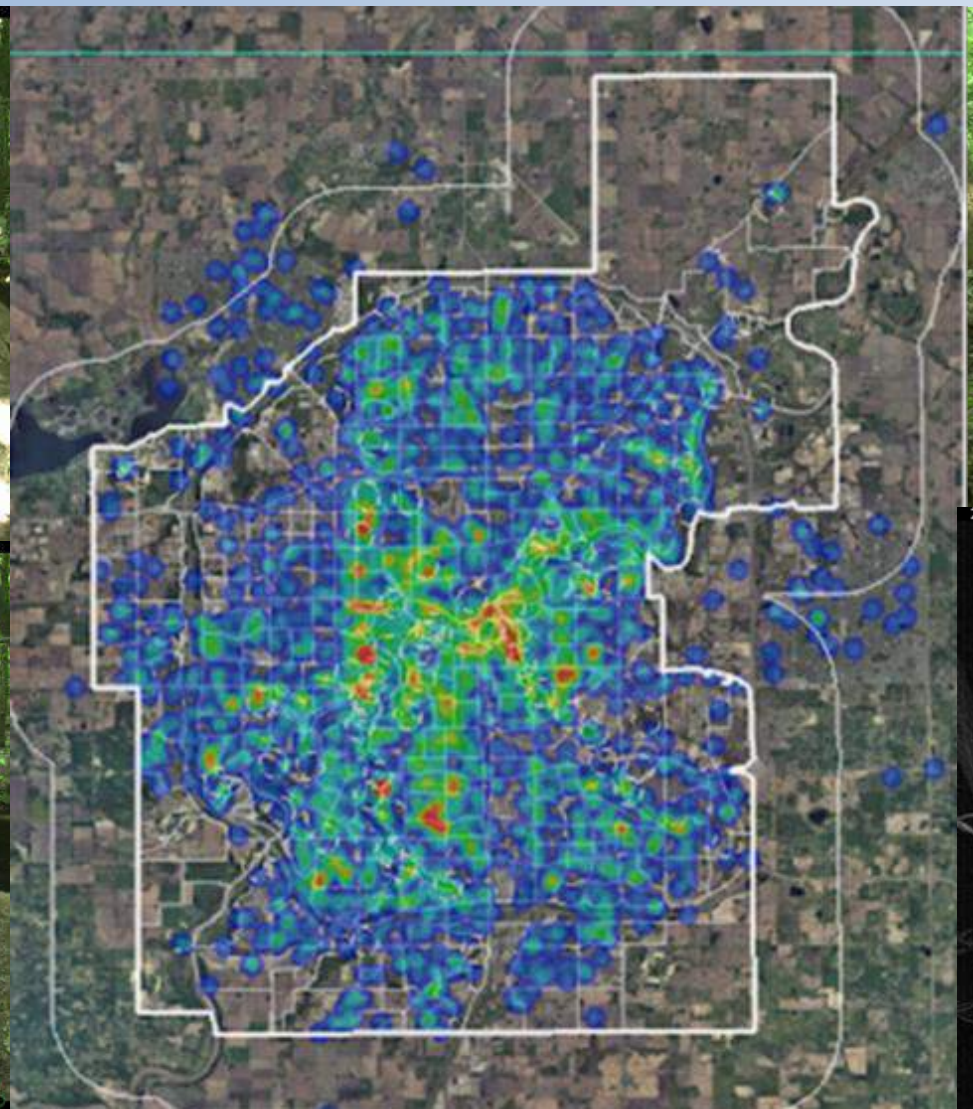


Wildlife monitoring



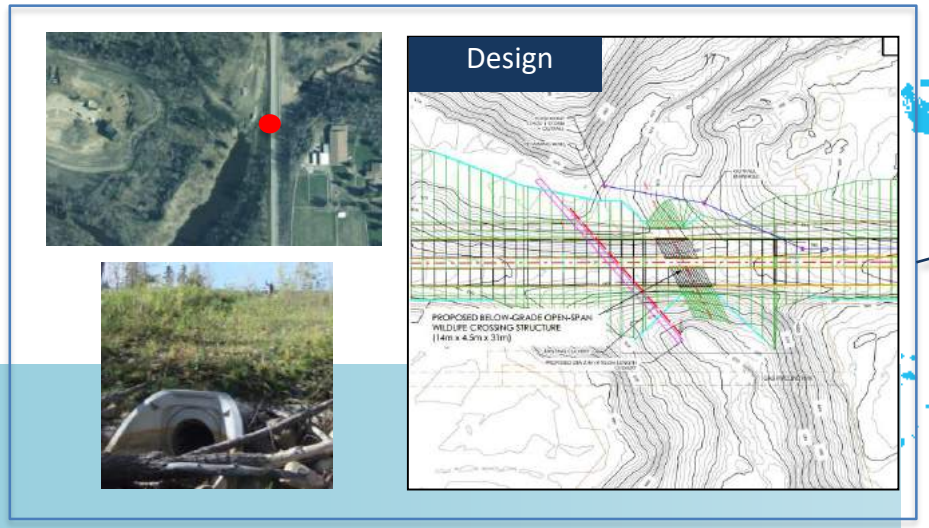


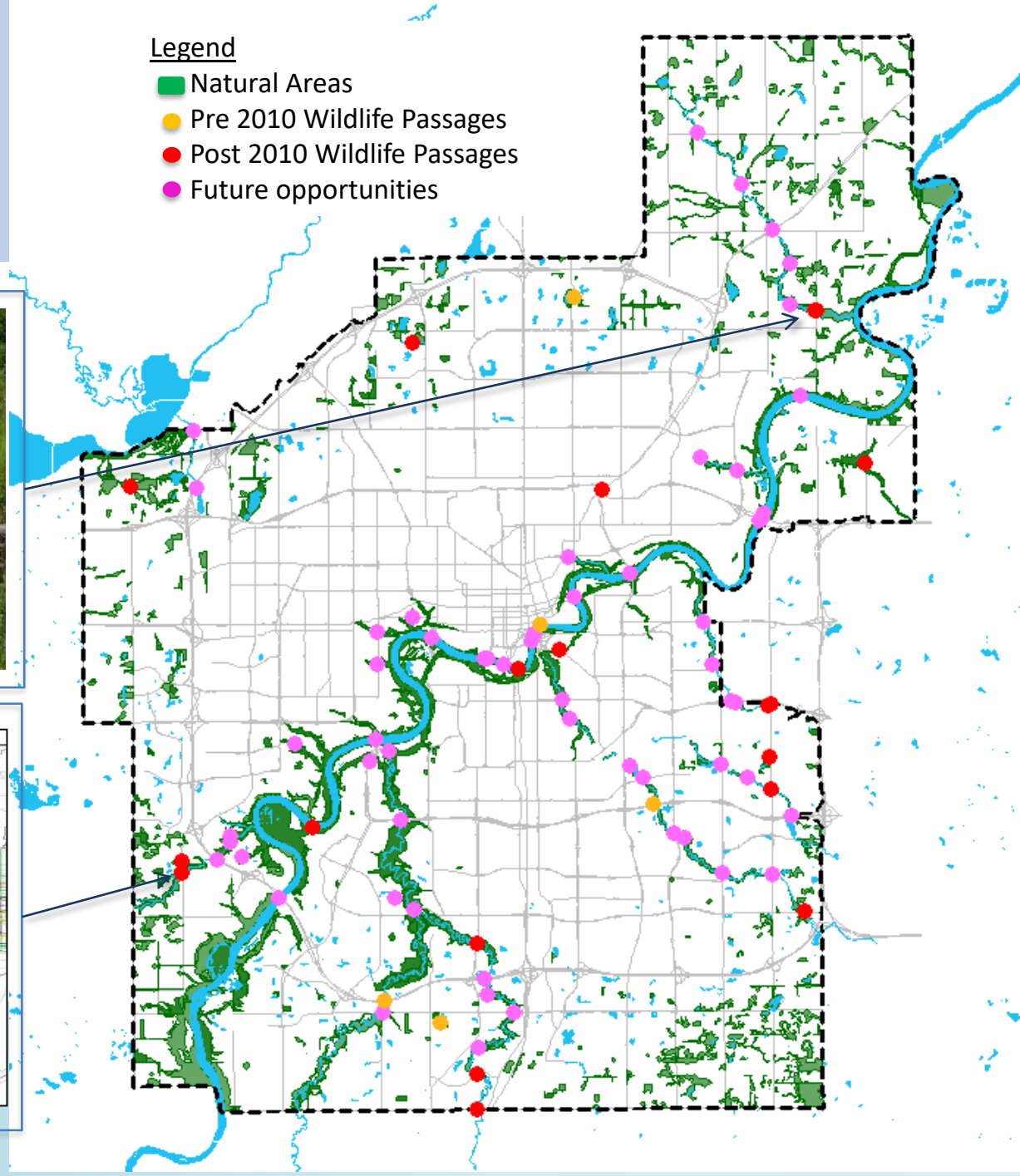
Urban Coyote Monitoring



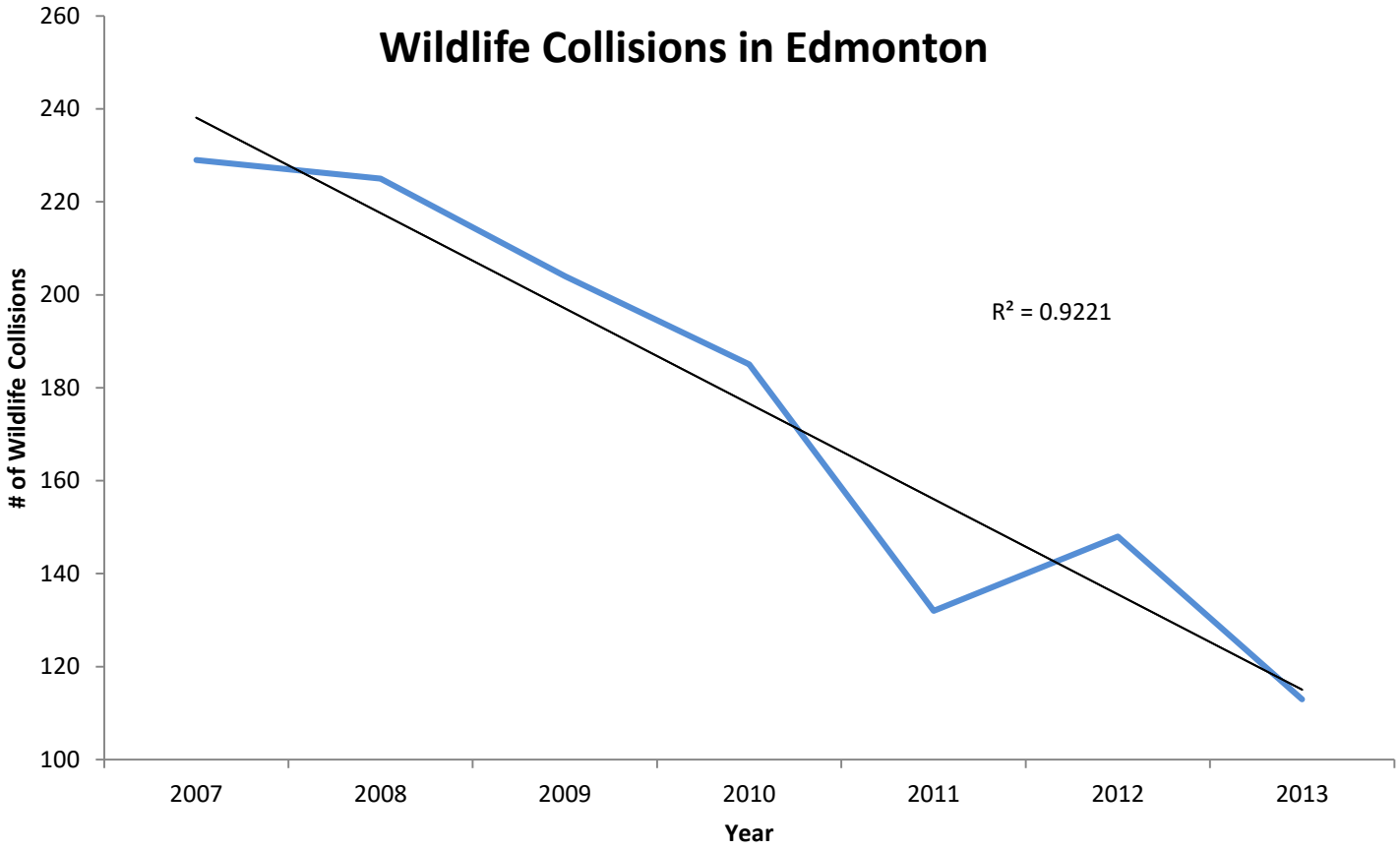
2019+ Future opportunities

Examples of passages with a restoration component





Positive Results



While the population of Edmonton **increased** by 160,000

The number of wildlife collisions **decreased** by 51%

Support from partners

The project's greatest success is how Edmonton's ecological connectivity goals have been embraced by the private and public sector

"Edmonton's wildlife passage initiative is one of those innovative programs that works to incorporate sustainability in our City. It encourages all of us to develop a new level of local expertise in wildlife passage design, which sets us apart from other municipalities."

–an Edmonton land developer

"Through my experience from across Alberta with large mammals, I can personally attest that the work completed in the city on deer and moose crossings is a unique initiative for a Canadian municipality outside of the Mountain Parks."

– Provincial biologist with 60 years experience

"This initiative is a recognizable effort by the municipality which is working towards creating a sustainable and resilient city by prioritizing biodiversity protection in its transportation and drainage planning.

… The wildlife passage project is a perfect example of how the City effectively engages various disciplines with the intent of finding a common approach to biodiversity conservation."

– ICLEI – Local Governments for Sustainability

Edmonton

Thank you!

Grant Pearsell
grant.pearsell@gmail.com

MAYOR OF LONDON

Wild London?
Biodiversity and the future city

Peter Massini

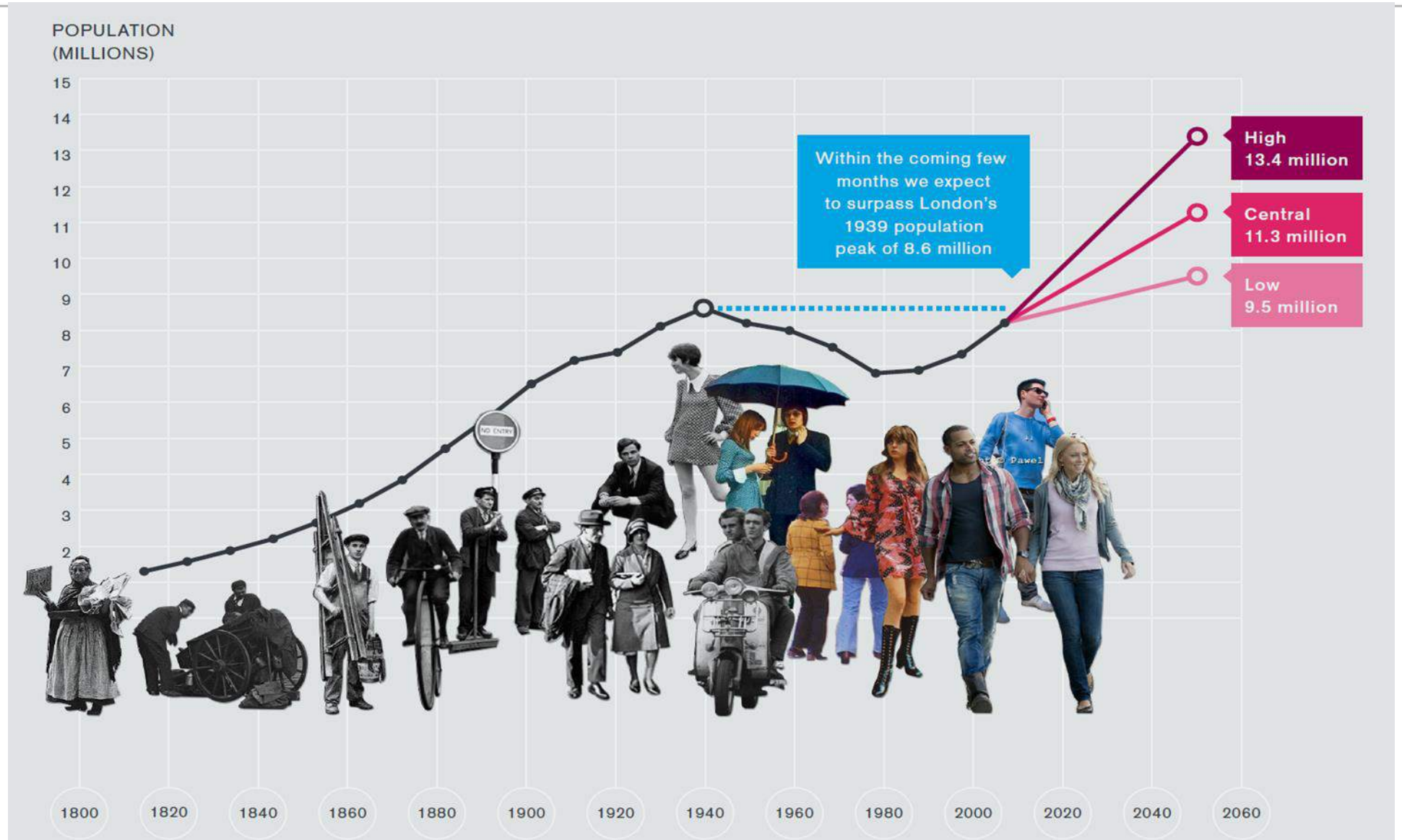
Lead – Green Infrastructure

Greater London Authority

MAYOR OF LONDON

MAYOR OF LONDON

MAYOR OF LONDON



MAYOR OF LONDON


GRANDSTAND WAY

MAYOR OF LONDON

Green infrastructure is the network of green spaces, rivers and woodlands (as well as features such as street trees and green roofs) that is planned, designed and managed to:

- promote healthier living;
- lessening the impacts of climate change;
- improving air quality and water quality;
- encouraging walking and cycling; and
- enhancing biodiversity and ecological resilience.

Policy G1 Green infrastructure

London's network of green and open spaces, and green features in the built environment such as green roofs and street trees, should be protected, planned, designed and managed as integrated features of green infrastructure.

N.b. Supporting text references natural capital accounting

Policy G6 Biodiversity and access to nature

Ensure the protection and conservation of Sites of Importance for Nature Conservation, priority species and habitats, and promote opportunities for enhancing them using Biodiversity Action Plans.

Seek opportunities to create other habitats, or features such as artificial nest sites, that are of particular relevance and benefit in an urban context.

Policy G5 Urban greening

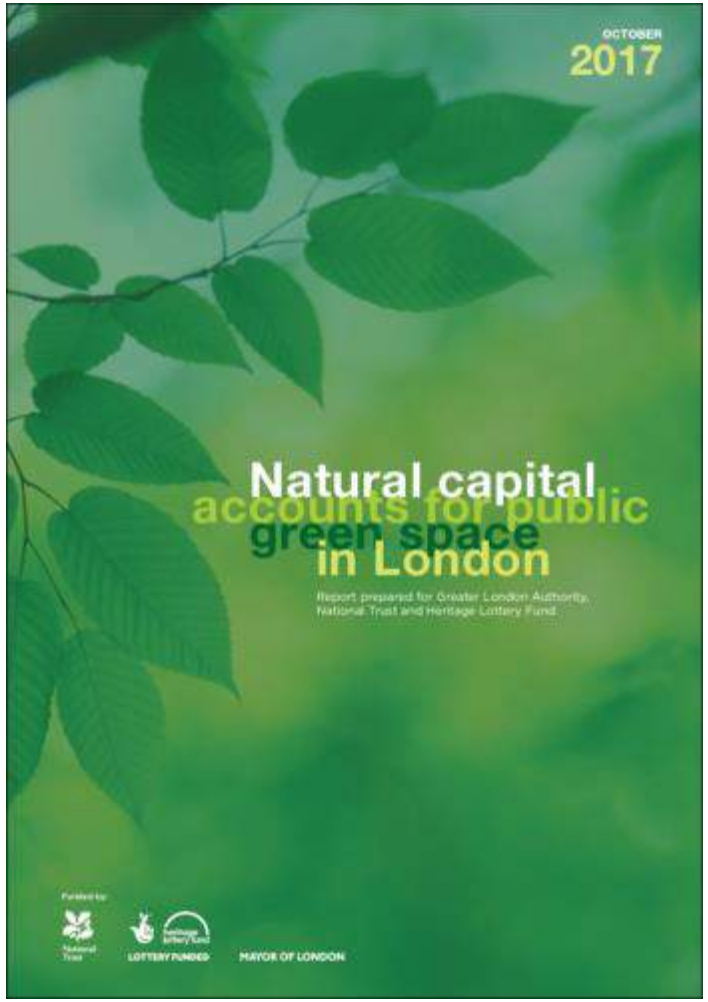
- Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.

A Natural Capital Account for London's green spaces

London's public green space have a gross asset value in excess of £91 billion, providing services valued at £5 billion per year.

For each £1 spent by local authorities and their partners on public green space, Londoners enjoy at least £27 in value.

Londoners avoid £950 million per year in health costs due to public green space



MAYOR OF LONDON

MAYOR OF LONDON

MAYOR OF LONDON

THANK YOU

peter.massini@london.gov.uk

@PeterMassini

CIDADE DE SÃO PAULO

VERDE E MEIO AMBIENTE

São Paulo, the challenges of SUSTAINABLE development and preservation of biodiversity

1

City of São Paulo Biodiversity

Main stages of preparation:

1. Diagnosis
2. Priority Areas for Conservation and Recovery
3. Action Plan

CIDADE DE SÃO PAULO
VERDE E MEIO AMBIENTE

1.a

Rain Forest Plan of São Paulo

Diagnosis

Flora

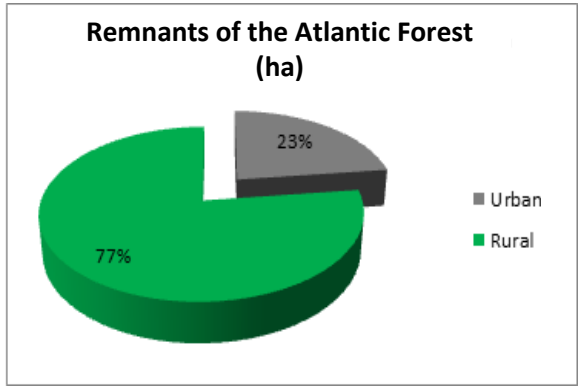
4,426 vascular species / 3,285 native species

Fauna

Class	Number of species
Mammalia	83
Birds	372
Amphibia	45
Reptilia (tortoises, crocodiles, lizards and snakes)	40
Osteichthyes (fishes)	23
Insecta (butterflies and crickets)	126
Arachnida (spiders)	09
Malacostraca (crabs and crayfishes)	02

District	Remnants of the Atlantic Forest Biome (ha)	%
Urban	10.554,25	23%
Rural	35.378,05	77%
Total	**45.906,47**	100,00%

Municipality Area	Remnants of the Atlantic Forest Biome (ha)	%
152.712,00	**45.906,47**	30,06%

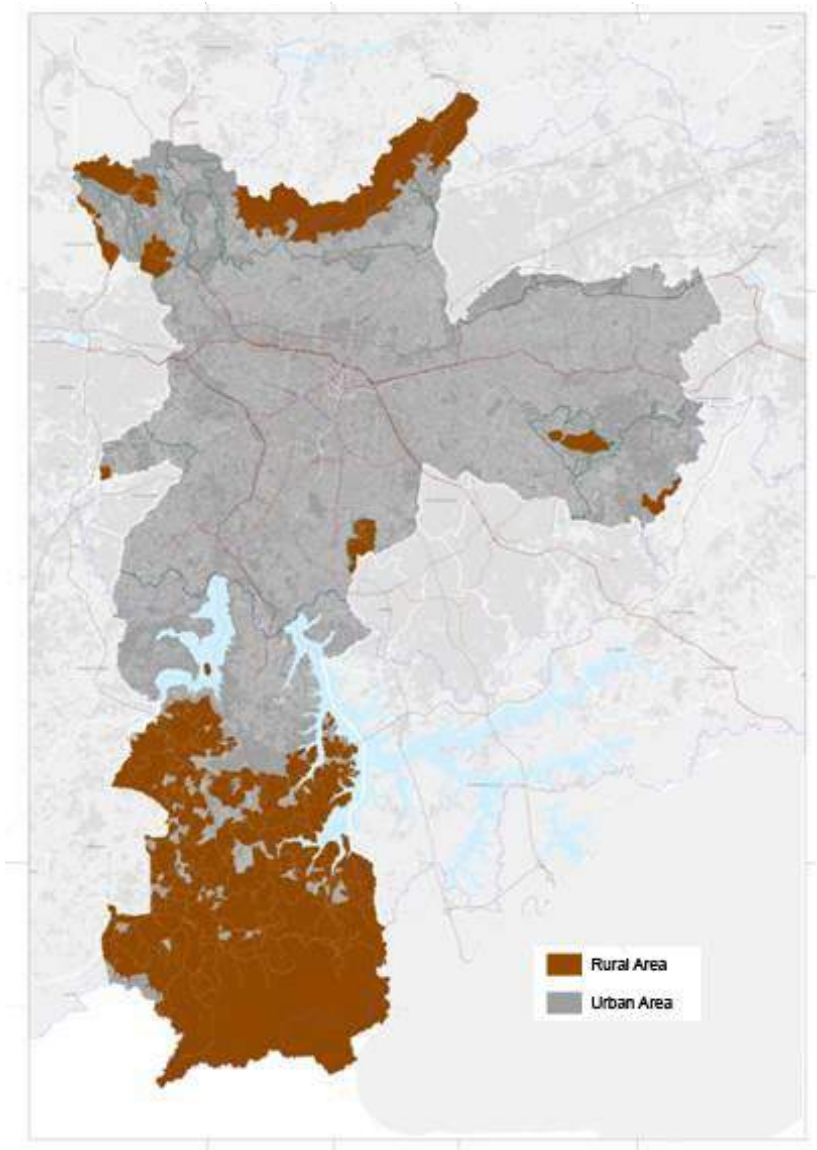


CIDADE DE SÃO PAULO
VERDE E MEIO AMBIENTE

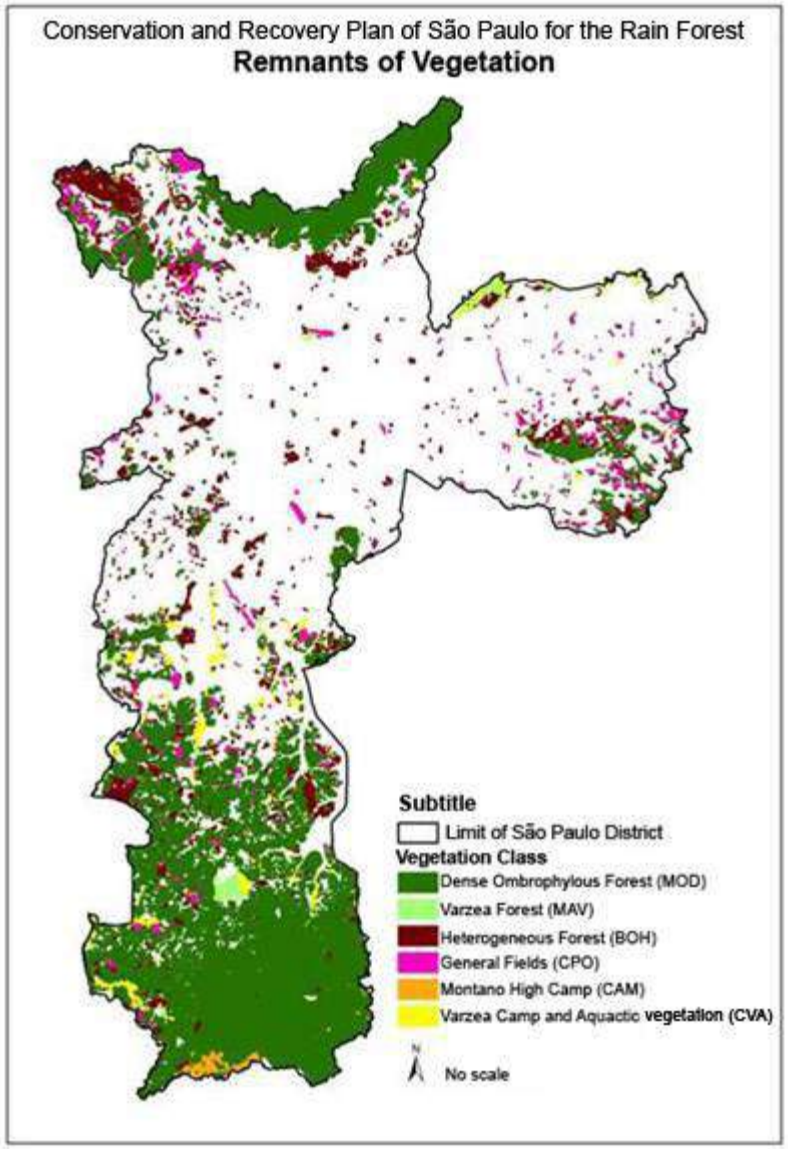
1.b

Rain Forest Plan of São Paulo

Urban Area and Rural Area



Remnants - PMMA



CIDADE DE SÃO PAULO
VERDE E MEIO AMBIENTE

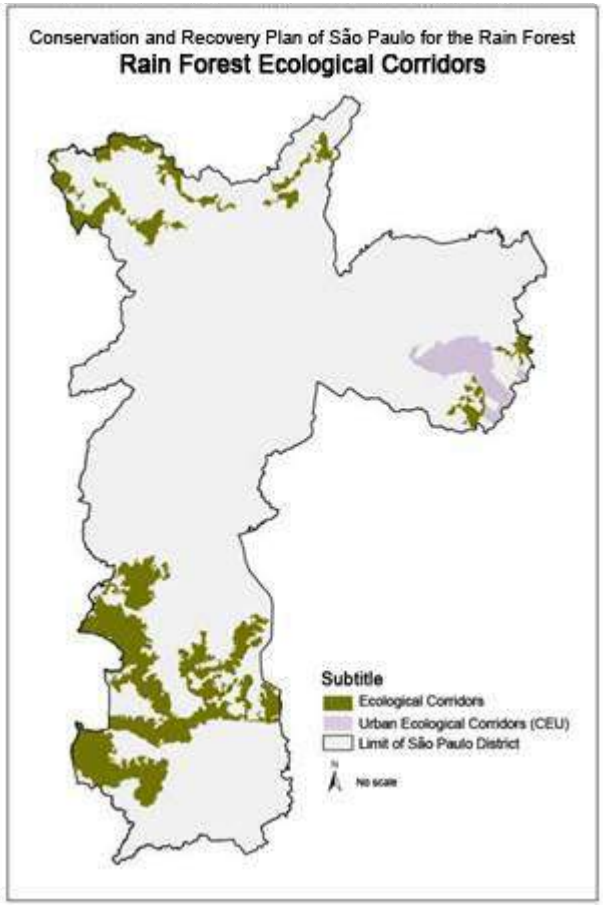
1.c

Rain Forest Plan of São Paulo

Priority Areas: Ecological Corridors

Ecological corridors are areas that have forests ecosystems with great importance and viable for the conservation of the Atlantic Forest Biodiversity, composed by conservation units groups, indigenous lands and interstitial areas. Its function is the effective protection of nature, reducing or preventing the fragmentation of existing forests, through the connection between different modalities of protected areas and other spaces with different uses of the soil.

Available in: http://www.mma.gov.br/areas-protegidas/programas-e-projetos/projeto-corredores-ecologicos



Atlantic Forest from São Paulo District (%)*	Total Area of Atlantic Forest from São Paulo District (hectare)	Total Area of Atlantic Forest from Ecological Corridors (hectare)
30,06	45.932,30	15.232,35

*Approximately 1/3 is within the Corridors

CIDADE DE SÃO PAULO
VERDE E MEIO AMBIENTE

1.d

Rain Forest Plan of São Paulo

Main Actions

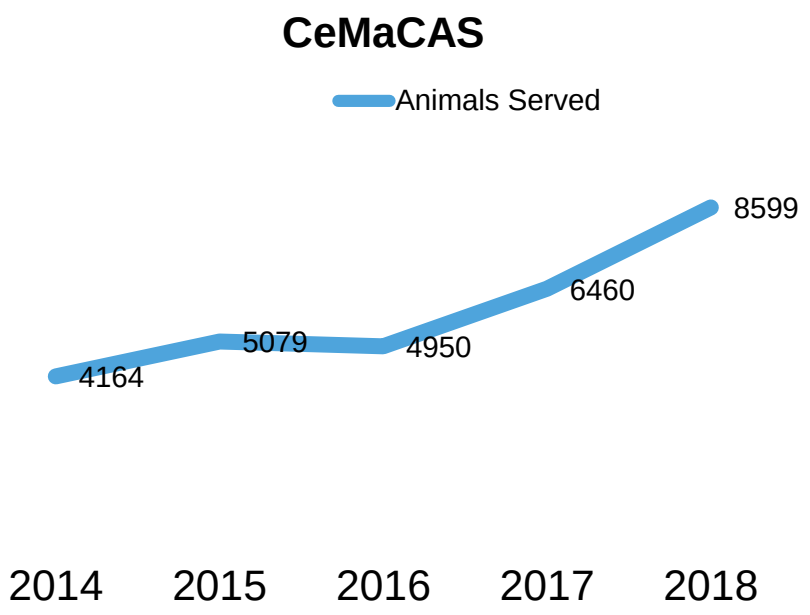
1.To create and implement Ecological Corridors;
2.Propose the creation and / or expansion of UCs, Urban Parks and Linear Parks;
3.To create and implement the Ecological Restoration Program in UCs, urban parks, linear parks and private areas;
4.To create the sustainable management development program for rural areas of the municipality of São Paulo
5.To improve Environmental Inspection in articulation with the State Government;
6.To prepare and implement the PMMA Communication Plan;
7.To apply the incentive instruments for conservation and recovery of remnant Rain Forest, as the PSA. (Payments for Provision of Environmental Services)
8.To raise and systematize studies of vegetation resilience to climate change;
9.To perform a study of the behavior of the regional climate against the change in the use and occupation of the soil in the vegetated areas.
10.To create financial incentives and technical support for the category of Private Natural Heritage Reserve

Technical Division of Veterinary Medicine and Wildlife Management

1.e

Wildlife Care

- The Wildlife Division is prepared to attend the various species of wild animals that live in the city of São Paulo. This service is provided by technicians specialized in the premises of the Technical Division of Veterinary Medicine and Wildlife Management and Conservation of Wild Animals (CeMaCAS).
- From1991 to 2018, 71,754 wild animals were treated.
- The Wildlife Division also conducts the wildlife county inventory. The most recent number (2018) recorded 1,121 species in 135 green areas and 5 water bodies.



2

Biodiversity Planning

System of Protected Areas, Green Areas and Free Spaces (SAPAVEL)

SAPAVEL is comprised of both environmentally sensitive areas such as conservation units and parks, as well as squares, open spaces, green areas of lots, cemeteries. Such system is an important tool to contribute to the environmental agenda of the township.

Payments for Provision of Environmental Services (PSA)

Implementation of a new instrument to reward property owners who knowingly preserve areas that provide relevant environmental services for the city's sustainability, such as water production, organic agriculture, preservation of remnants of the Atlantic Forest and biodiversity.

National Wildlife Management System (SISFAUNA)

The National Wildlife Management System is an electronic system for the management and control of enterprises and activities related to the use and management of wild fauna in carriage in the national territory.

2.a

Biodiversity Planning

Urban Tree Management System (SISGAU)

SISGAU is a web platform tool that assists the tree planting process through the construction of a register of trees, compiling information relevant to the creation of strategies for managing the specimens.

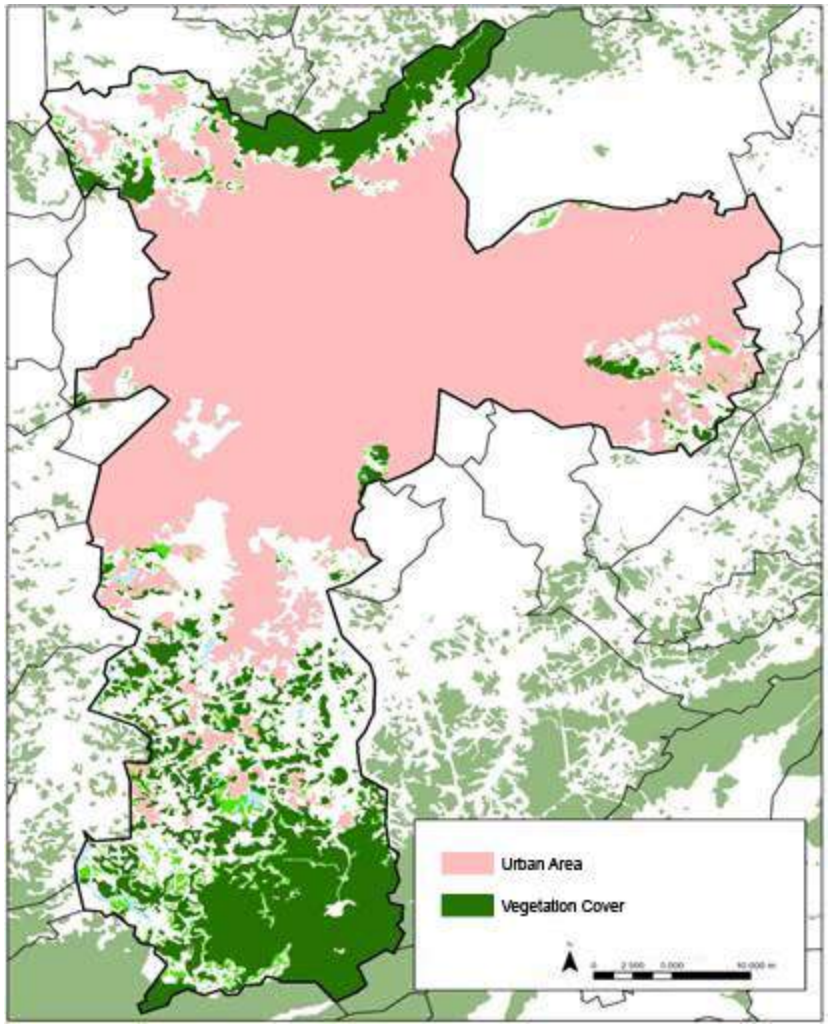
Supervision

SVMA counts on the Coordination of Environmental Surveillance (CFA), which supervises through of denunciations of environmental crimes, mainly using Law 9605/1998, which deals with criminal and administrative sanctions derived from actions harmful to the environment.

3

Indicators for monitoring

Vegetation Cover



Green Area by Inhabitant

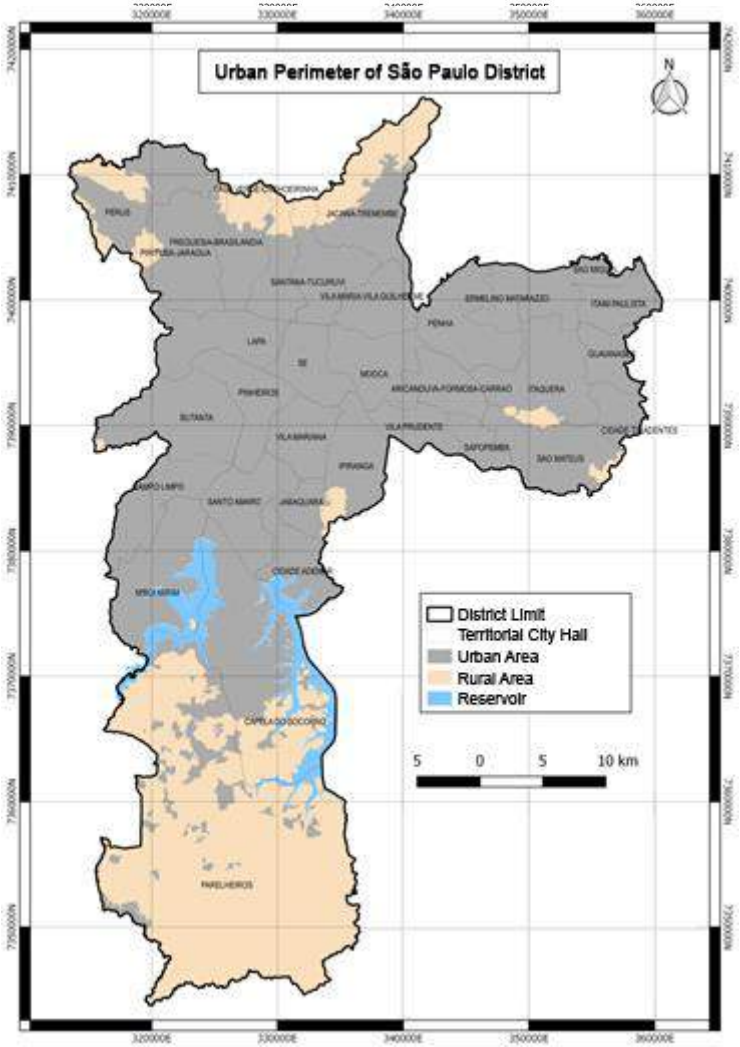
Green public area, in square meters per inhabitant by territorial city hall of São Paulo District

Aricanduva / Formosa / Carrão	4,13
Butantã	5,73
Campo Limpo	2,25
Capela do Socorro	16,23
Casa Verde / Cachoeirinha	17,44
Cidade Ademar	0,77
Cidade Tiradentes	4,89
Ermelino Matarazzo	4,17
Freguesia / Brasilândia	18,54
Guaianases	1,35
Ipiranga	10,7
Itaim Paulista	2,09
Itaquera	12,82
Jabaquara	4,69
Jaçanã / Tremembé	88,58
Lapa	4,71
M'Boi Mirim	6,94
Mooca	2,37
Parelheiros	358,79
Penha	15,1
Perus	63,71
Pinheiros	6,31
Pirituba	12,63
Santana / Tucuruvi	15,07
Santo Amaro	2,27
São Mateus	3,13
São Miguel	2,94
Sé	2,54
Vila Maria / Vilha Guilherme	3,03
Vila Mariana	6,8
Sapopemba	1,54
Vila Prudente	

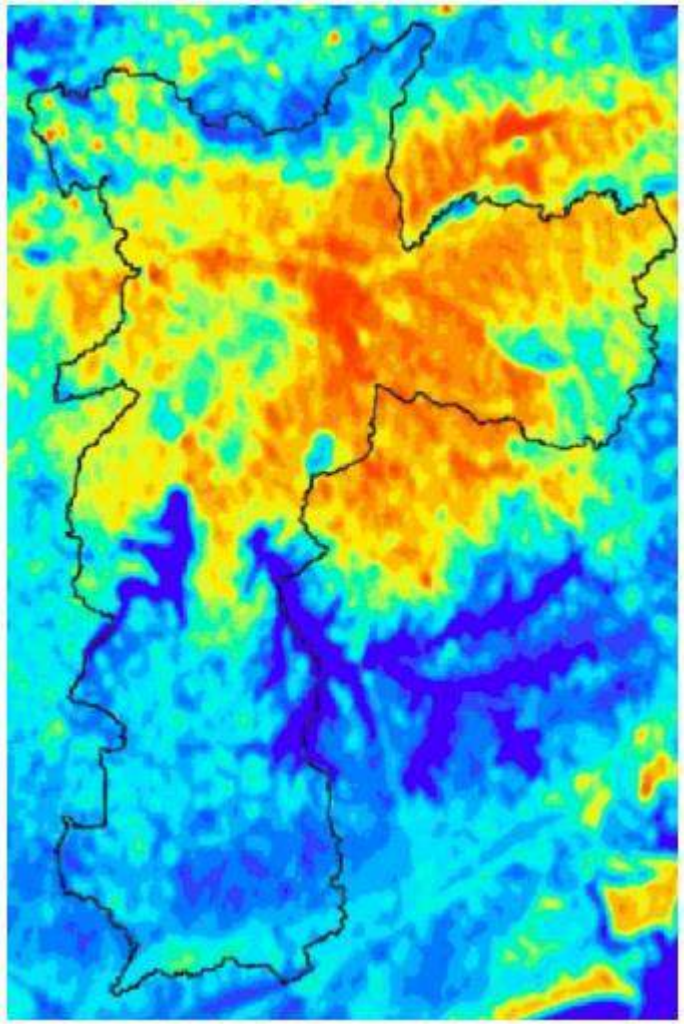
3.a

Indicators for monitoring

Urban Area



Heat Islands



4 Decision Making

The SVMA considers several factors for the decision making that can directly or indirectly impact the life of the citizen, we can mention:

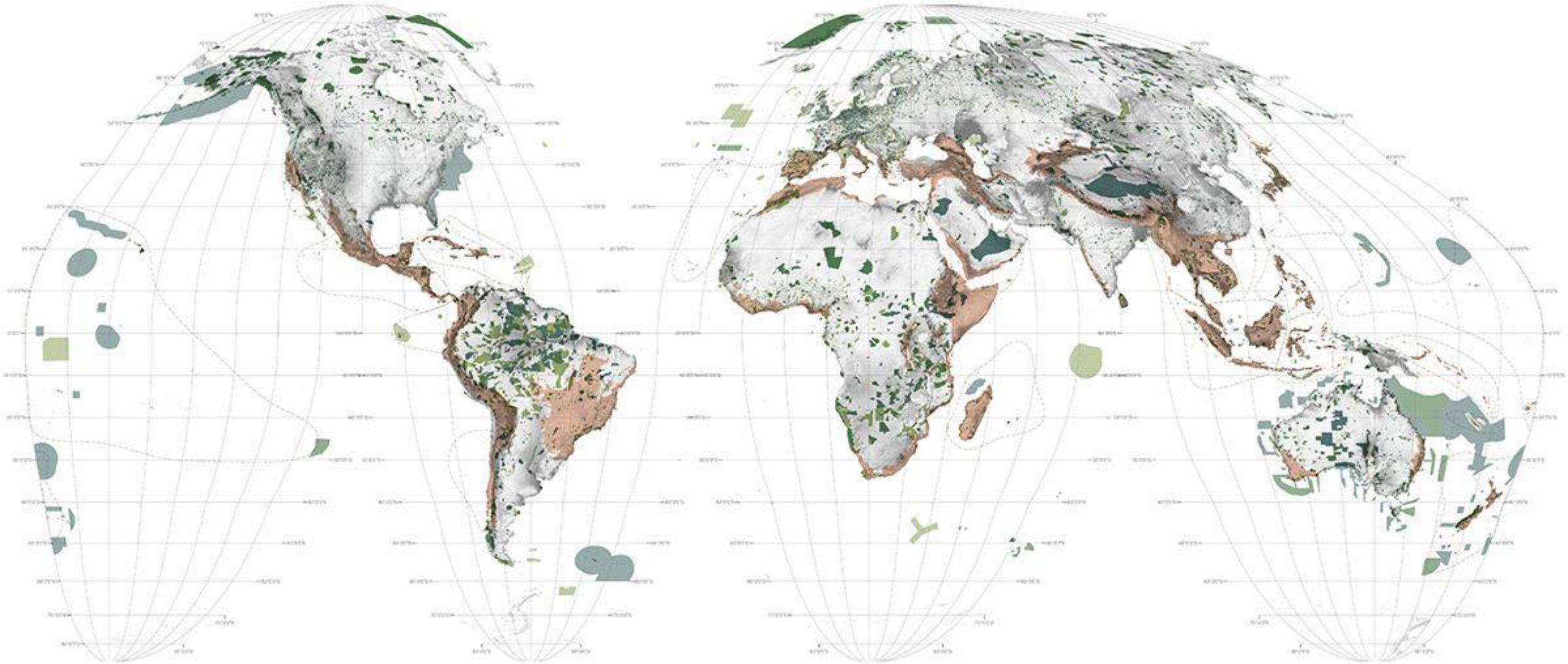
- Encouraging the adoption of sustainable practices in construction, solid waste disposal and environmental preservation;
- Resilience
- Long-Term Planning;
- Strategic Director Plan;

The adoption of solutions based on nature for new constructions with increased permeability, containment of rainwater, ceilings and green walls and the non-incentive to use of automobile.

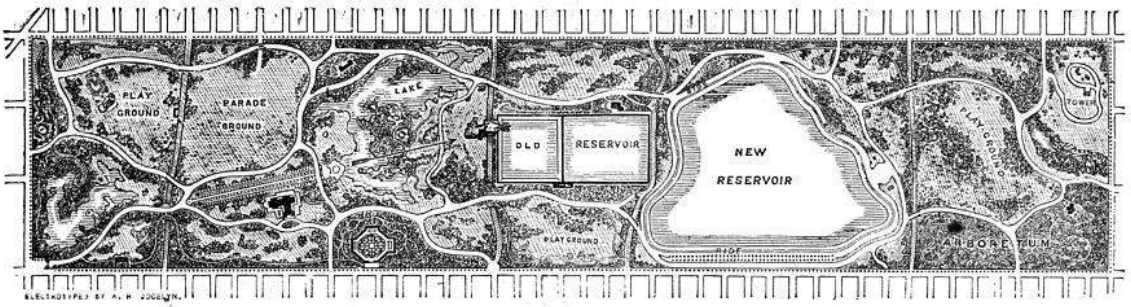
CIDADE DE SÃO PAULO

VERDE E MEIO AMBIENTE

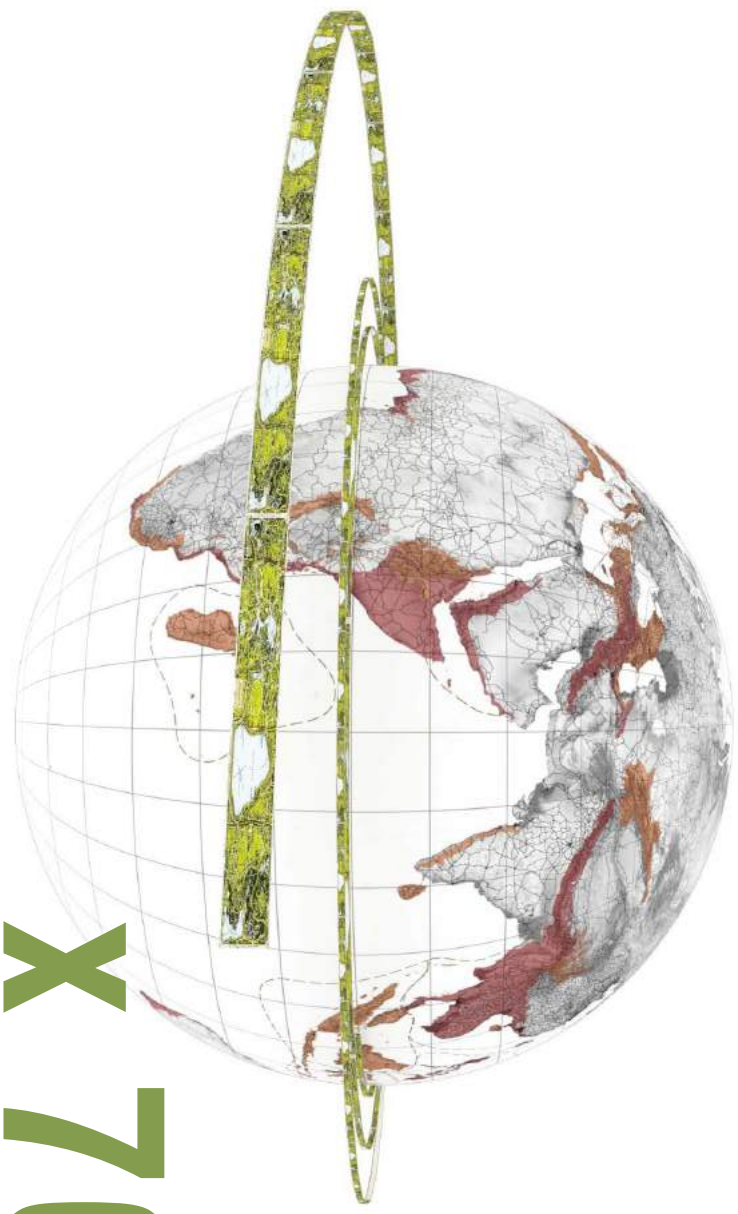
1.6%: representative & connected



1.6% of the earth's terrestrial surface in number of Central Parks.

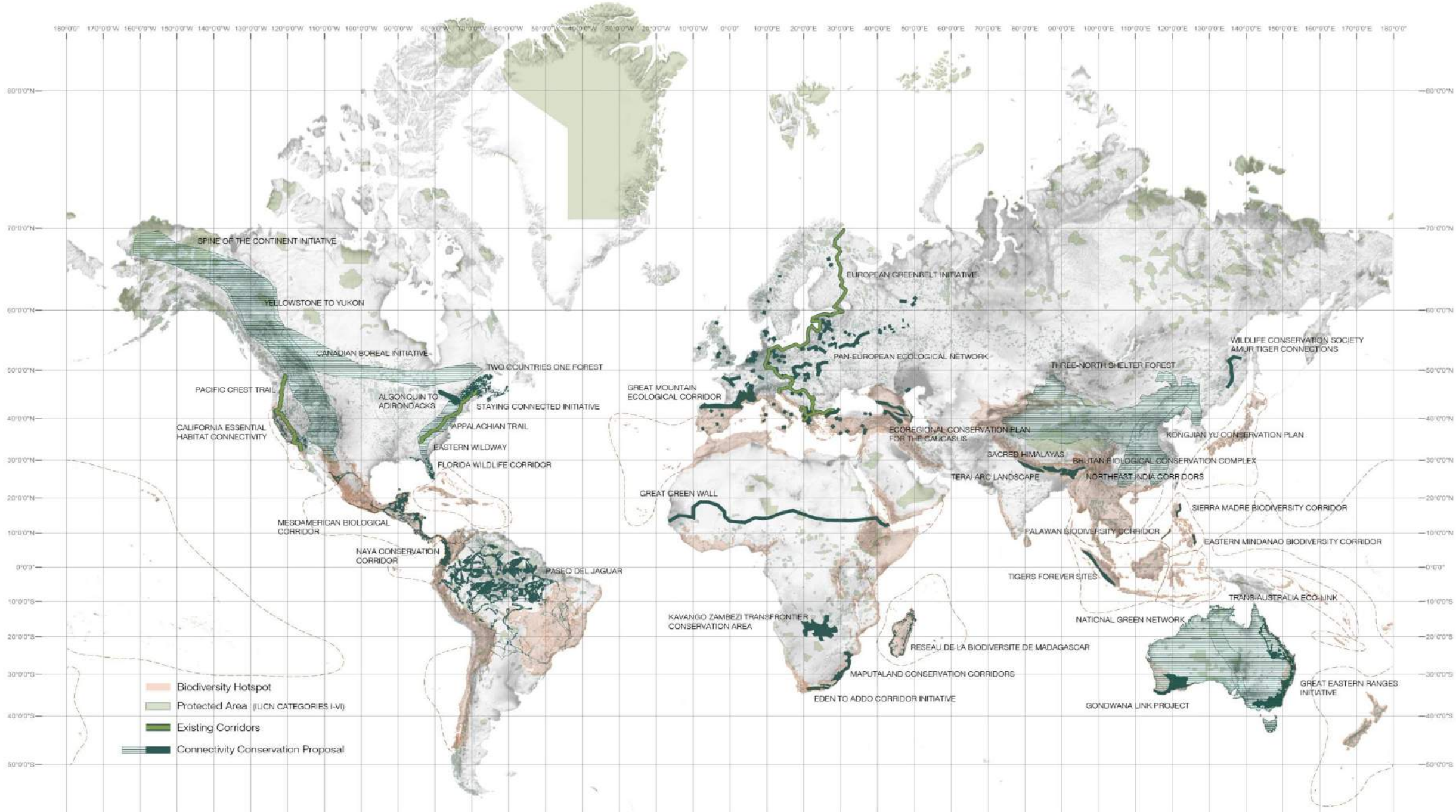


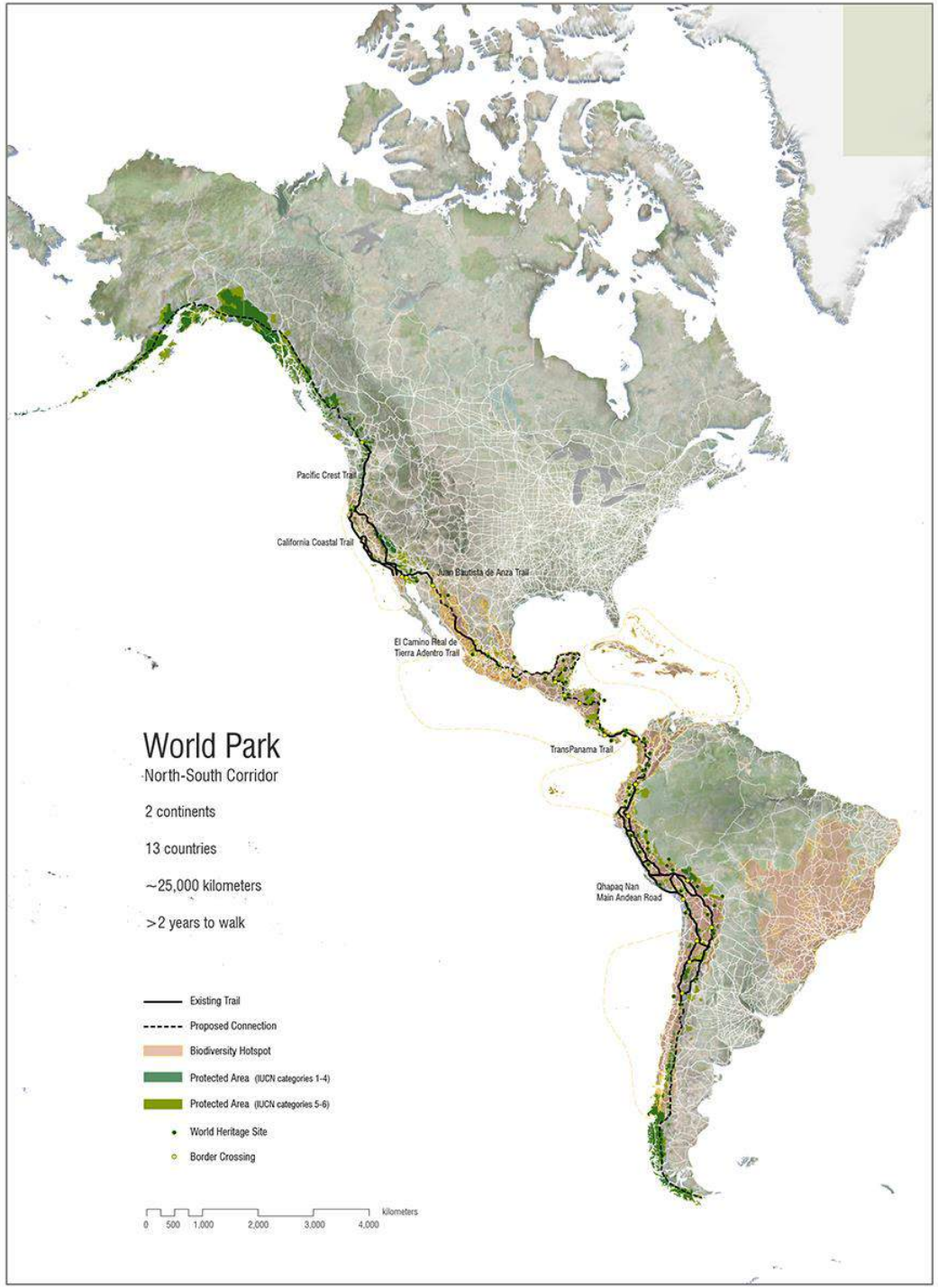
PRIZE PLAN FOR THE CENTRAL PARK, NEW YORK. DESIGNED BY MESSRS. OLMSTEAD AND VAUX.

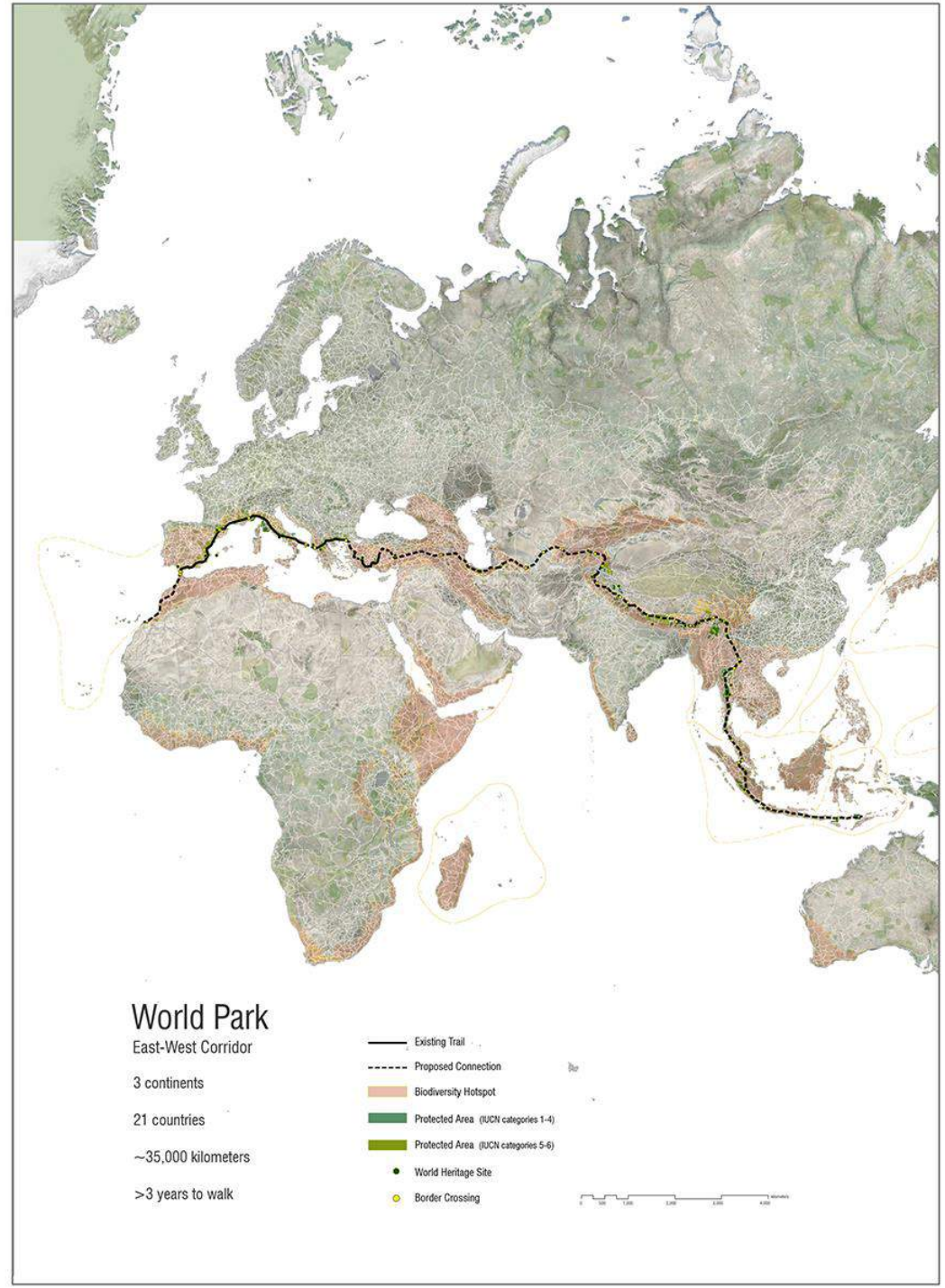


x 70

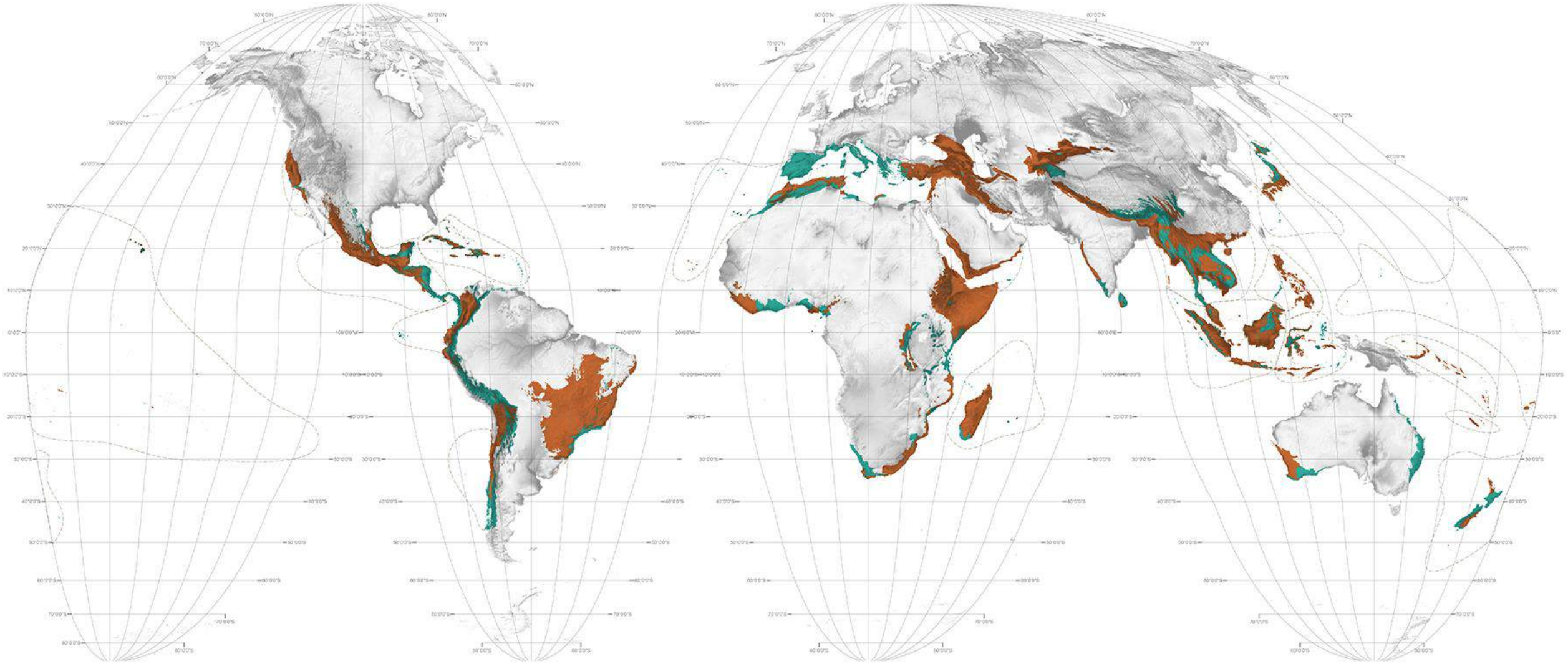
695,825 Central Parks can wrap around the globe 70 times.


SPINE OF THE CONTINENT INITIATIVE
YELLOWSTONE TO YUKON
CANADIAN BOREAL INITIATIVE
TWO COUNTRIES ONE FOREST
PACIFIC CREST TRAIL
ALGONQUIN TO ADIRONDACKS
STAYING CONNECTED INITIATIVE
CALIFORNIA ESSENTIAL HABITAT CONNECTIVITY
APPALACHIAN TRAIL
EASTERN WILDWAY
FLORIDA WILDLIFE CORRIDOR
MESOAMERICAN BIOLOGICAL CORRIDOR
NAYA CONSERVATION CORRIDOR
PASEO DEL JAGUAR
EUROPEAN GREENBELT INITIATIVE
PAN-EUROPEAN ECOLOGICAL NETWORK
GREAT MOUNTAIN ECOLOGICAL CORRIDOR
ECOREGIONAL CONSERVATION PLAN FOR THE CAUCASUS
GREAT GREEN WALL
KAVANGO ZAMBEZI TRANSFRONTIER CONSERVATION AREA
RESEAU DE LA BIODIVERSITE DE MADAGASCAR
MAPUTALAND CONSERVATION CORRIDORS
EDEN TO ADDO CORRIDOR INITIATIVE
THREE-NORTH SHELTER FOREST
WILDLIFE CONSERVATION SOCIETY AMUR TIGER CONNECTIONS
KONGJIAN YU CONSERVATION PLAN
SACRED HIMALAYAS
BHUTAN BIOLOGICAL CONSERVATION COMPLEX
TERAI ARC LANDSCAPE
NORTHEAST INDIA CORRIDORS
SIERRA MADRE BIODIVERSITY CORRIDOR
PALAWAN BIODIVERSITY CORRIDOR
EASTERN MINDANAO BIODIVERSITY CORRIDOR
TIGERS FOREVER SITES
TRANS-AUSTRALIA ECO-LINK
NATIONAL GREEN NETWORK
GONDWANA LINK PROJECT
GREAT EASTERN RANGES INITIATIVE
Biodiversity Hotspot
Protected Area (IUCN CATEGORIES I-VI)
Existing Corridors
Connectivity Conservation Proposal

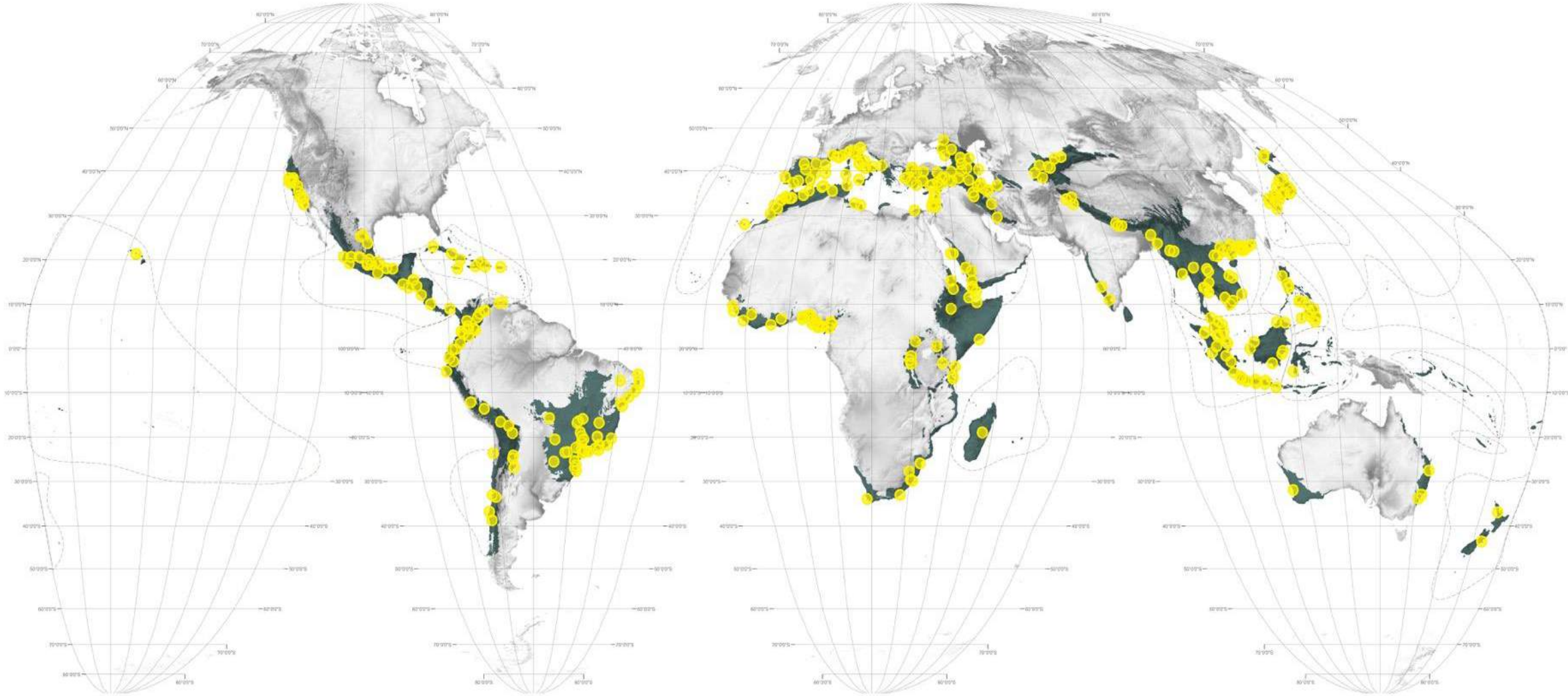

Pacific Crest Trail
California Coastal Trail
Juan Bautista de Anza Trail
El Camino Real de
Tierra Adentro Trail
TransPanama Trail
Qhapaq Nan
Main Andean Road
World Park
North-South Corridor
2 continents
13 countries
~25,000 kilometers
>2 years to walk
Existing Trail
Proposed Connection
Biodiversity Hotspot
Protected Area (IUCN categories 1-4)
Protected Area (IUCN categories 5-6)
World Heritage Site
Border Crossing
0 500 1,000 2,000 3,000 4,000
kilometers


World Park
East-West Corridor
3 continents
21 countries
~35,000 kilometers
>3 years to walk
Existing Trail
Proposed Connection
Biodiversity Hotspot
Protected Area (IUCN categories 1-4)
Protected Area (IUCN categories 5-6)
World Heritage Site
Border Crossing

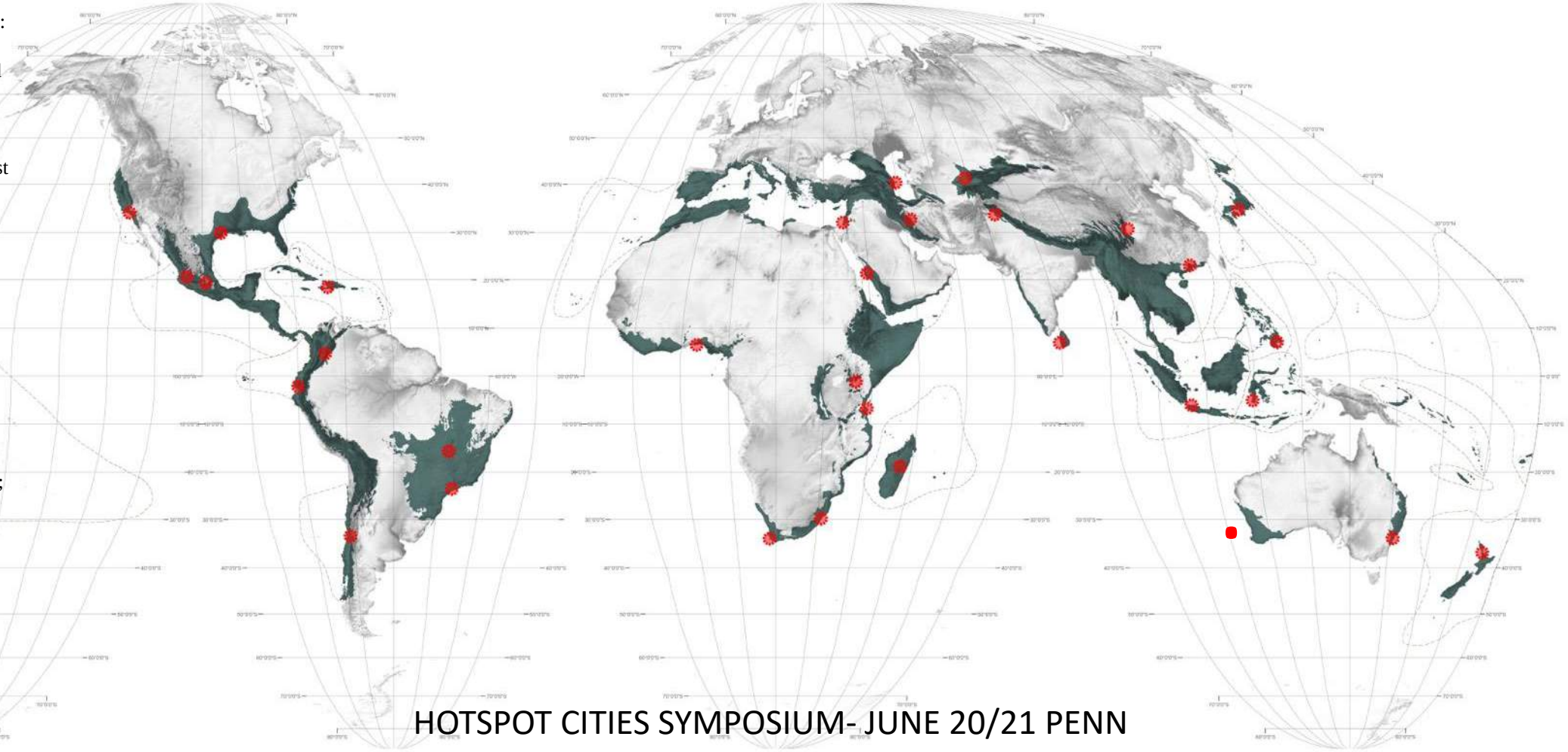
221/391 ecoregions
21/36 hotspots



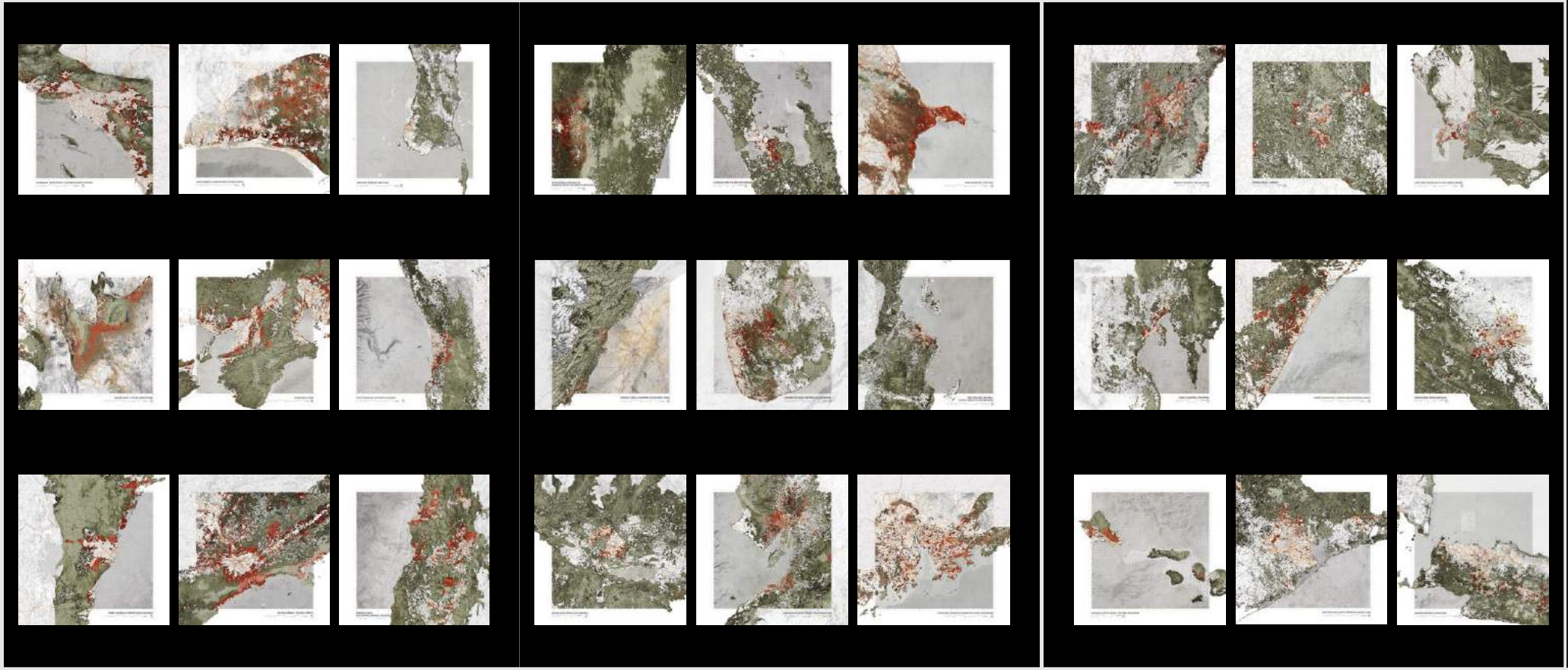
Green: Meet the 17% target
Red: Miss the 17% target



1) Atlantic Forest: Sao Paulo, Brazil; 2) California Floristic Province: Los Angeles, USA; 3) Cape Floristic Region: Cape Town, South Africa; 4) Caribbean: Port-au-Prince, Haiti; 5) Caucasus: Baku, Azerbaijan; 6) Cerrado: Brasilia, Brazil; 7) Chilean Winter Rainfall and Valdivian Forests: Santiago, Chile; 8) Coastal Forests of Eastern Africa: Dar es Salaam, United Republic of Tanzania; 9) Eastern Afromontane: Nairobi, Kenya; 10) Forests of East Australia: Sydney, Australia; 11) Guinean Forests of West Africa: Lagos, Nigeria; 12) Himalaya: Rawalpindi, Pakistan; 13) Horn of Africa: Mecca, Saudi Arabia; 14) Indo-Burma: Guangzhou, China; 15) Irano-Anatolian: Esfahan, Iran; 16) Japan: Osaka, Japan; 17) Madagascar and the Indian Ocean Islands: Antananarivo, Madagascar; 18) Madrean Pine-Oak Woodlands: Ciudad de México, Mexico; 19) Maputaland-Pondoland-Albany: Durban, South Africa; 20) Mediterranean Basin: Tel Aviv, Israel; 21) Mesoamerica: Guadalajara, Mexico; 22) Mountains of Central Asia: Tashkent, Uzbekistan; 23) Mountains of Southwest China: Chengdu, China; 24) New Zealand: Auckland, New Zealand; 25) Philippines: Davao, Philippines; 26) Polynesia-Micronesia: Honolulu, USA; 27) Southwest Australia: Perth, Australia; 28) Sundaland: Jakarta, Indonesia; 29) Tropical Andes: Bogotá, Colombia; 30) Tumbes-Choco-Magdalena: Guayaquil, Equador; 31) Wallacea: Makassar (Ujung Padang), Indonesia; 32) Western Ghats and Sri Lanka: Colombo, Sri Lanka.



HOTSPOT CITIES SYMPOSIUM- JUNE 20/21 PENN


LEGEND
Conflict z
Likelihood
Urban gr
Likelihood
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Hotsp
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Water
Hydro
Railroa
Roads
Left to right
Previous S
1. Andaman
2. Auckland
3. Baku, A
4. Bogotá,
5. Brasília,
6. Cape To
7. Changsh
8. Colombo
9. Dar es S
10. Davao,
11. Durban,
12. Estanue
13. Guadalc
14. Guayaq
15. Hong K
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20. Los An
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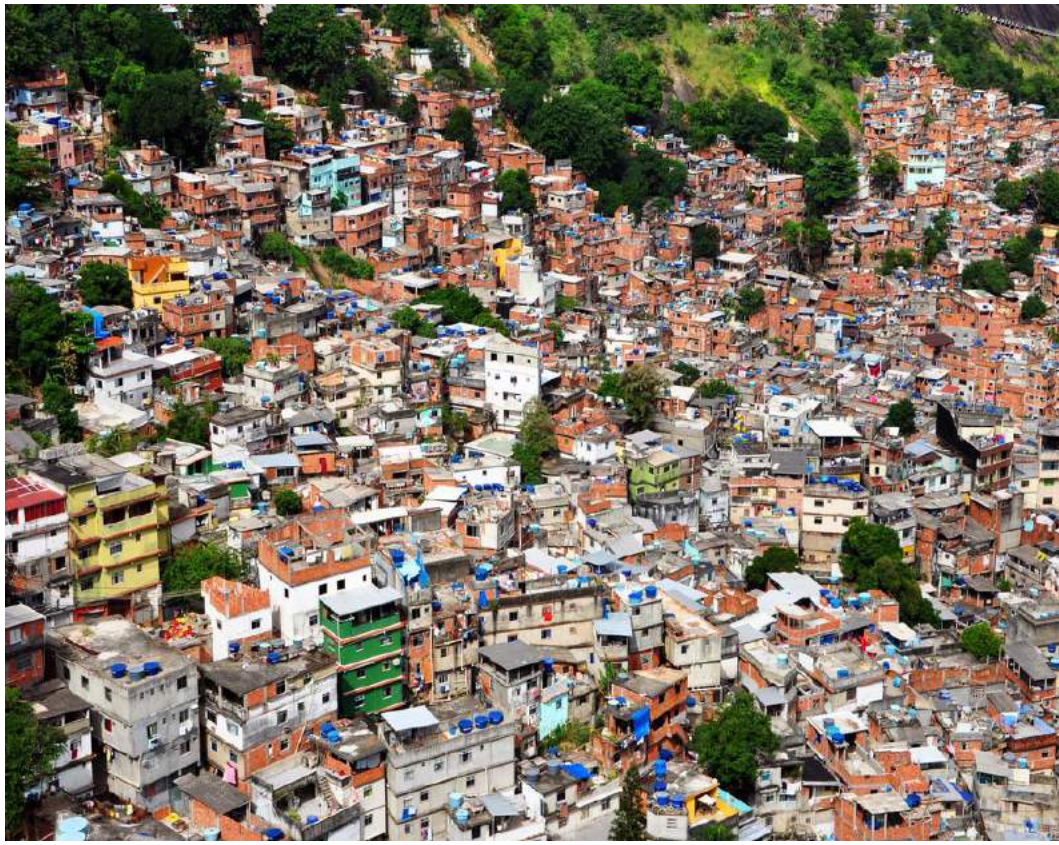
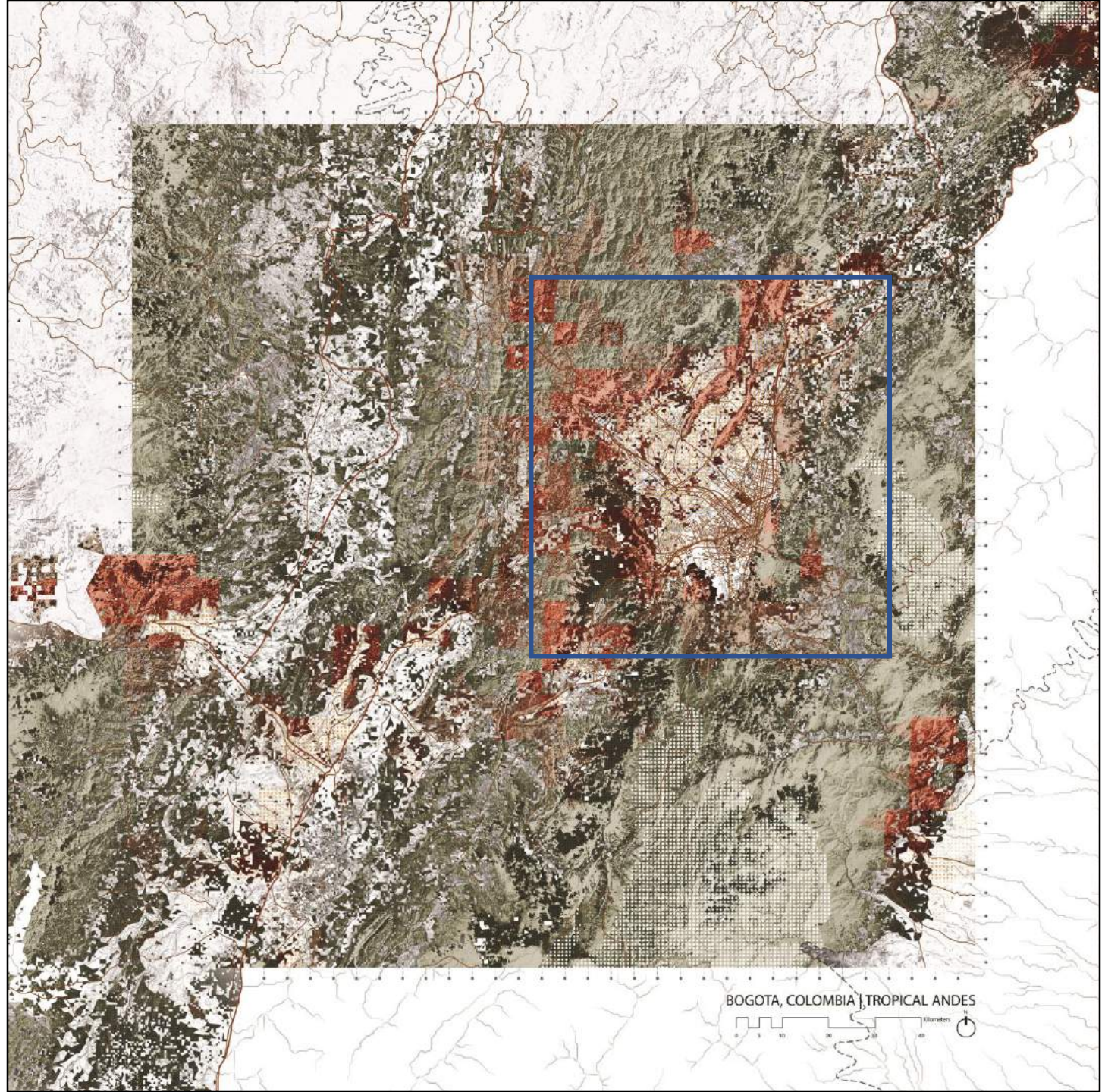
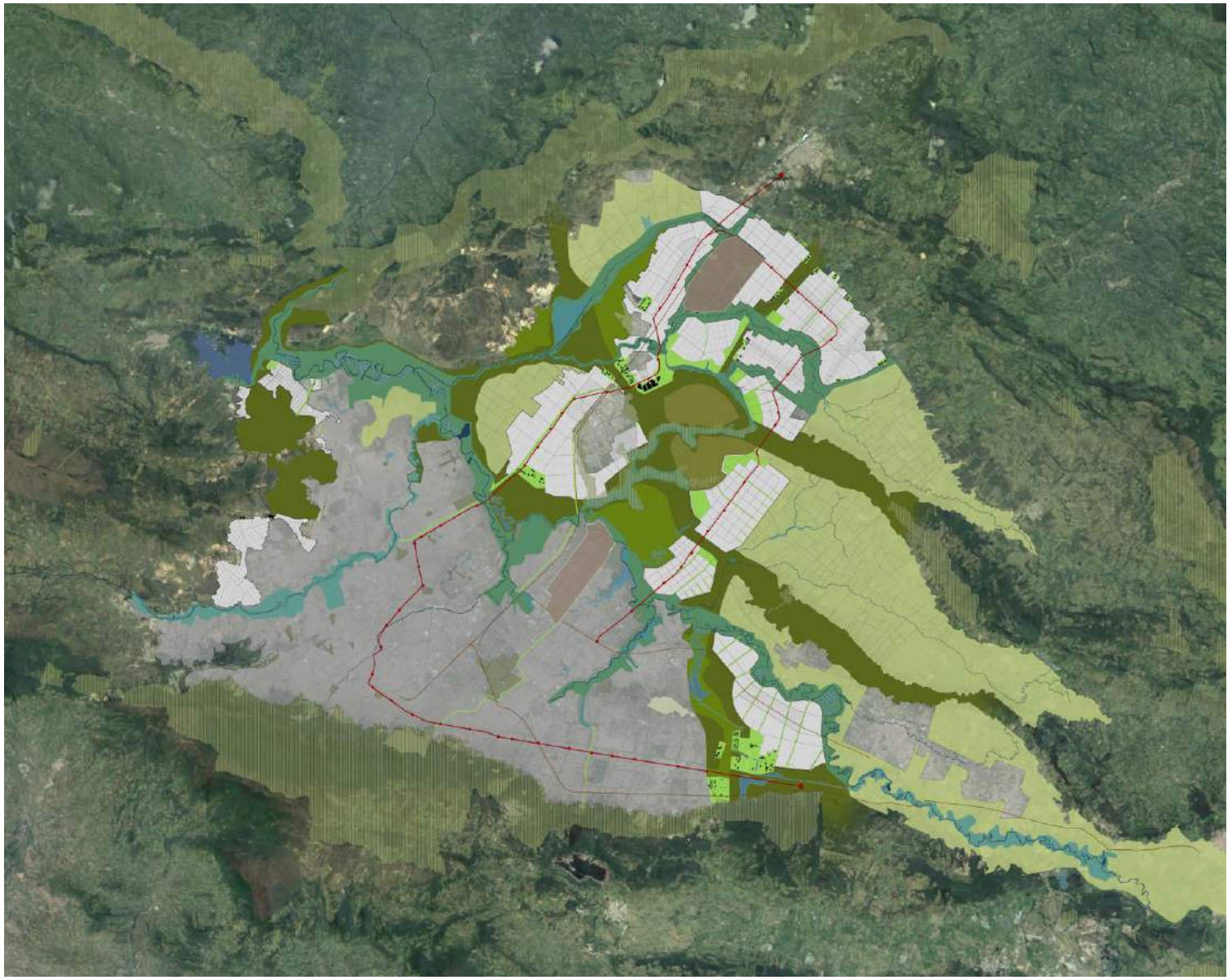
22. Mecca,
23. Mexico
24. Nairobi
25. Osaka
26. Perth,
27. Portlan
28. Rawalp
29. São Pa
30. Santiag
31. Sydney
32. Teshen
33. Tel Avi




BOGOTA, COLOMBIA | TROPICAL ANDES
Kilometers
0
5
10
20
30
40
N

METROPOLITAN FRAMEWORK



EXISTING PROTECTED AREA
ECOLOGICAL CORRIDOR
RIPARIAN CORRIDOR
STEWARDS AND CIVIC SPACES
WATER BODY

AGROFORESTRY
PROTECTED AGRICULTRAL LAND

EXISTING URBAN
URBAN EXPANSION
AIRPORT

METRO
LIGHT RAIL
CARGO ROAD

Lunch Session 3 Presented by the GPSC:

Urban Biodiversity, Natural Capital Accounting, and Nature-based Infrastructure

Singapore, Edmonton, London, and Sao Paulo approaches

May 9, 2019 | 12:30 – 14:00 | MC 9 – 100