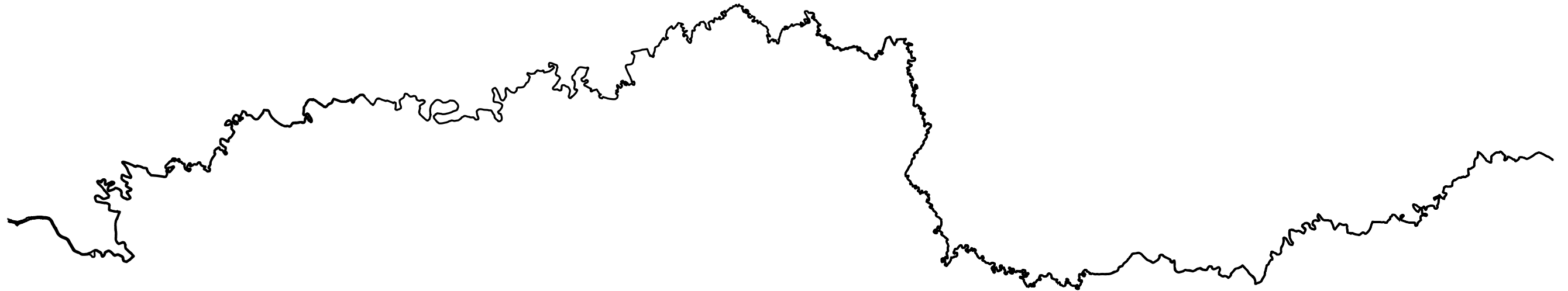


Rethinking Birrarung

Regenerating a dynamic Yarra River corridor



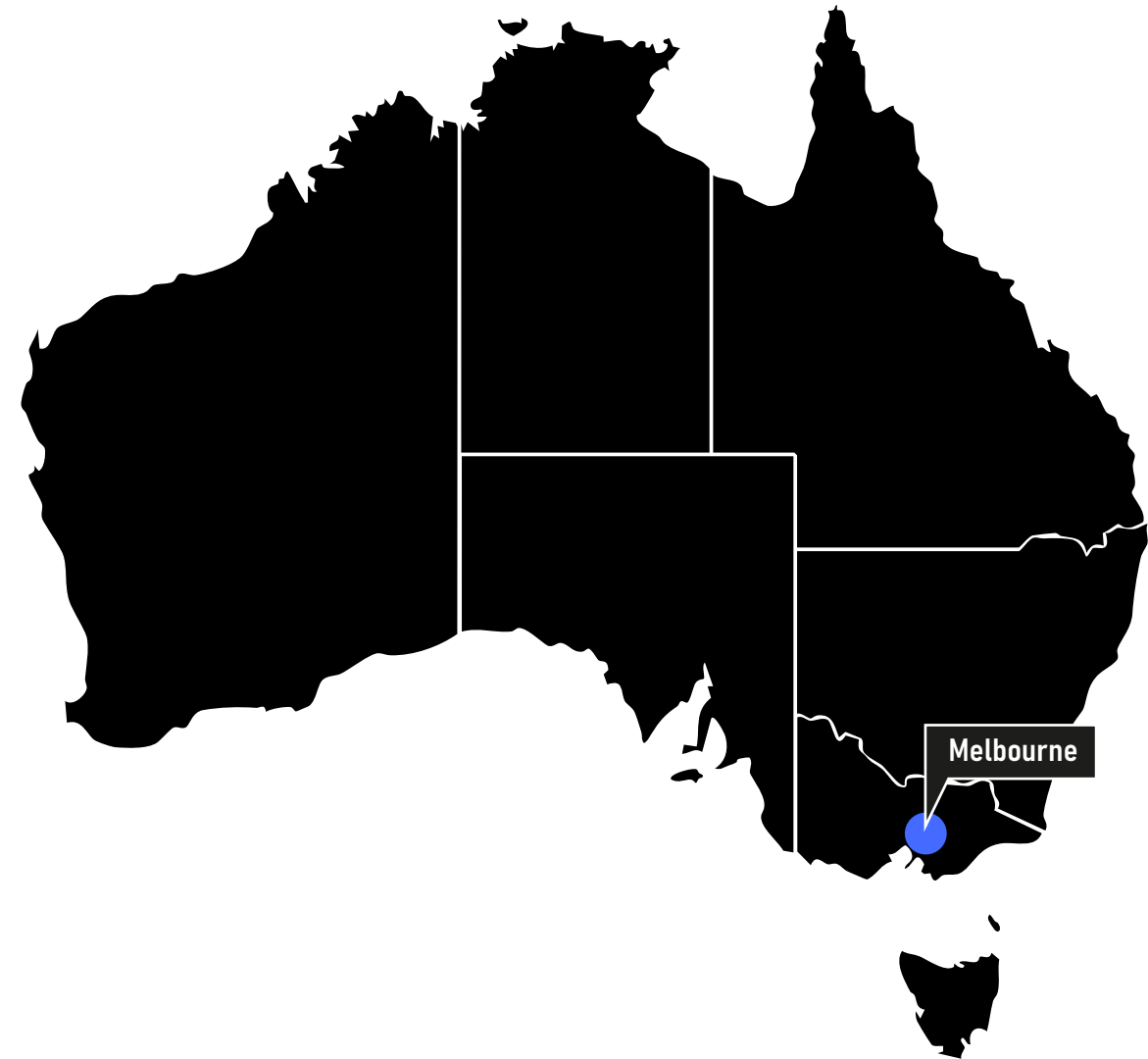
Lotte van Elst

P5 Graduation Presentation
MSc Architecture, Urbanism and Building Sciences
Delft University of Technology

1st mentor: Steffen Nijhuis
2nd mentor: Kristel Aalbers

Rethinking Birrarung

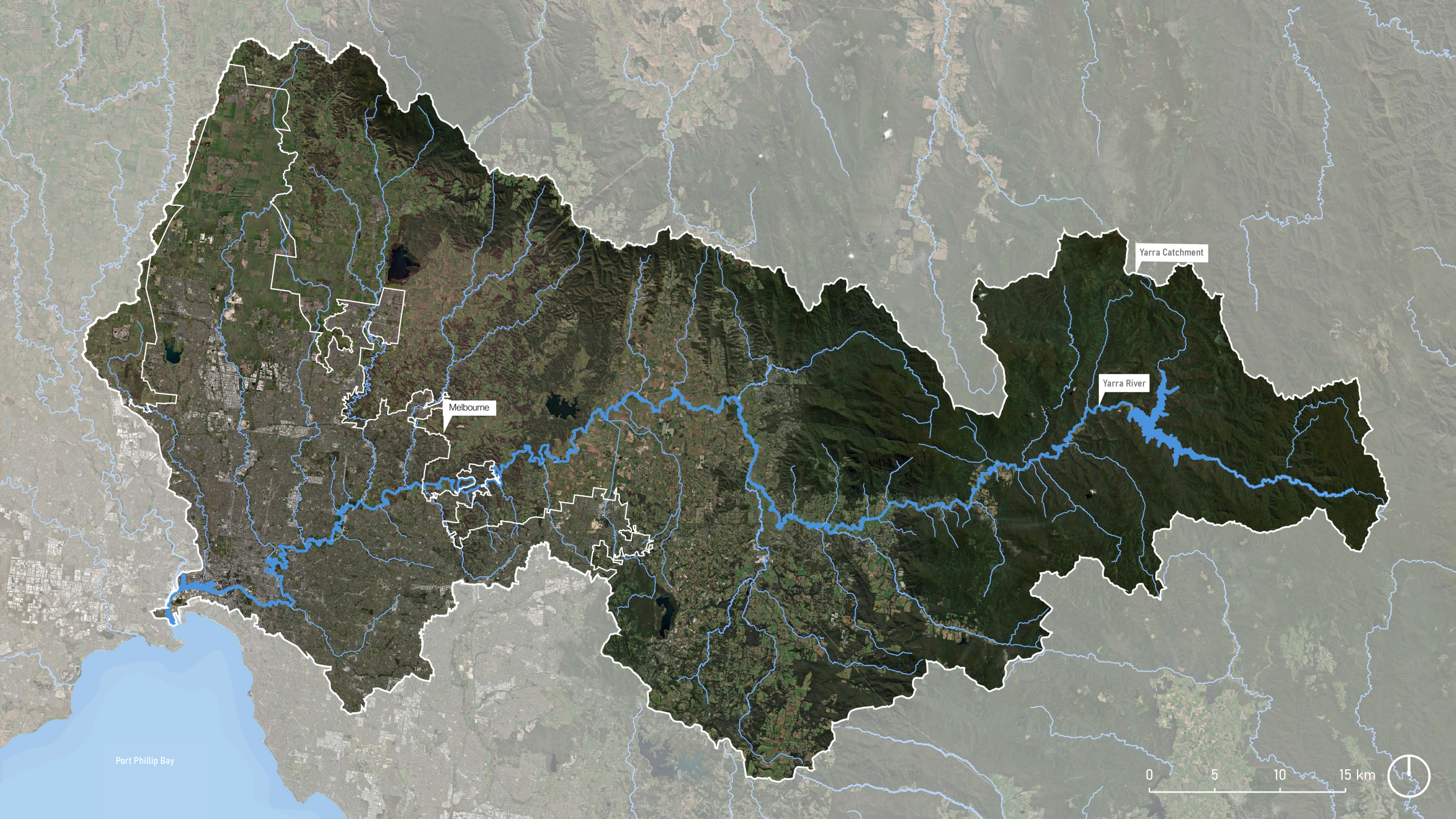
Regenerating a dynamic Yarra River corridor



Research supported by:

STICHTING N-H-BOS
ter bevordering van de landschapsarchitectuur





Yarra Catchment

Yarra River

Melbourne

Port Phillip Bay



Fascination



Main Yarra Trail cycling route

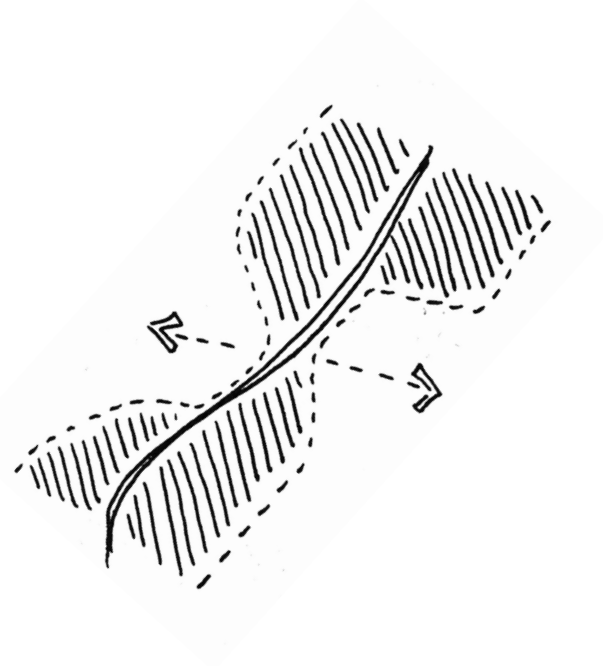


Rethinking Birrarung

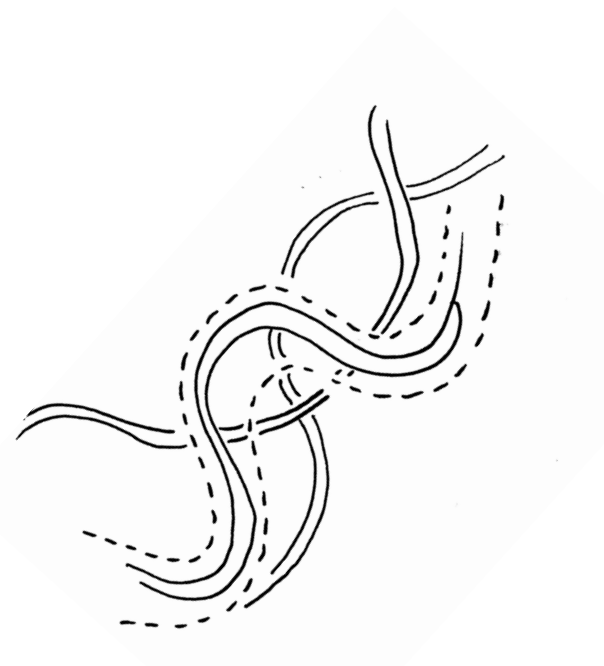


Recreational use of river in Munich

Problem field



1. Fragmentation of ecological corridor



2. Reduced water retention capacity



3. Urban and social disconnect from river

Birrarung / Yarra River

Pre-colonisation river (<1835)

Traditional Owners of the land
camped and lived alongside the river

Birrarung

River of mists and shadows





Legend

- Forested land typologies
- Riparian land typologies
- Other land typologies

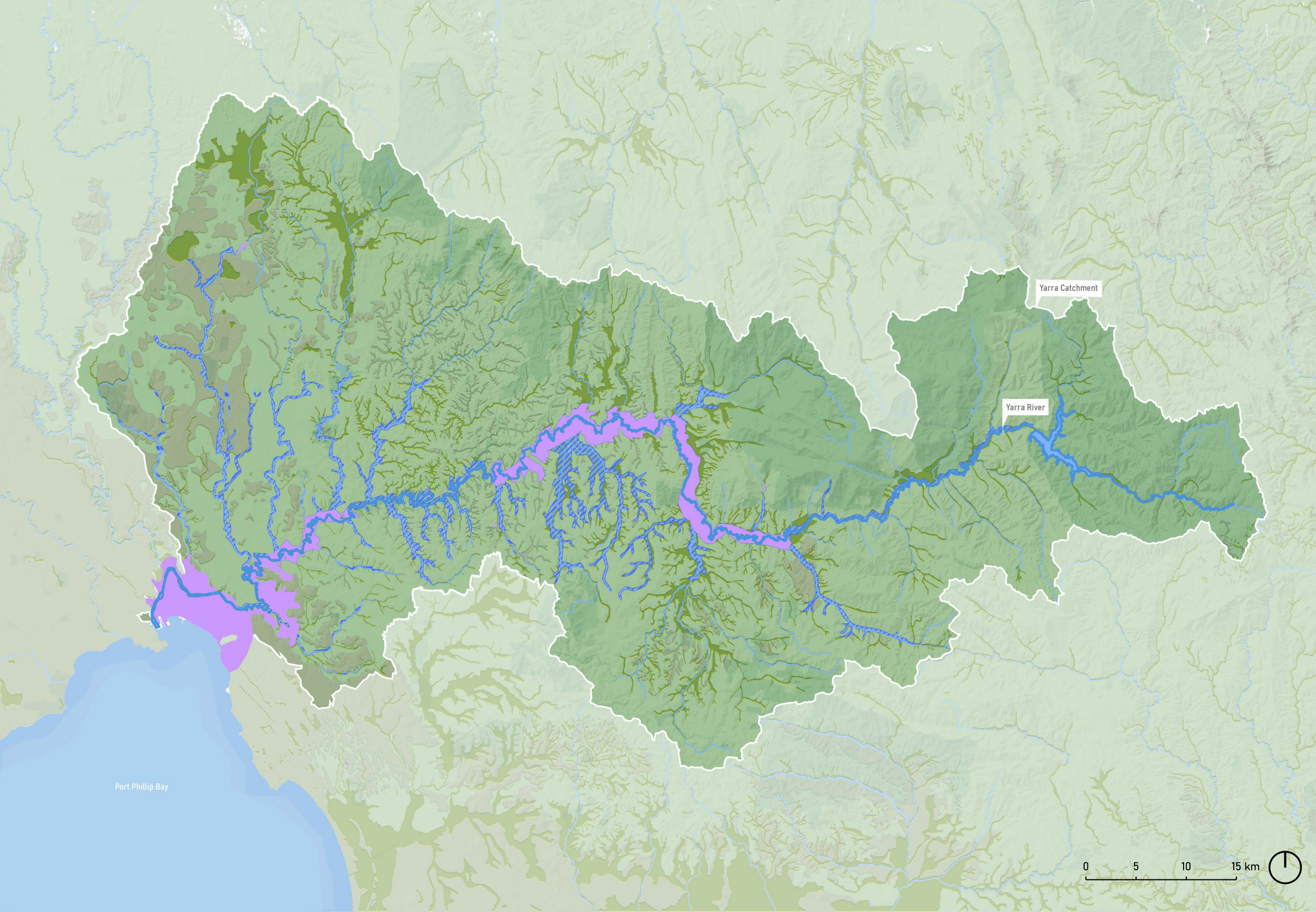
Yarra Catchment

Yarra River

Port Phillip Bay

Pre-colonisation catchment

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Legend

- Forested land typologies
- Riparian land typologies
- Other land typologies
- 1/100 year flood overlay
- Floodplains

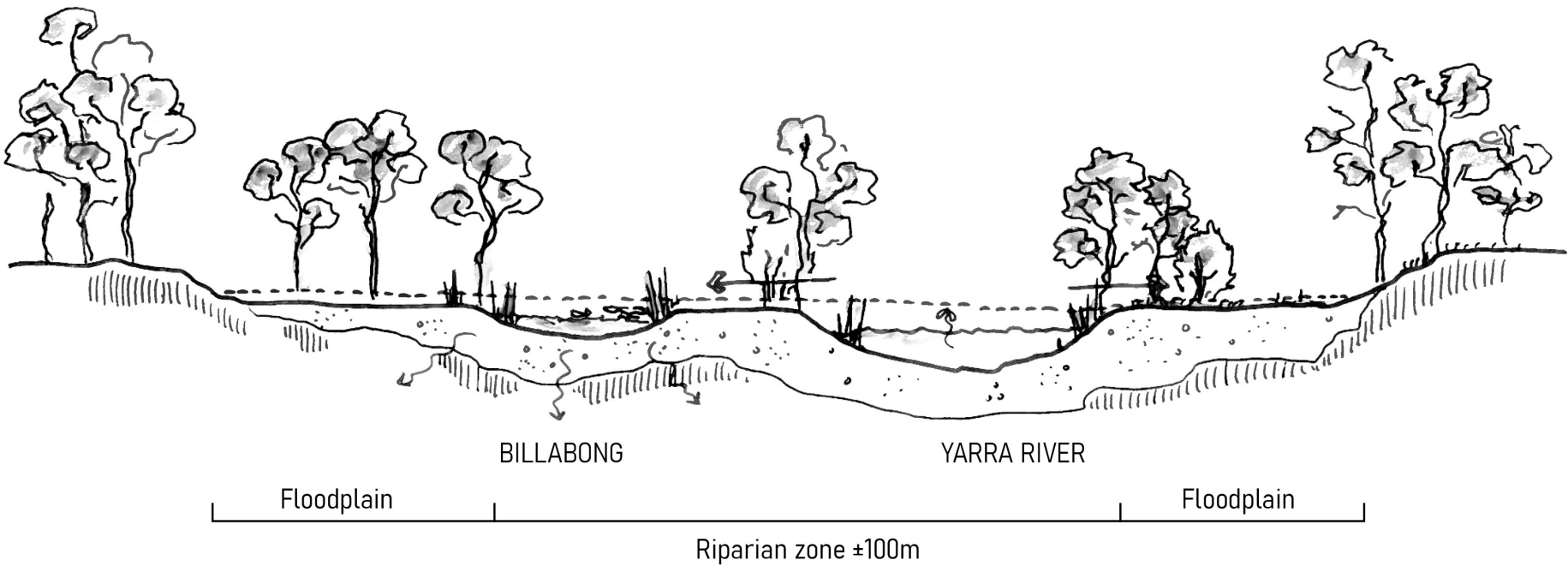
Floodplains of the Yarra River

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Riparian zone

Ecological corridor
Riparian habitats

Large water retention capacity
Filtering and buffering water



River Red Gum
Eucalyptus camaldulensis



Swamp Paperbark
Melaleuca ericifolia



Common Reed
Phragmites australis



Water Ribbons
Cynnogeton procerum



Nankeen Night Heron
Nycticorax caledonicus



Platypus
Ornithorhynchus anatinus



Growling Grass Frog
Ranoidea raniformis



Macquarie perch
Macquaria australasica



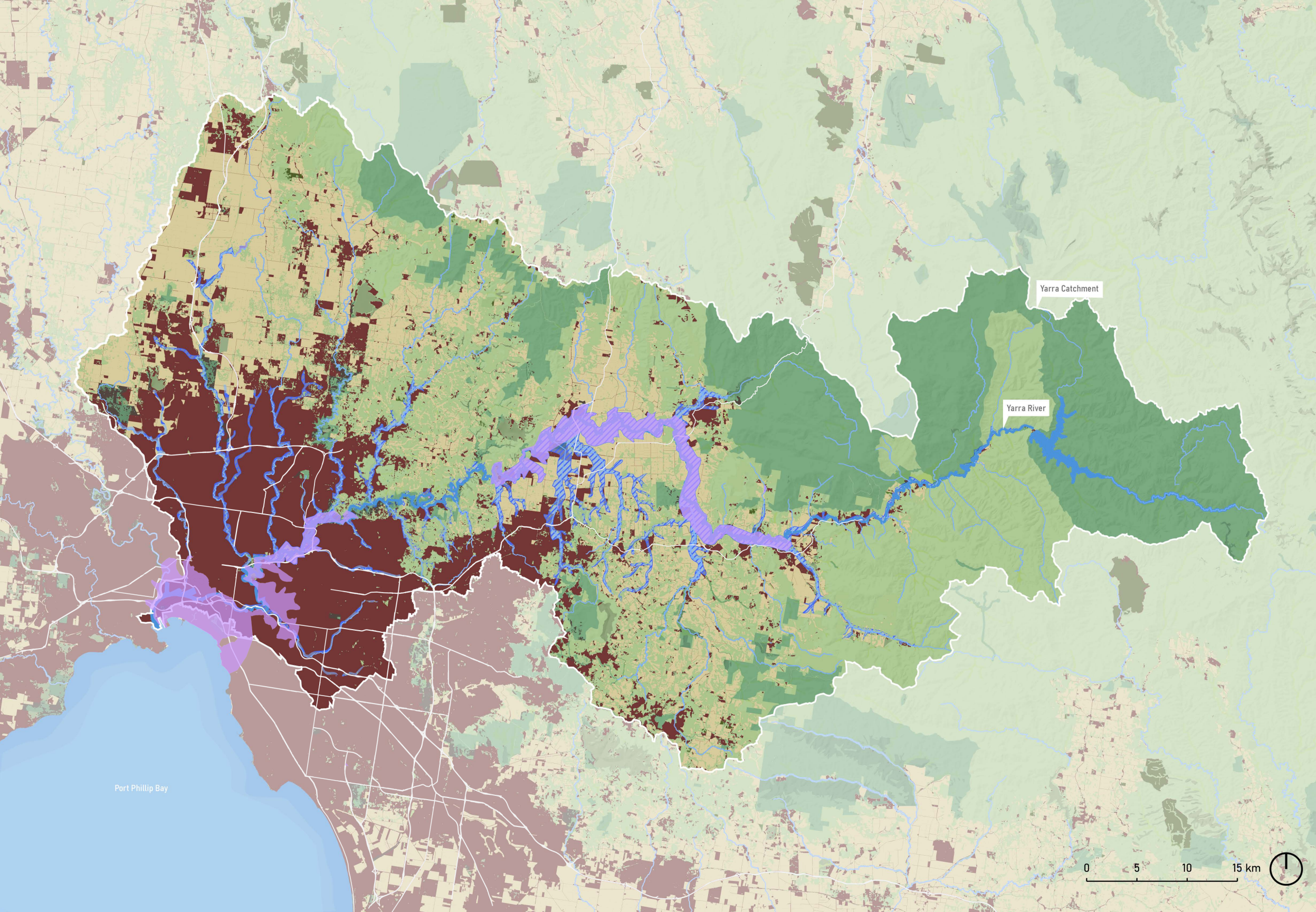
Australian Grayling
Prototroctes maraena

Birrarung / Yarra River

Post-colonisation river (1854)

Melbourne was founded in 1835 and build on the riverbanks on the lower floodplain





Legend

- Urban zone
- Forested land
- Parks and Reserves
- Agricultural land
- Yarra River
- Creeks
- 1/100 year flood overlay
- Floodplains

Post-colonisation catchment

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

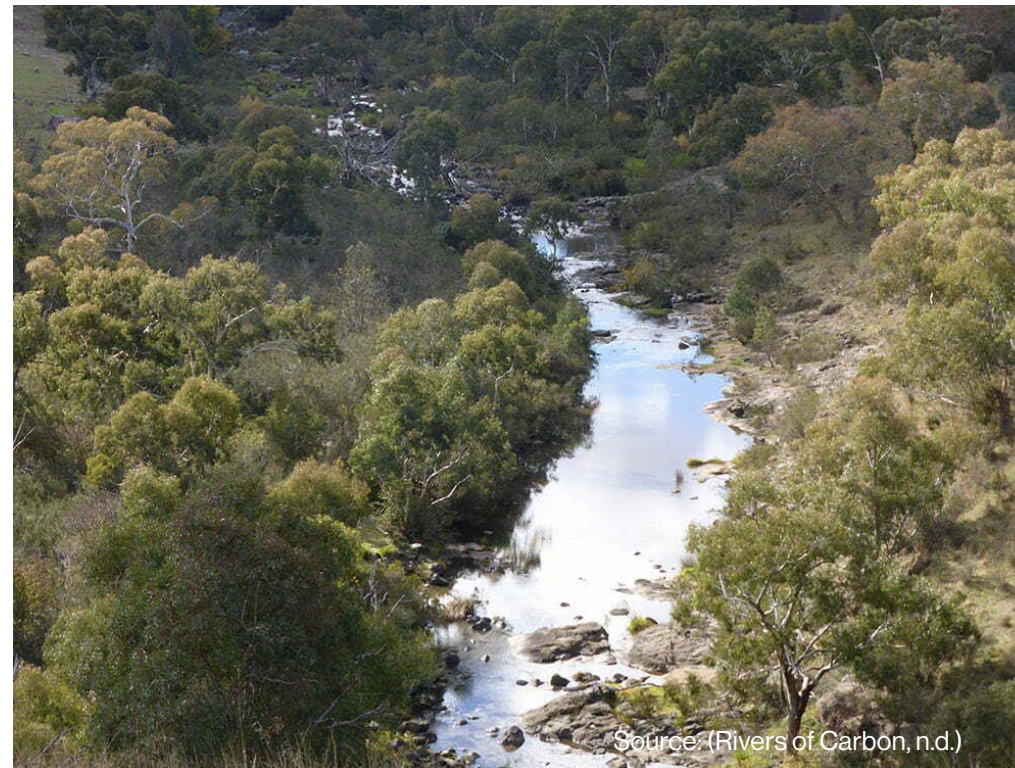
Change in riparian land use

Agriculture on riparian zone

Riparian zone holds fertile soil and is a desired location for agriculture

Low water retention capacity

Low ecological value



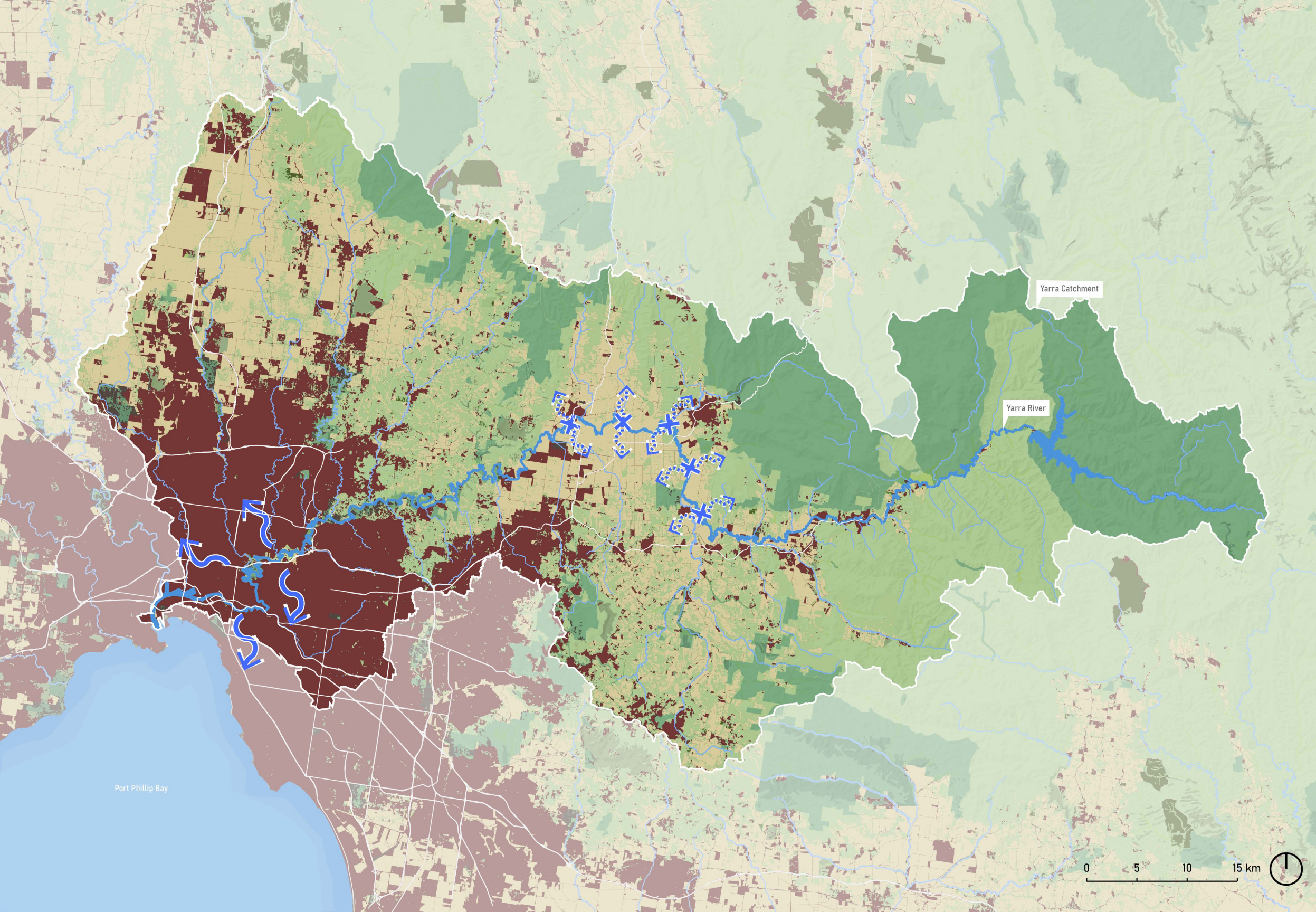
Source: (Rivers of Carbon, n.d.)

Intact riparian zone



Source: (FlyHigh Visuals, 2022)

Compromised riparian zone



Legend

- Urban zone
- Forested land
- Parks and Reserves
- Agricultural land
- Yarra River
- Creeks
- 1/100 year flood overlay

Compromised water buffering capacity

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap





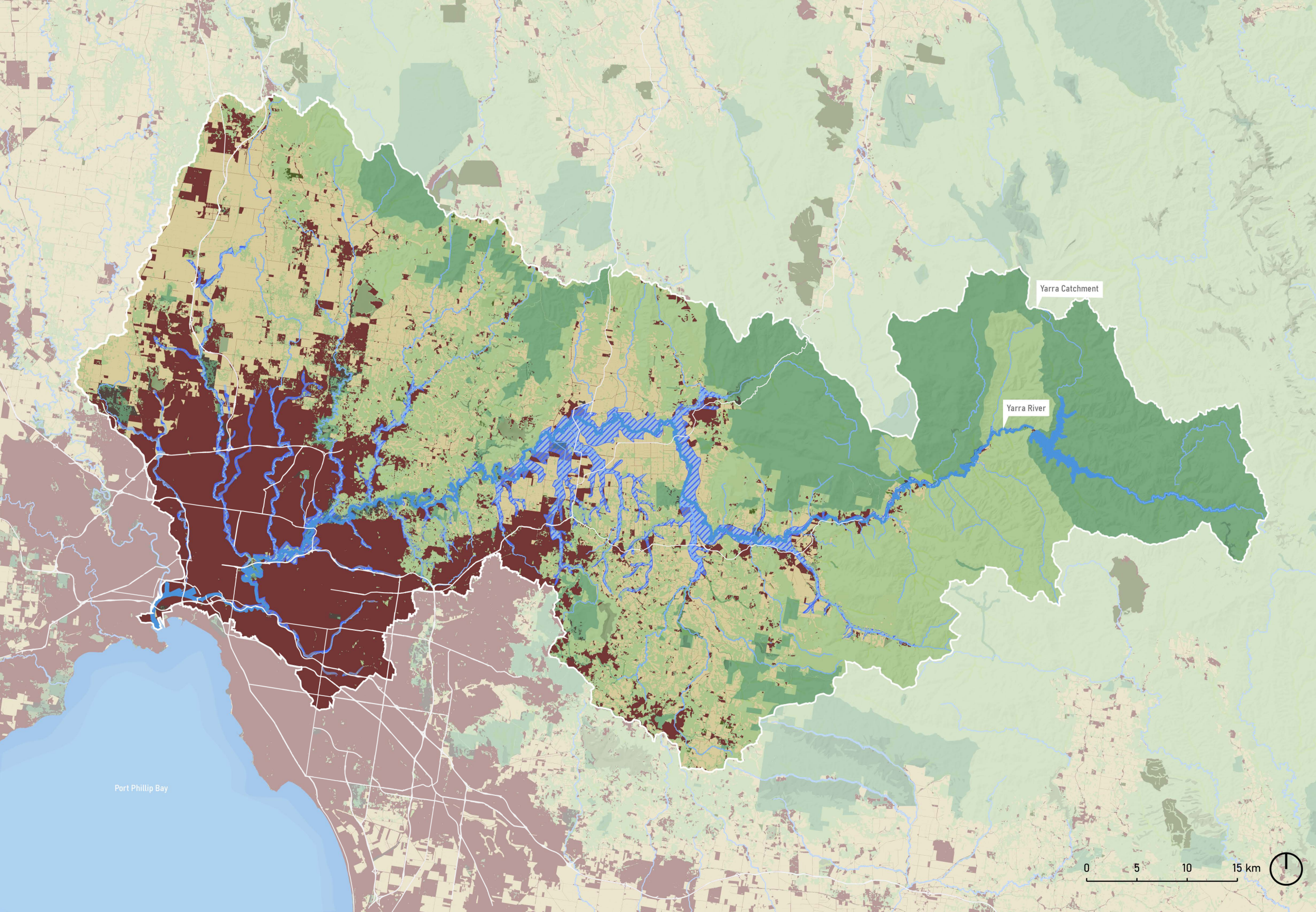
River flooding in urban context



Road flooding in outer Melbourne suburb



Flooding in Melbourne CBD - October 2022

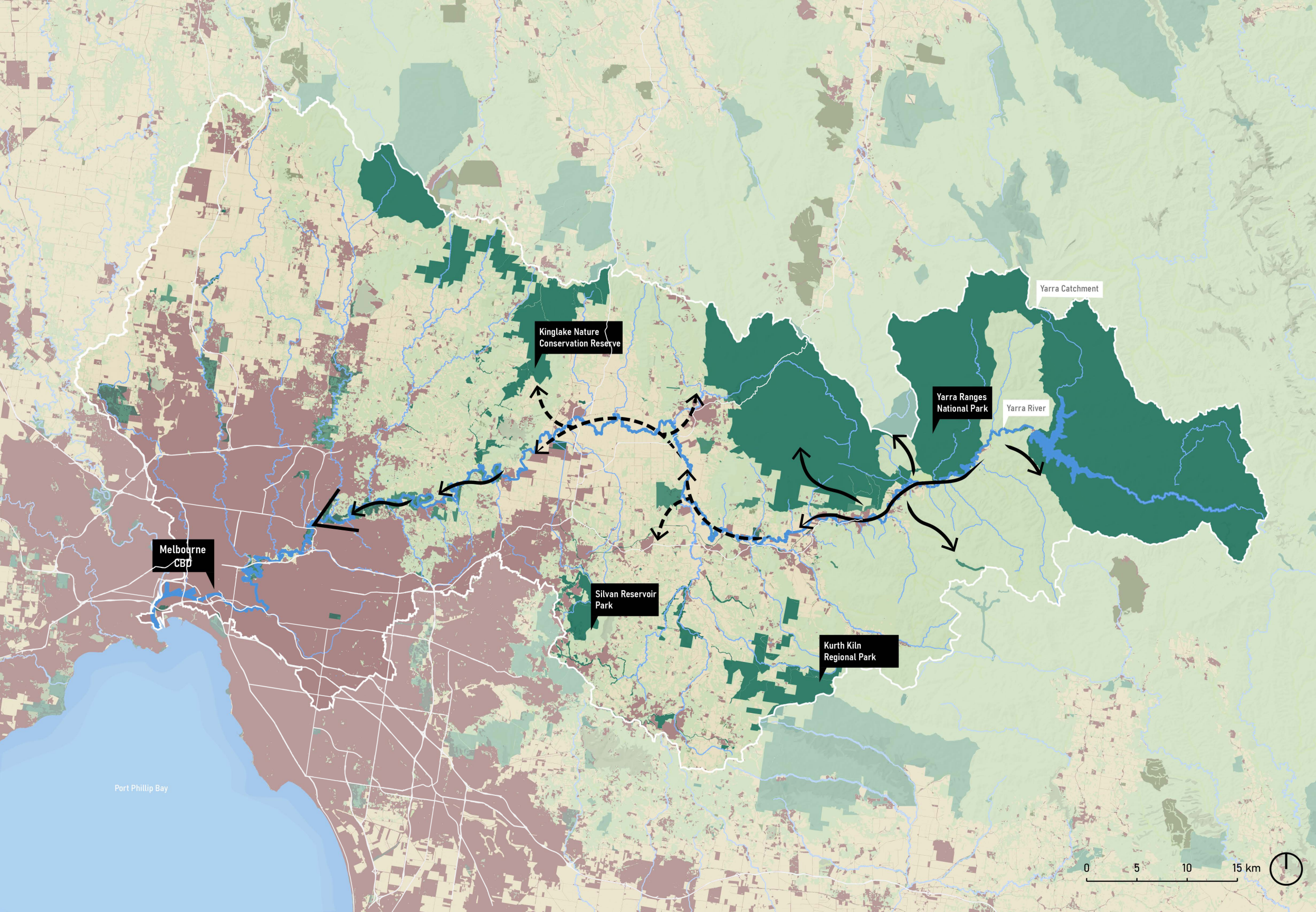


Legend

- Urban zone
- Forested land
- Parks and Reserves
- Agricultural land
- Yarra River
- Creeks
- 1/100 year flood overlay

1/100 year flood prediction

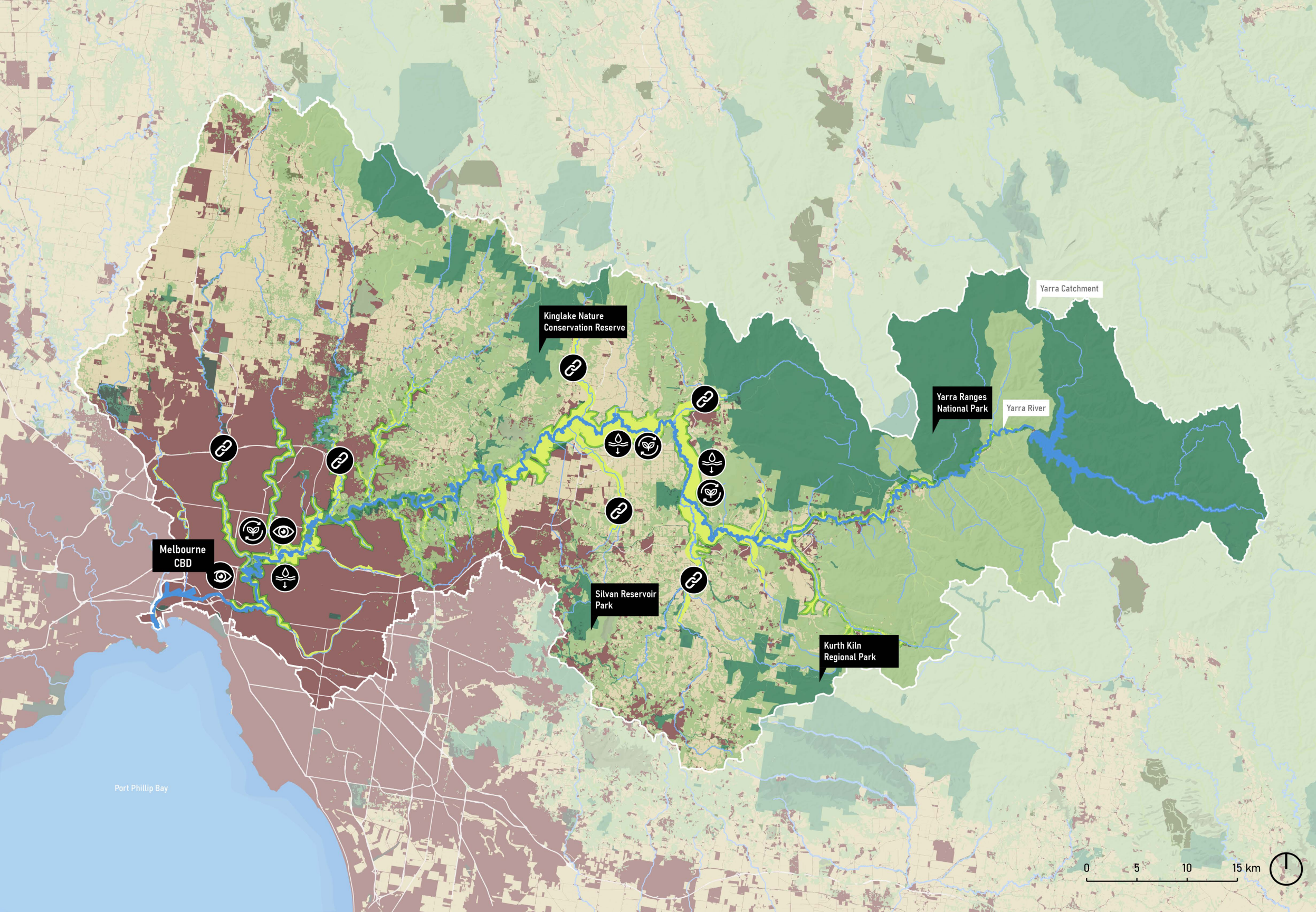
Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



- Legend**
- Urban zone
 - Forested land
 - Parks and Reserves
 - Agricultural land
 - Yarra River
 - Creeks
 - 1/100 year flood overlay

Fragmented ecological network

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

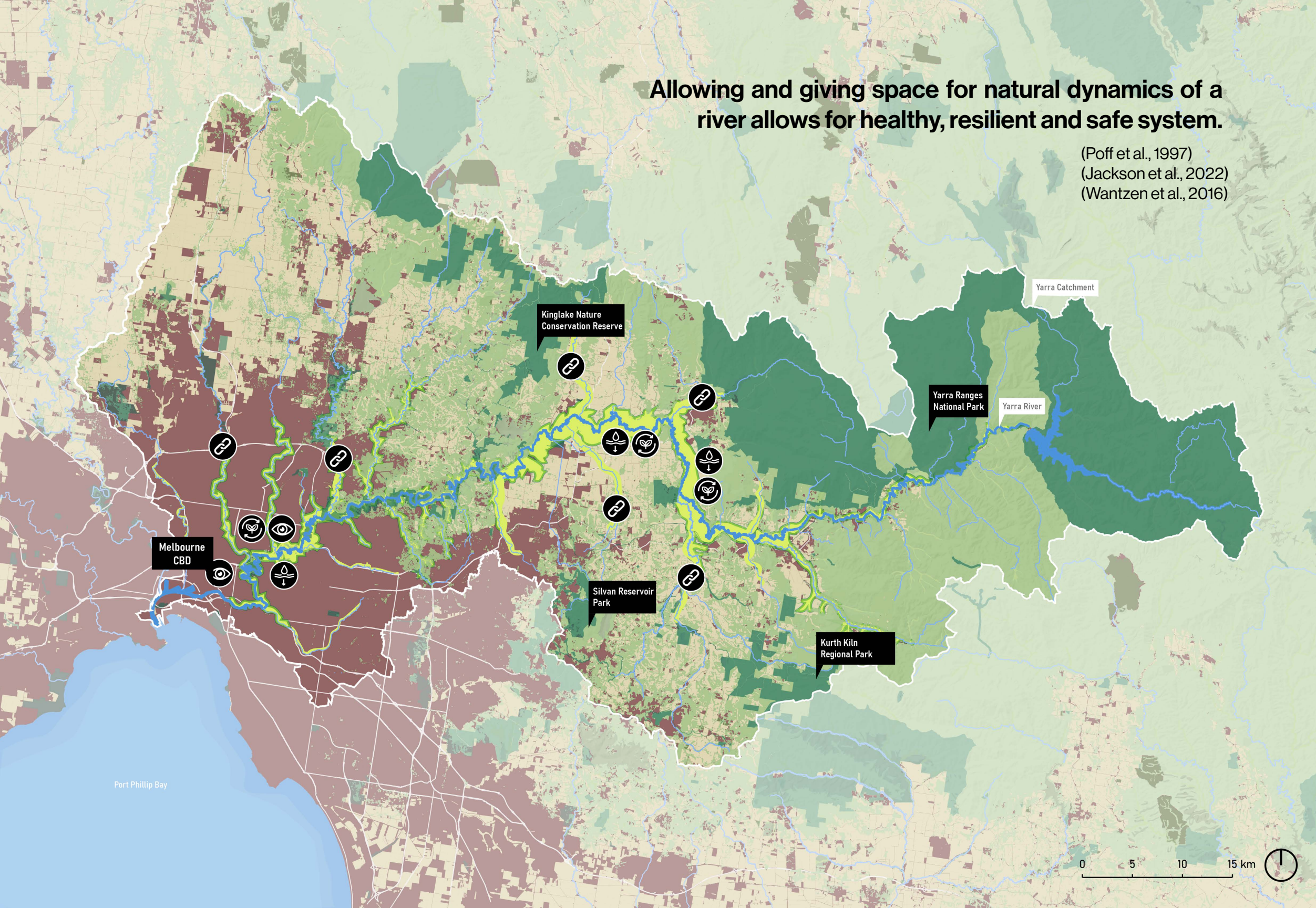


Legend

- Urban zone
- Forested land
- Parks and Reserves
- Agricultural land
- Yarra River
- Creeks
- 1/100 year flood overlay
- Opportunity for habitat connection
- Opportunity for riparian regeneration
- Opportunity for water buffering
- Opportunity for urban-river connection

Opportunities within the catchment

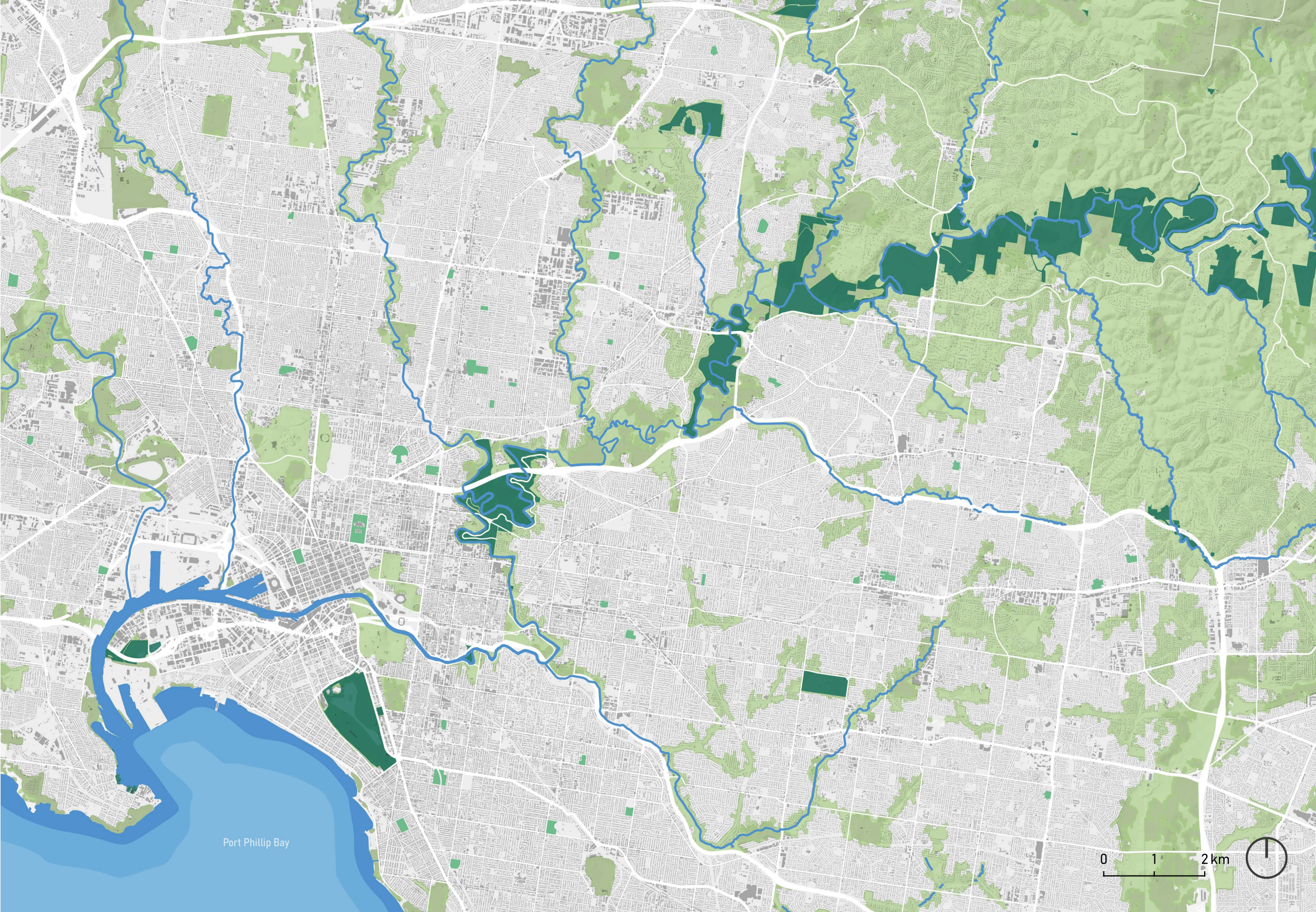
Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



- Legend**
- Urban zone
 - Forested land
 - Parks and Reserves
 - Agricultural land
 - Yarra River
 - Creeks
 - 1/100 year flood overlay
 - Opportunity for habitat connection
 - Opportunity for riparian regeneration
 - Opportunity for water buffering
 - Opportunity for urban-river connection

Opportunities within the catchment

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
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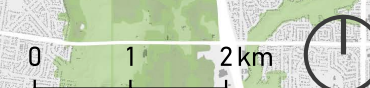
Legend

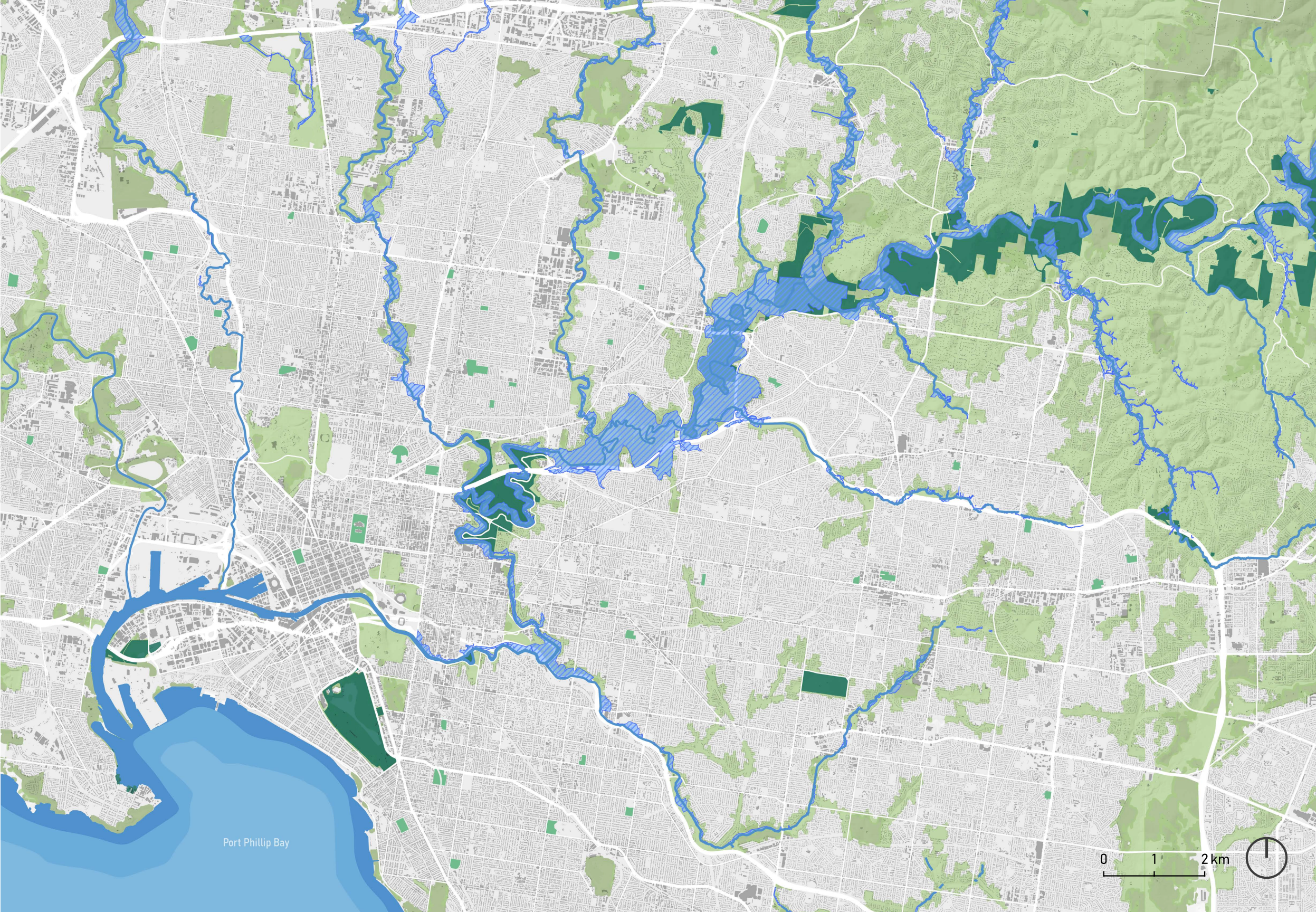
- Forest
- Shrubland
- National parks and reserves

Downstream urban context

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Port Phillip Bay



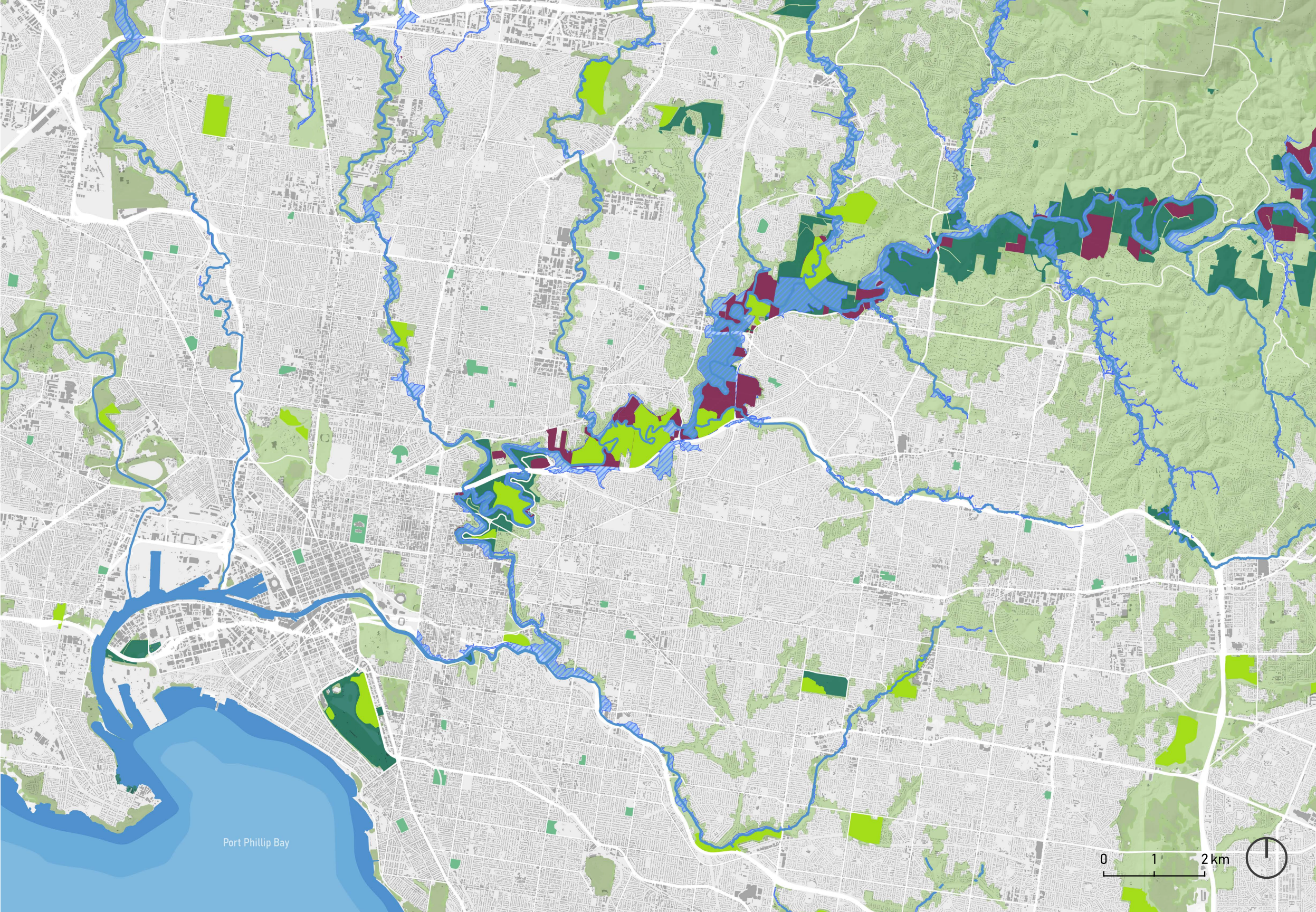


- Legend**
- Forest
 - Shrubland
 - National parks and reserves
 - 1/100 year flood overlay

Downstream floodplain

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



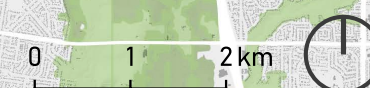


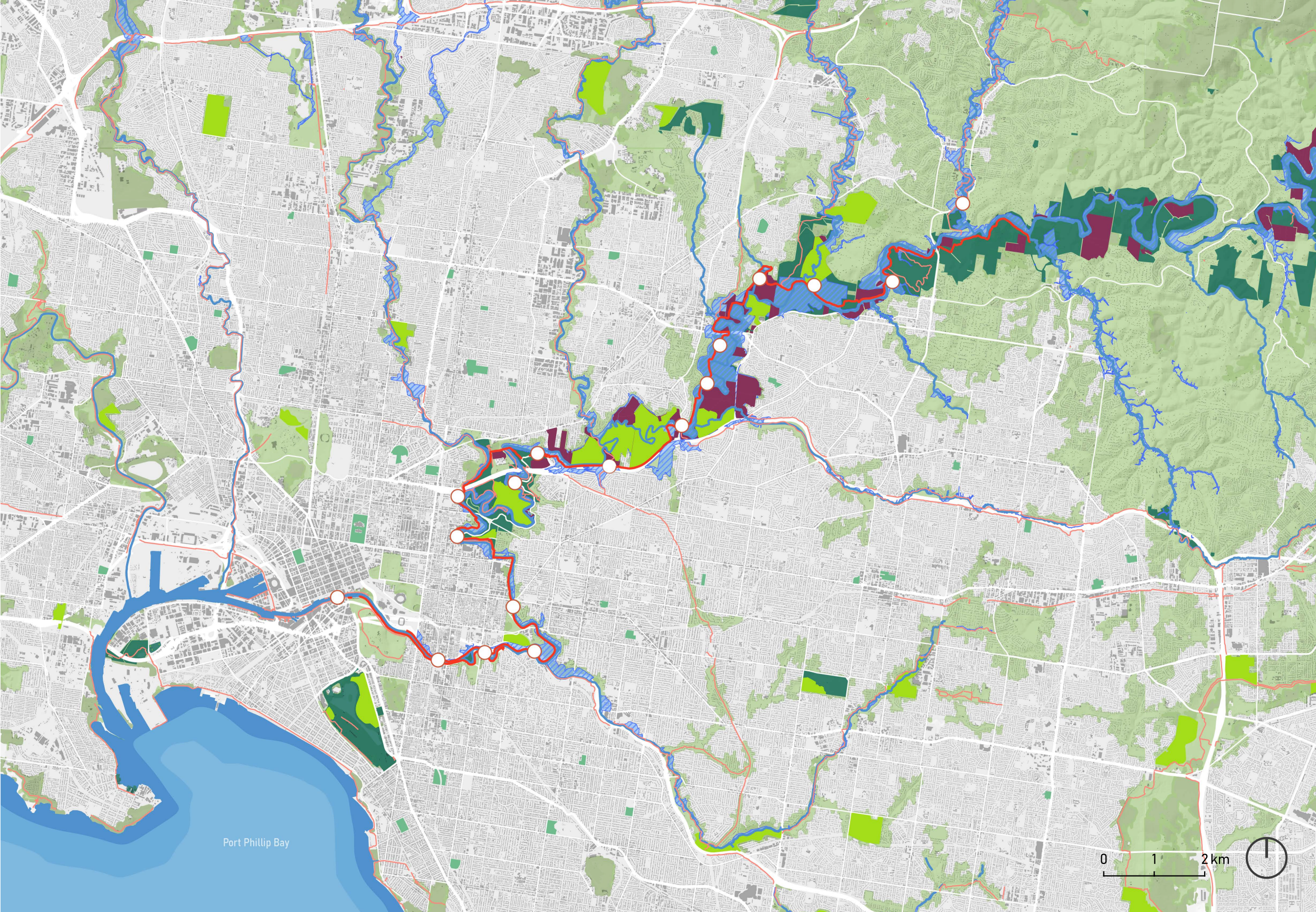
Legend

- Forest
- Shrubland
- National parks and reserves
- Privatized land
- Golfcourses
- Built-up area
- Port Phillip Bay
- Public parks and gardens
- Main infrastructure
- Trails
- Yarra River

Corridor fragmentation

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap





Legend

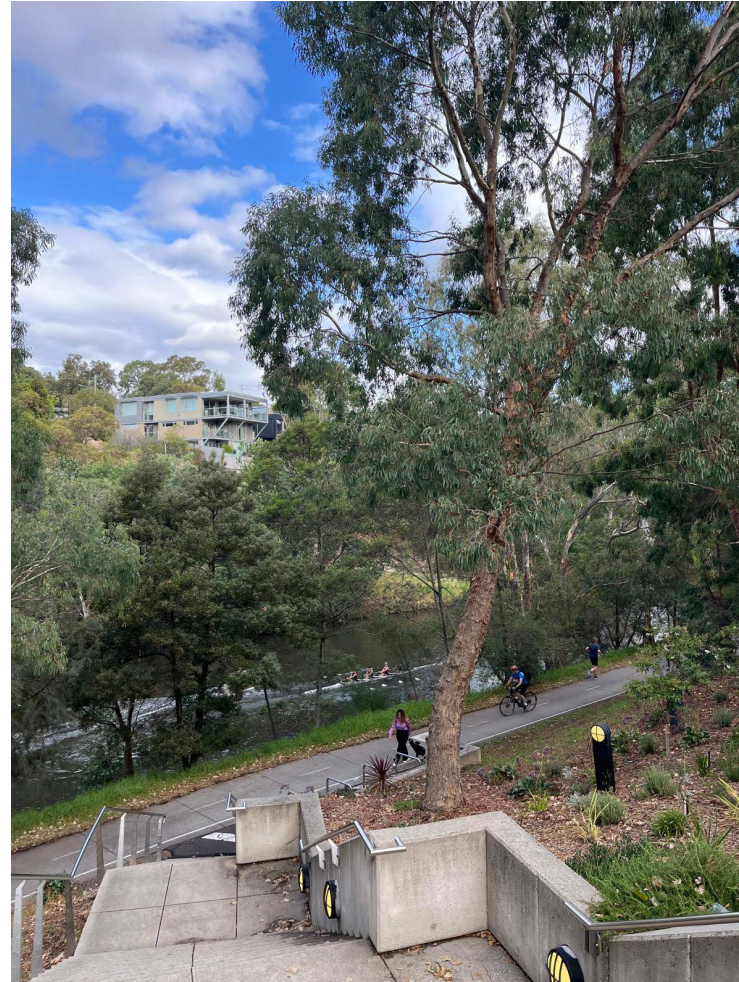
- Forest
- Shrubland
- National parks and reserves
- Privatized land
- Golfcourses
- Built-up area
- Port Phillip Bay
- Public parks and gardens
- Main infrastructure
- Trails
- Yarra River
- Points of access to river and trails

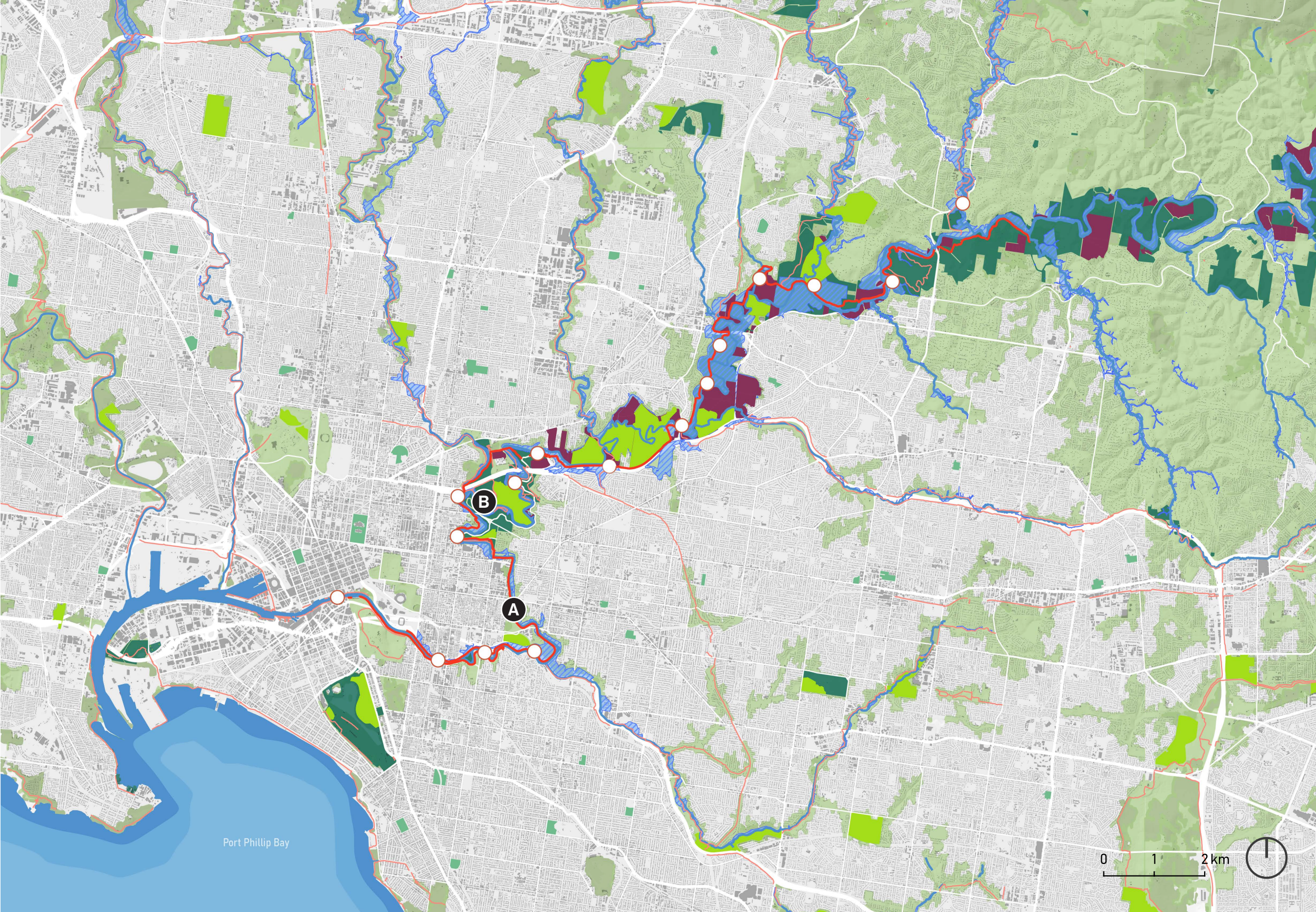
Trails along the Yarra river

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Topographic constraints and restricted access





- Legend**
- Forest
 - Shrubland
 - National parks and reserves
 - Privatized land
 - Golfcourses
 - Built-up area
 - Port Phillip Bay
 - Public parks and gardens
 - Main infrastructure
 - Trails
 - Yarra River
 - Points of access to river and t

Trails along the Yarra river

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Appreciation of the river

“I love coming down here with my little girl [dog], it’s my escape from the city. I work night shifts in a bakery. **You come down here and it’s like you’re in a different world**”


- Oscar (47)
Melbourne citizen



“I grew up in the country, always very close to nature. In the city, I feel like there are definitely not enough places close to nature. ... **I would love more places like this along the river.**”

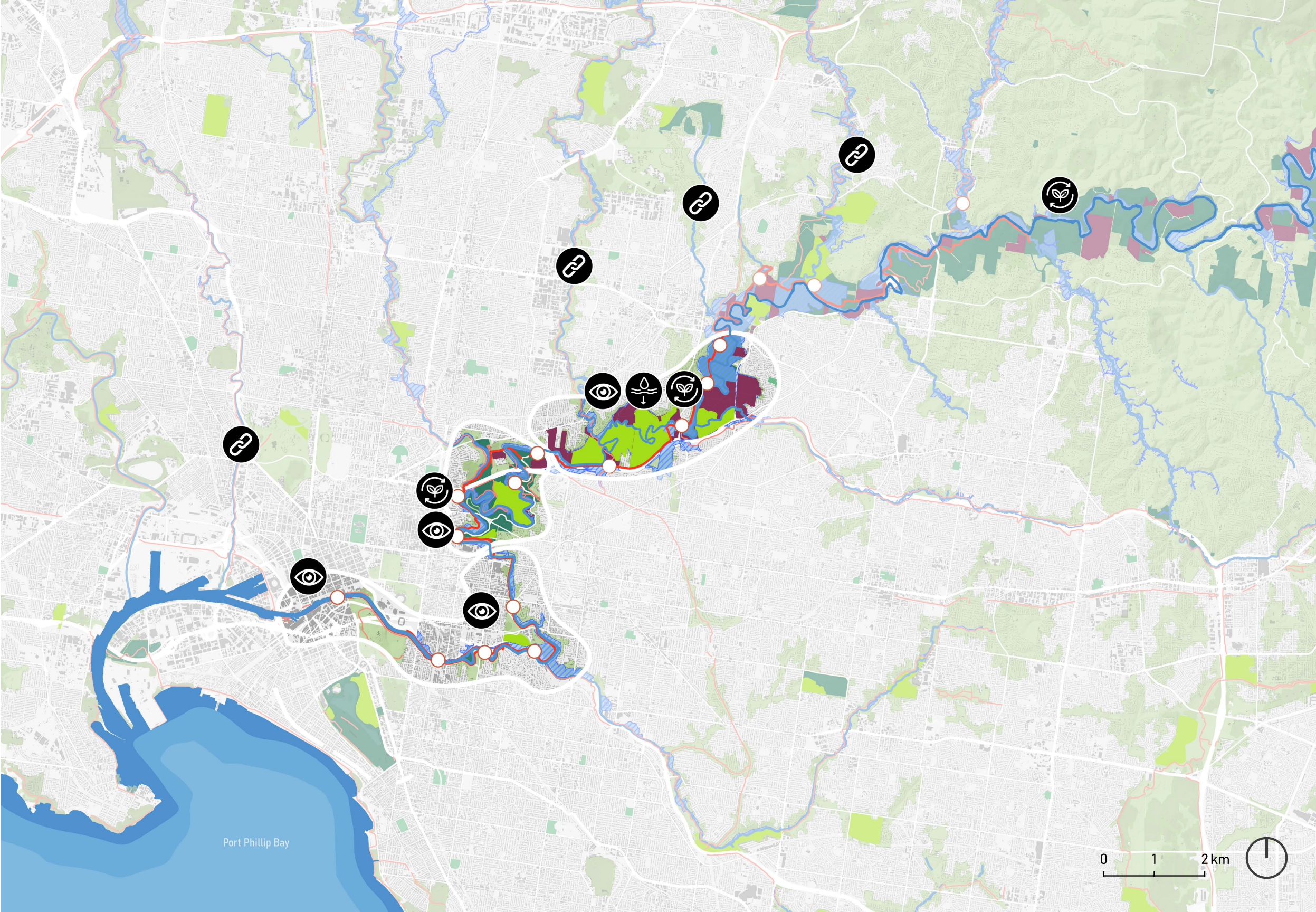
- Sarah (35)
Melbourne citizen





A socially connected river, a river that is easy to see, access, and engage with, is more likely to be valued, maintained, and protected by the public.

(Kondolf & Pinto, 2017)



- Legend**
- Forest
 - Shrubland
 - National parks and reserves
 - Privatized land
 - Golfcourses
 - Built-up area
 - Port Phillip Bay
 - Public parks and gardens
 - Main infrastructure
 - Trails
 - Yarra River
 - Points of access to river and t
 - Area of interest
 - Opportunity for habitat connection
 - Opportunity for riparian regeneration
 - Opportunity for water buffering
 - Opportunity for urban-river connection

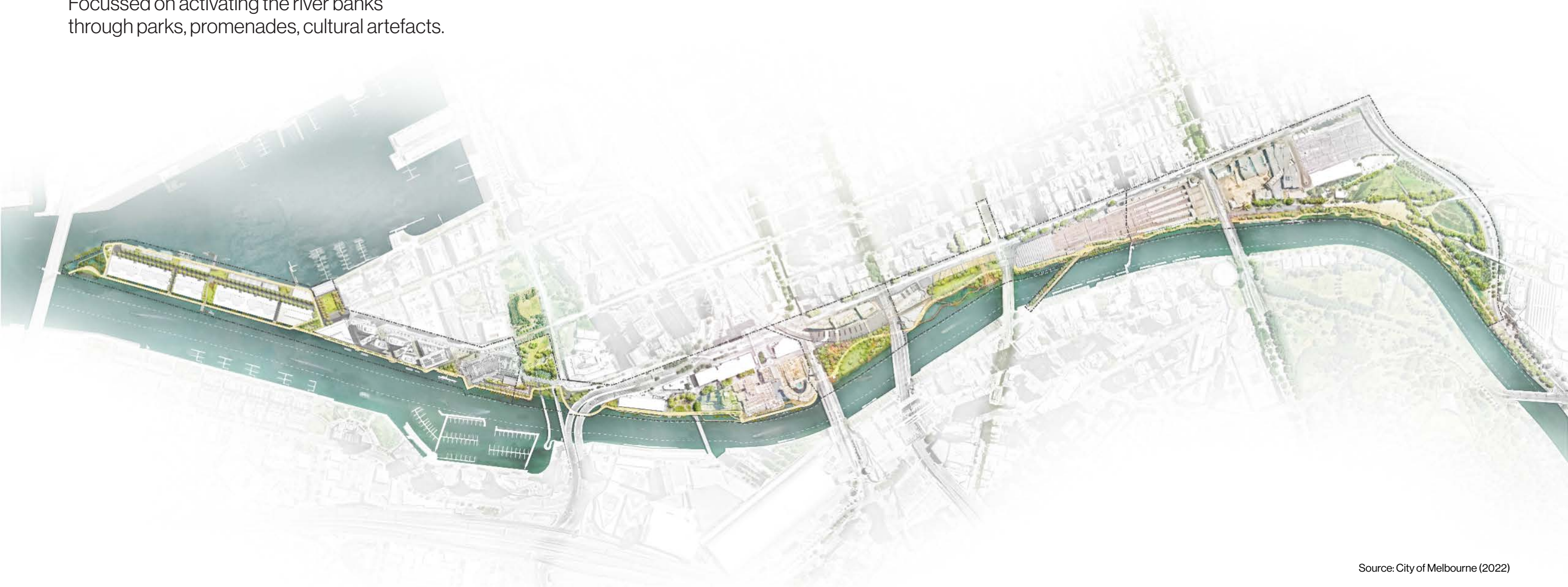
Opportunities in urban context

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Greenline project

A vision for the north bank of the Yarra River within the City of Melbourne.

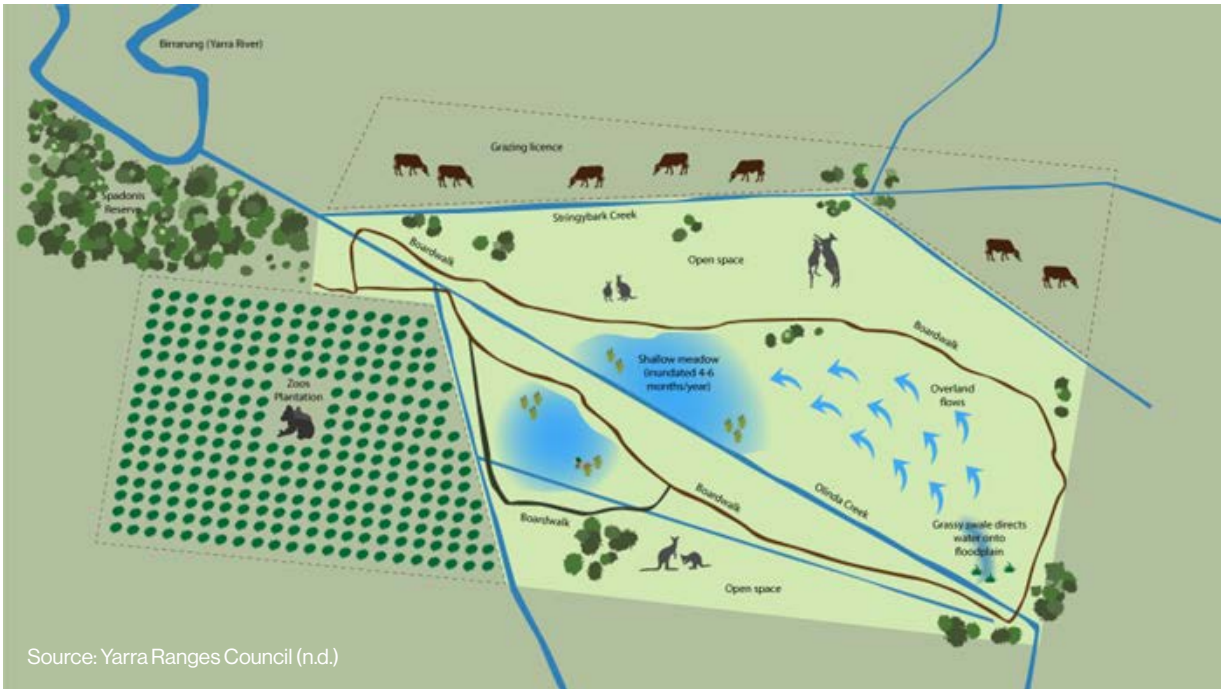
Focussed on activating the river banks through parks, promenades, cultural artefacts.



Source: City of Melbourne (2022)

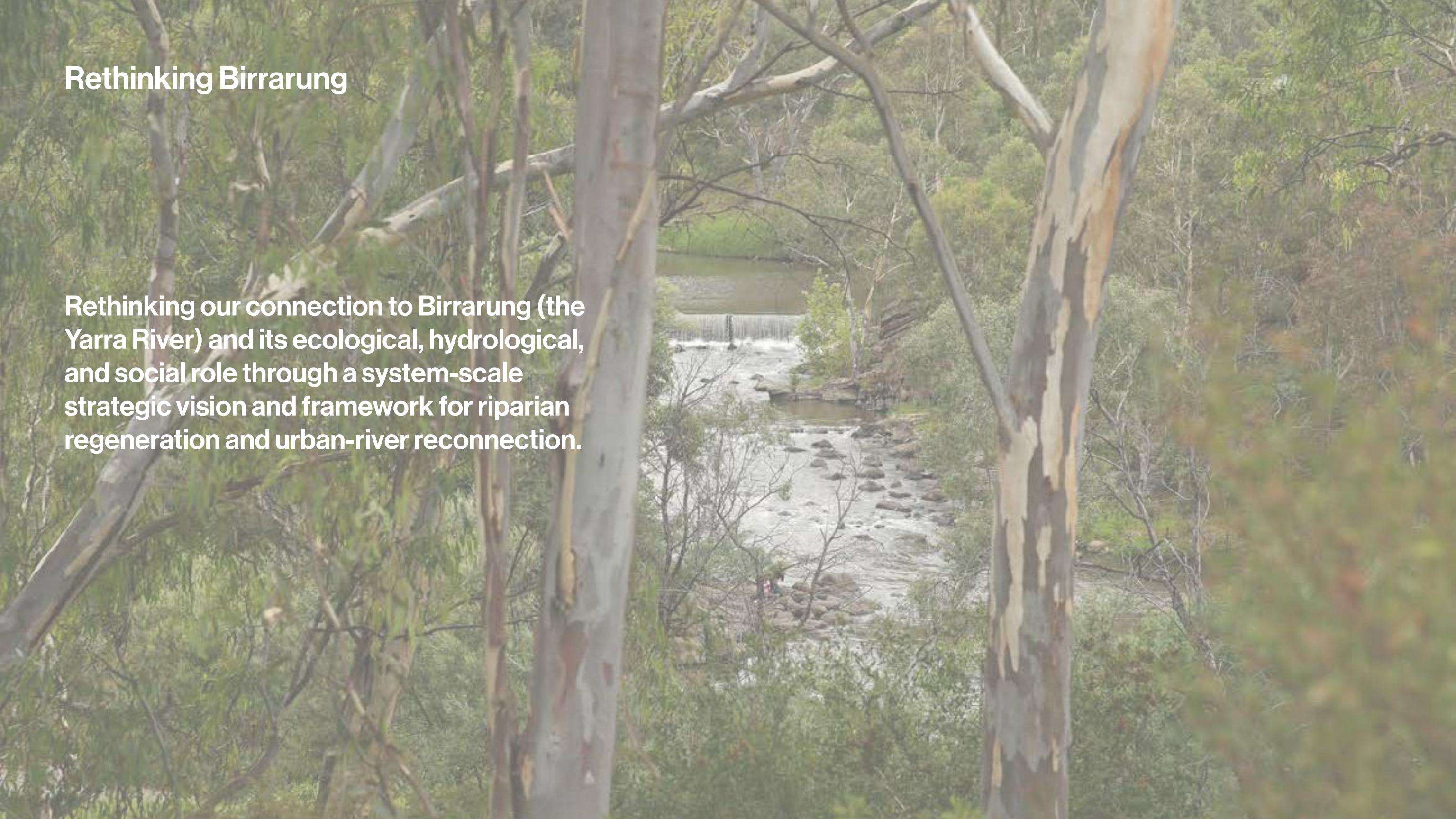
Billabong & Floodplain restoration

Floodplain restoration at Olinda Creek,
rural Victoria



Rethinking Birrarung

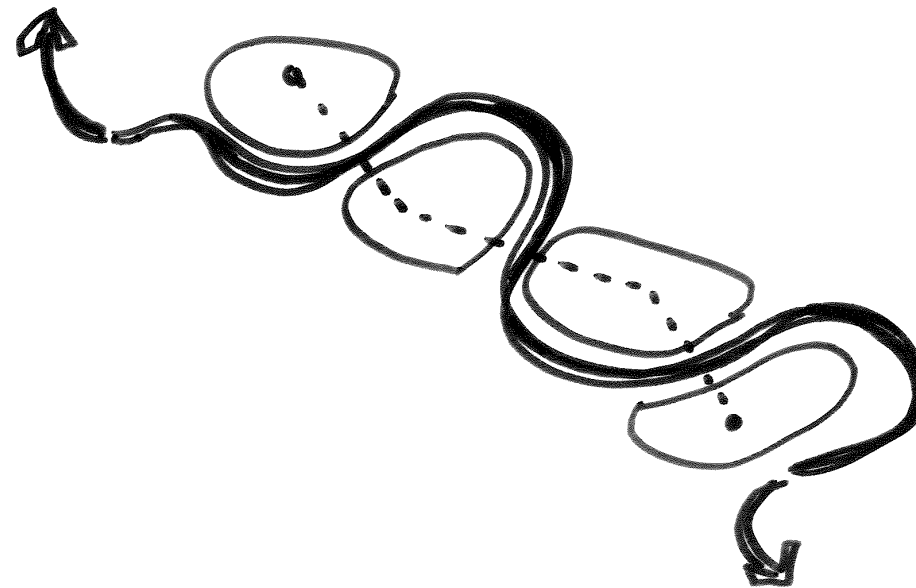
Rethinking our connection to Birrarung (the Yarra River) and its ecological, hydrological, and social role through a system-scale strategic vision and framework for riparian regeneration and urban-river reconnection.



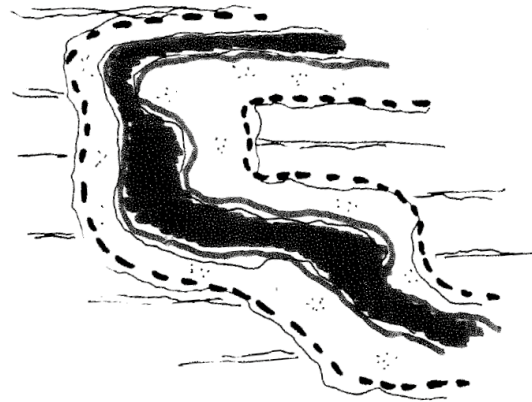
Landscape infrastructure

(Nijhuis & Jauslin, 2015)

River as a linear system of connected and interdependent spaces



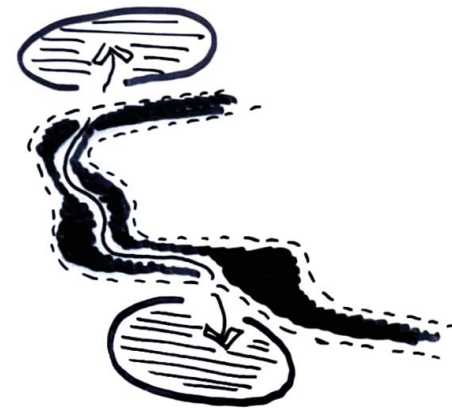
Strategy 1



Riparian regeneration

Reclaiming the riparian zone and creating the conditions for riparian regeneration

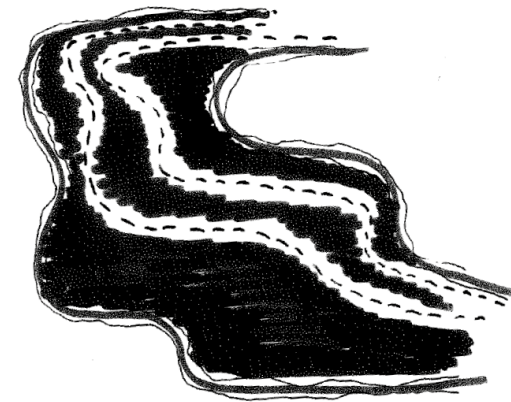
Strategy 2



(Re)connecting habitats

Connecting the riparian zone to surrounding parks and reserves

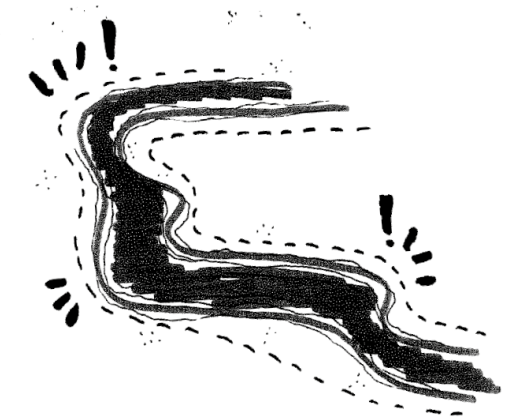
Strategy 3



Facilitate water dynamics and retention

Increasing the riparian flooding frequency and water retention capacity

Strategy 4

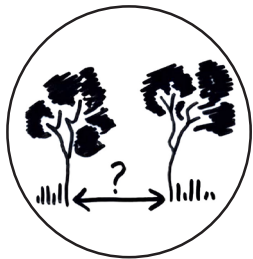


Improve visual and physical connection to river

Creating a visually and physically engaging riparian landscape & river

Design Principles

Riparian regeneration



Target species define (spatial) conditions



Revegetation pattern based on existing vegetation



Hybrid land-use forms on riparian zone

(Re)connecting habitats



Continuous vegetation type and structure



Creek corridors ecological activation



Alternative habitat connectivity routes

Water dynamics and retention



Excavate floodplain and billabong inlets



Direct stormwater runoff onto the floodplain



Reduce river bank gradient



Use the topography for passive flow on floodplain

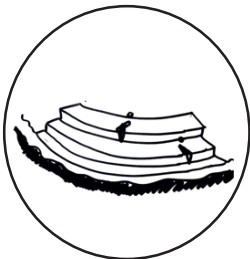
Visual and physical connection to river



Sightlines and trails encourage slow recreation



Access to riverfront through slow banks



Activated banks through architectural artifacts



Activating public space on riparian zone



Materiality as a tool to indicate transitions

Target species



Source: (Treeproject, n.d.)

River Red Gum

Canopy

Bi-annual submersion



Source: (Victorian Government, n.d.).

Growling Grass Frog

Billabongs

Aquatic vegetation and semi-permanent wetlands



Souce: (lilkanyongmail, n.d.).

Platypus

River + Riverbanks

Dense riparian vegetation with stable banks

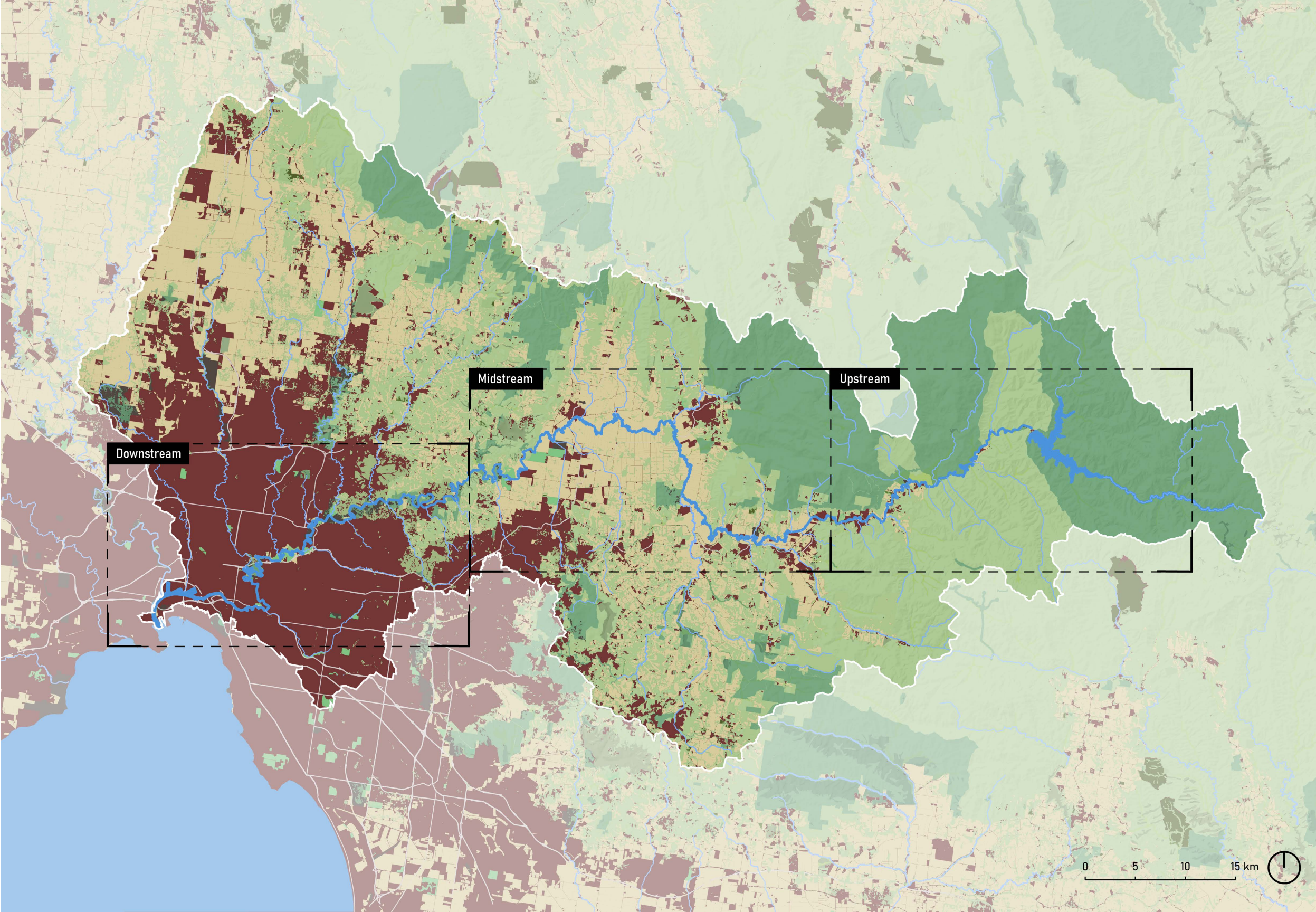


Source: (Davis, n.d.).

Superb Fairy-wren

Understorey

Dense understorey vegetation

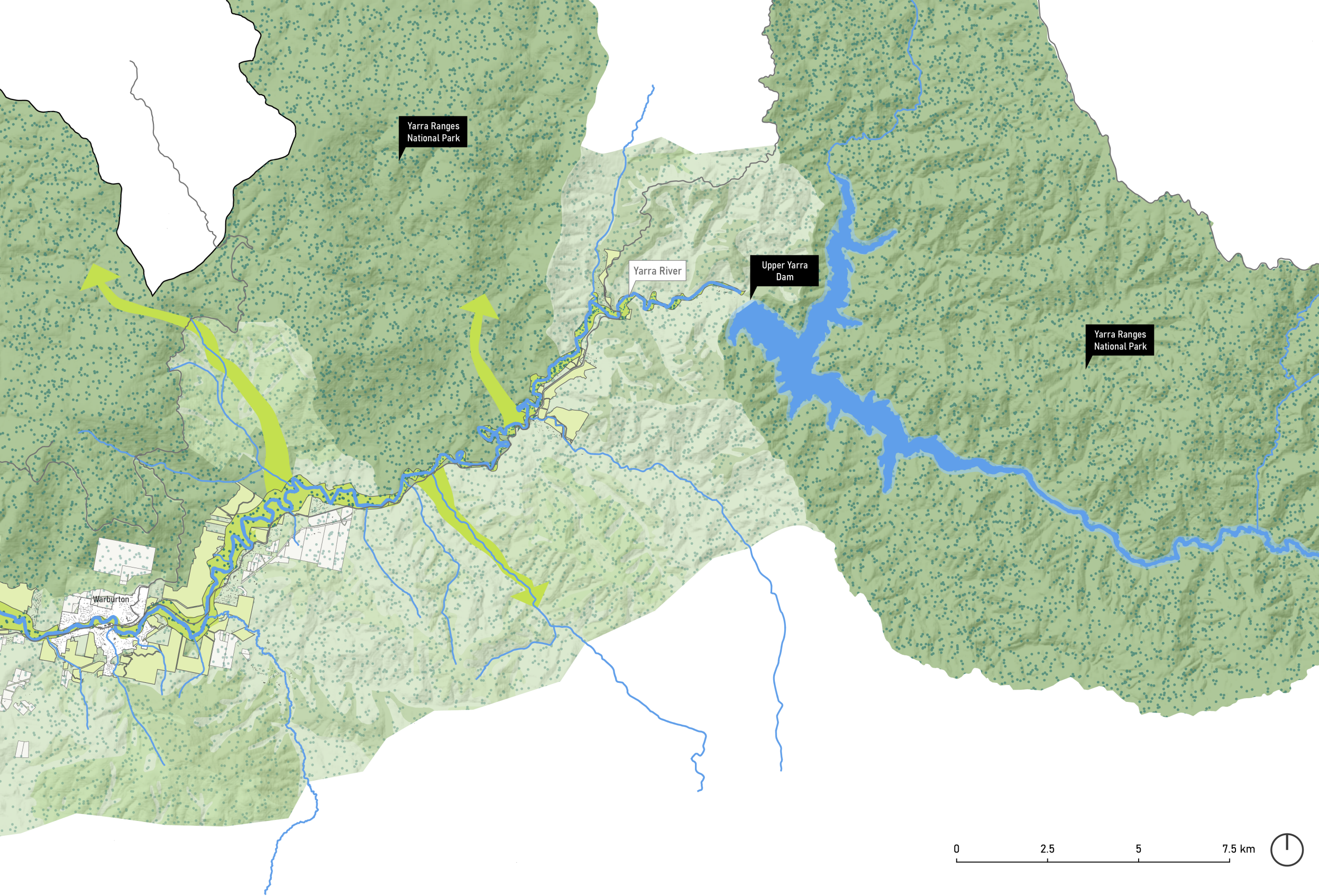


Legend

- Urban zone
- Forested land
- Parks and Reserves
- Agricultural land
- Yarra River
- Creeks




Three stretches of the river

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Legend

Strategies

-  Riparian regeneration
-  (Re)connecting habitats
-  Floodplain water retention

Context

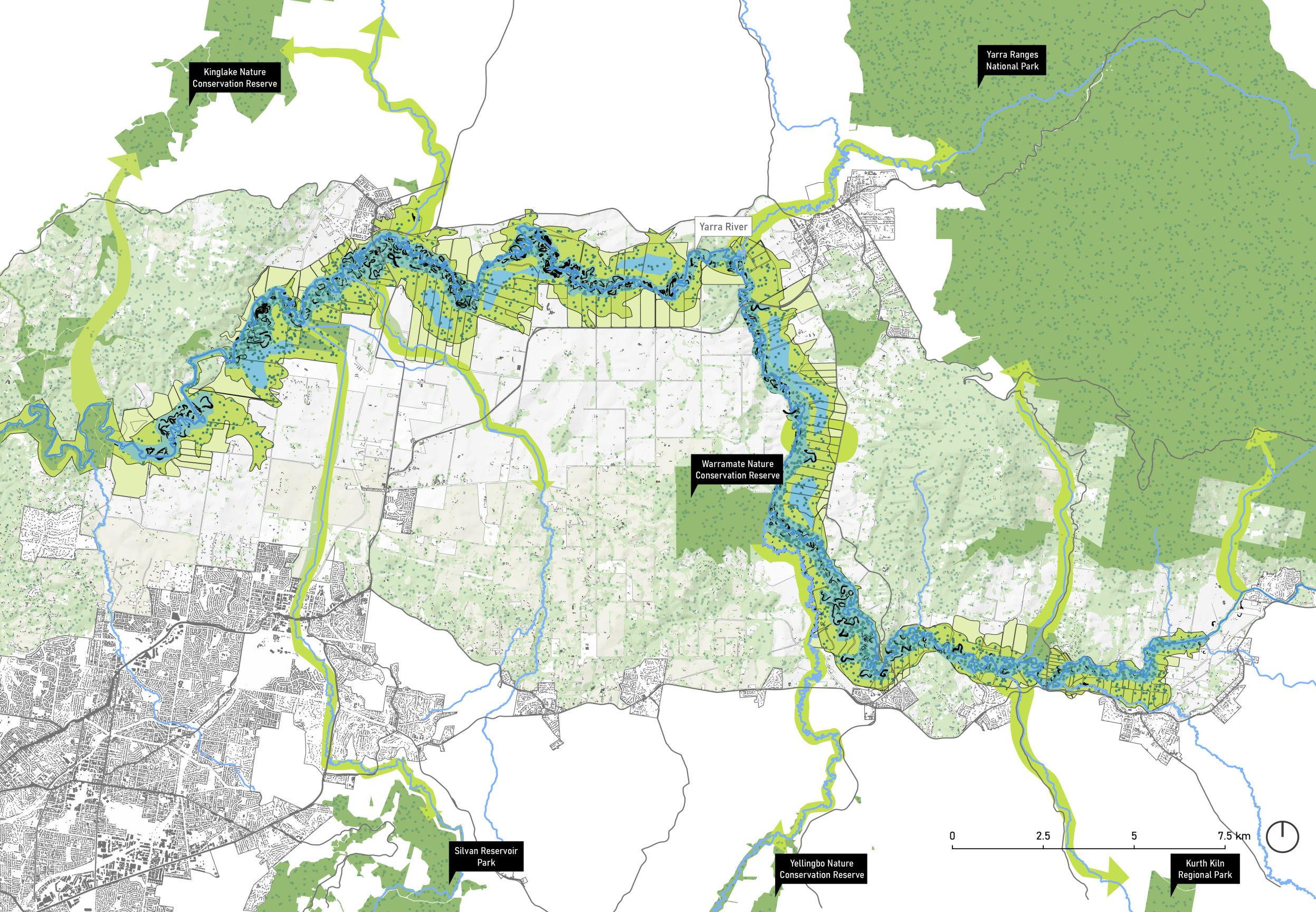
-  Yarra River
-  Creeks
-  Forested land
-  Parks and Reserves
-  Agriculture
-  Golfcourses
-  Main infrastructure

Upstream

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap




0 2.5 5 7.5 km





Legend

Strategies

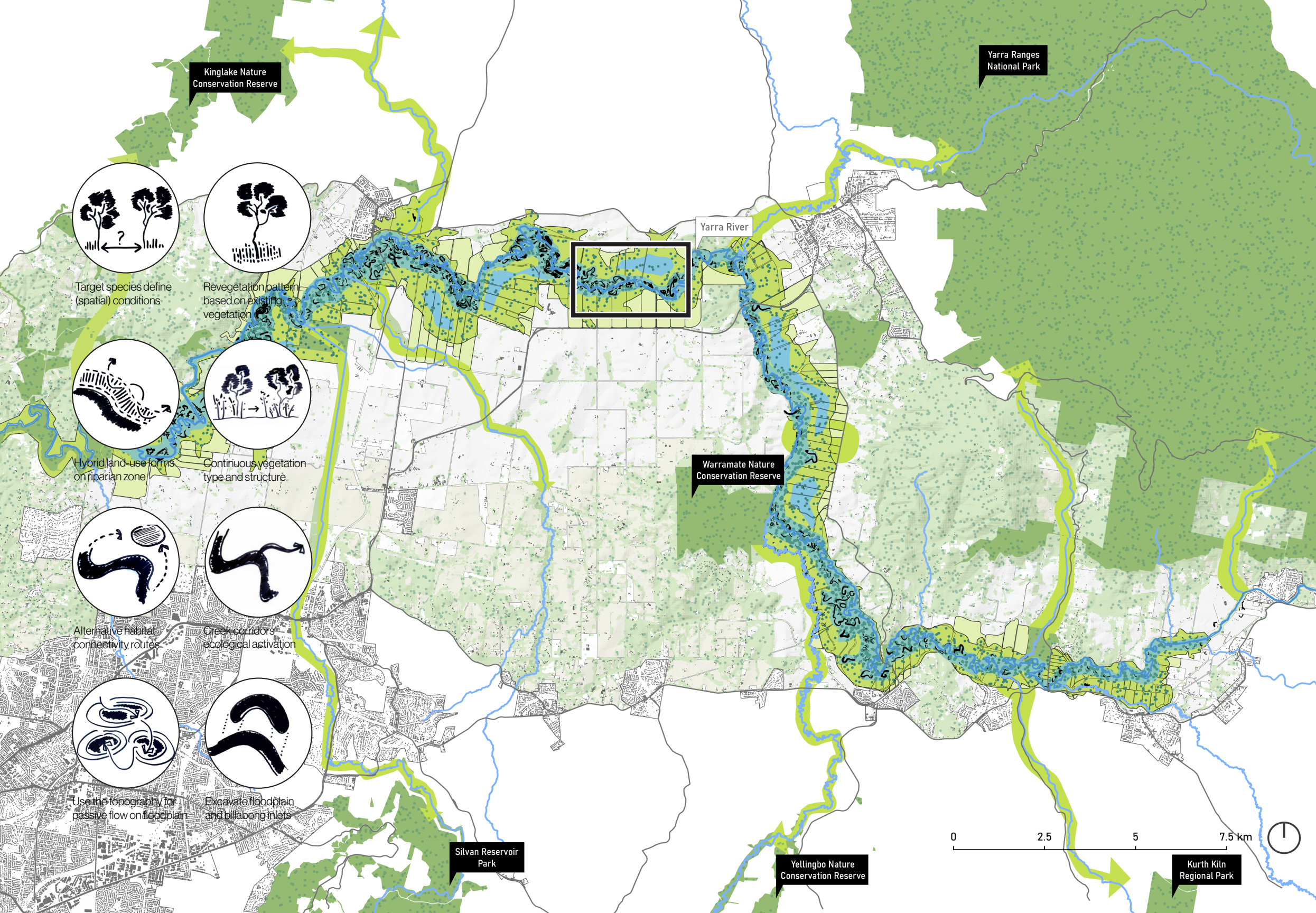
-  Riparian regeneration
-  (Re)connecting habitats
-  Floodplain water retention

Context

-  Yarra River
-  Creeks
-  Forested land
-  Parks and Reserves
-  Agriculture
-  Golfcourses
-  Main infrastructure

Midstream

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Legend

Strategies

- Riparian regeneration
- (Re)connecting habitats
- Floodplain water retention

Context

- Yarra River
- Creeks
- Forested land
- Parks and Reserves
- Agriculture
- Golfcourses
- Main infrastructure

Midstream

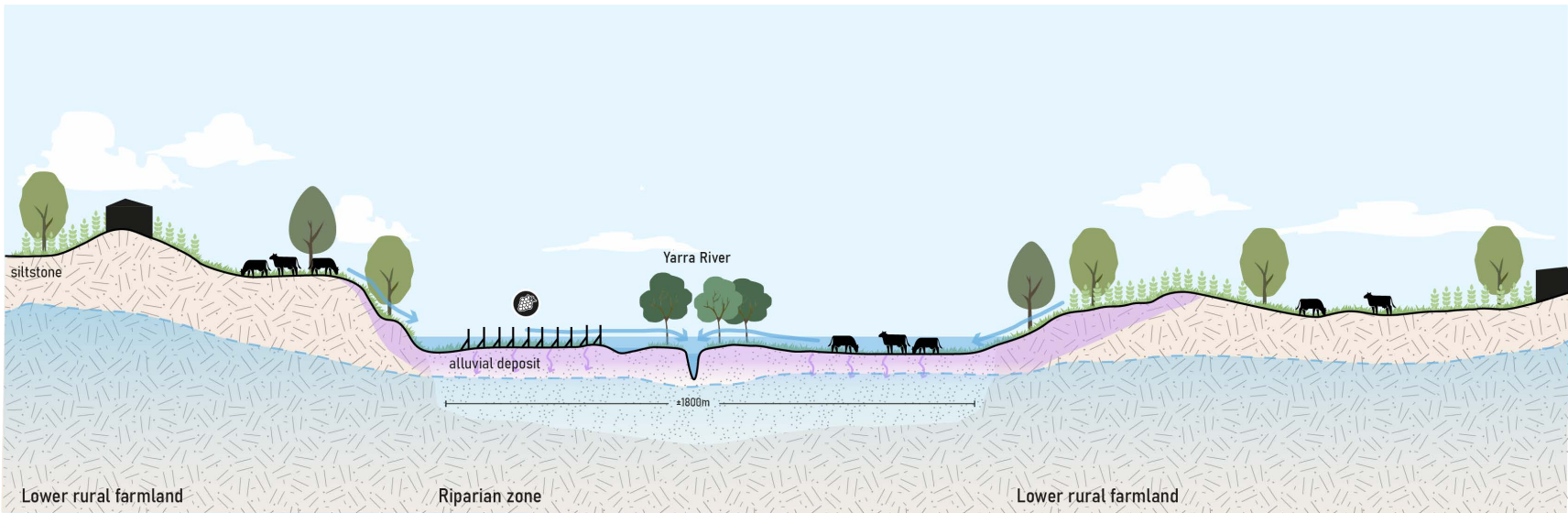
Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Rural riparian zone / Floodplain

Current rural riparian zone

Intensive agriculture causes

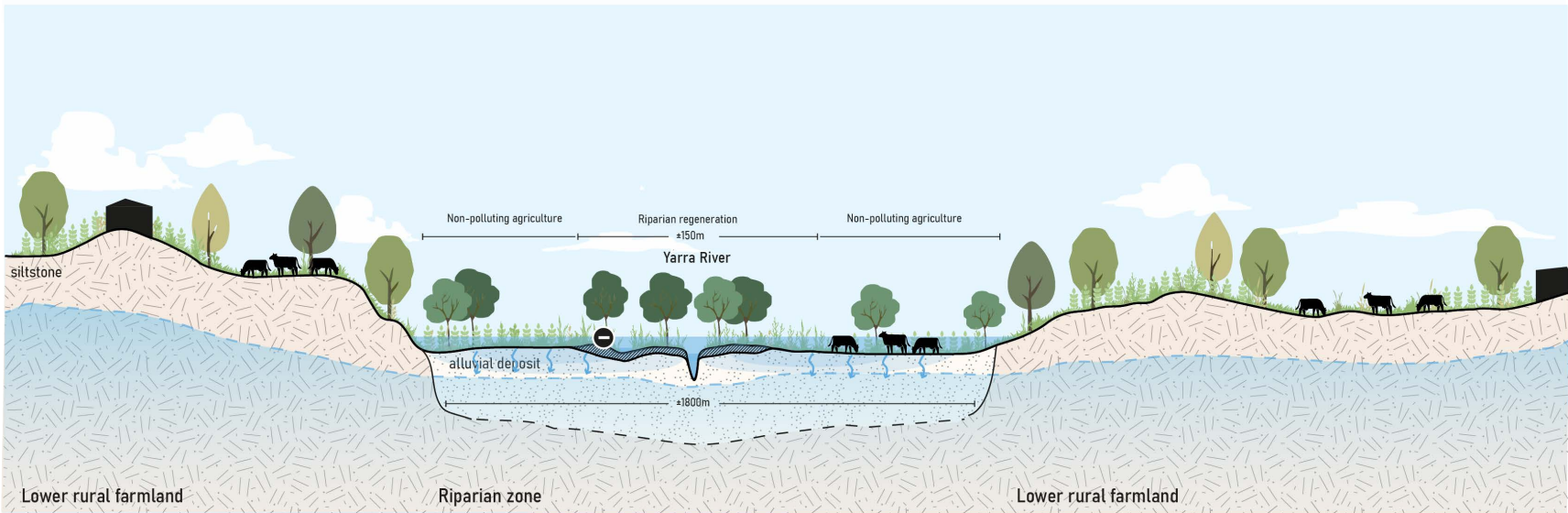
- quick water runoff
- water pollution
- fragments ecological corridor

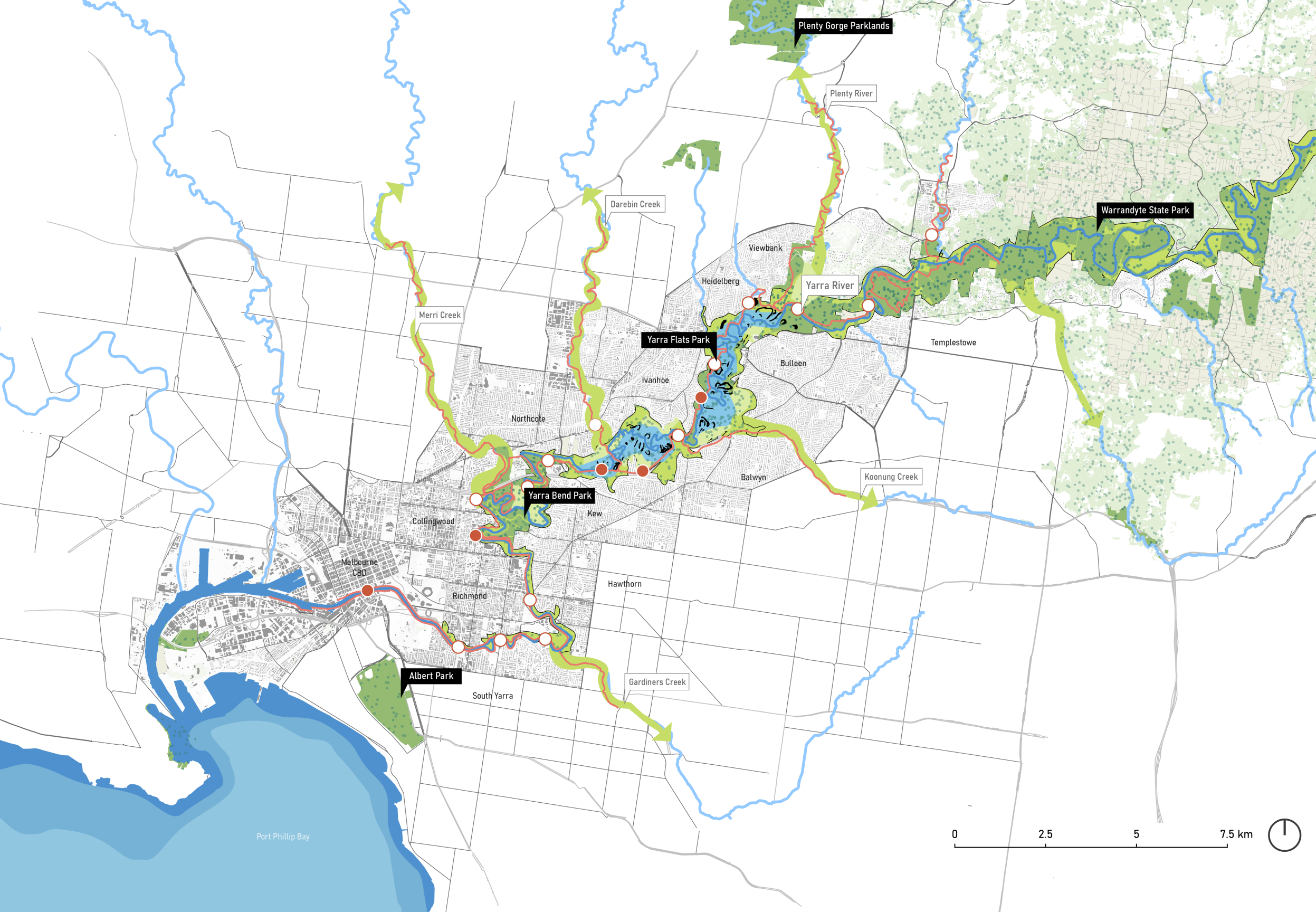


Proposed rural riparian zone

150m wide riparian buffer with adjacent non-intensive agricultural land

- improved water retention
- riparian habitat regeneration

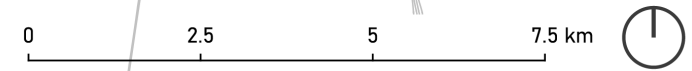


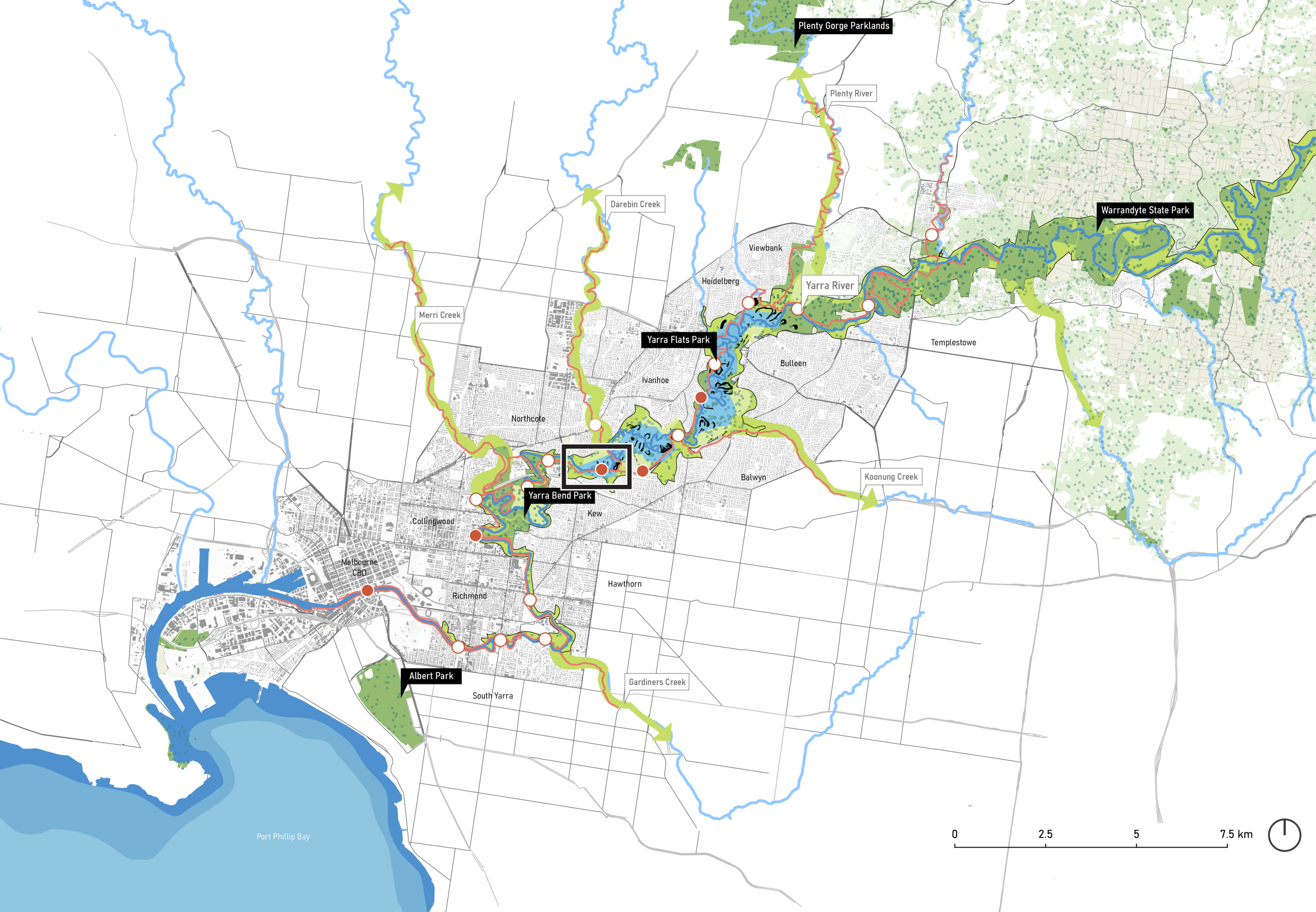


- Legend**
- Strategies**
- Riparian regeneration
 - (Re)connecting habitats
 - Floodplain water retention
 - Improved riparian access
- Context**
- Yarra River
 - Creeks
 - Forested land
 - Parks and Reserves
 - Agriculture
 - Golfcourses
 - Privatized land
 - Main infrastructure
 - Trails along waterways
 - Existing riparian access
 - Sites of detailed design interventions

Downstream

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap





Legend

Strategies

- Riparian regeneration
- (Re)connecting habitats
- Floodplain water retention
- Improved riparian access

Context

- Yarra River
- Creeks
- Forested land
- Parks and Reserves
- Agriculture
- Golfcourses
- Privatized land
- Main infrastructure
- Trails along waterways
- Existing riparian access
- Sites of detailed design interventions

Downstream

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Urban floodplain



Golf courses on the downstream floodplain flood during high river levels





Downstream urban floodplain

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Legend

-  Flooded area
-  Waterway
-  Remnant of Billabong
-  Riparian woodland
-  Wetland
-  Urban green context
-  Existing trails
-  New trails
-  Recreational destination
-  Viewpoint
-  Parking

River red gums bordering streams

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Legend

- Flooded area
- Waterway
- Remnant of Billabong
- Riparian woodland
- Wetland
- Urban green context
- Existing trails
- - - New trails
- Recreational destination
- ⓘ Viewpoint
- P Parking

Proposed vegetation plan

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Floodplain trails

Gravel trails and boardwalks through the floodplain

// Local basalt stone artefacts to suggest interaction with landscape

Planting around existing vegetation

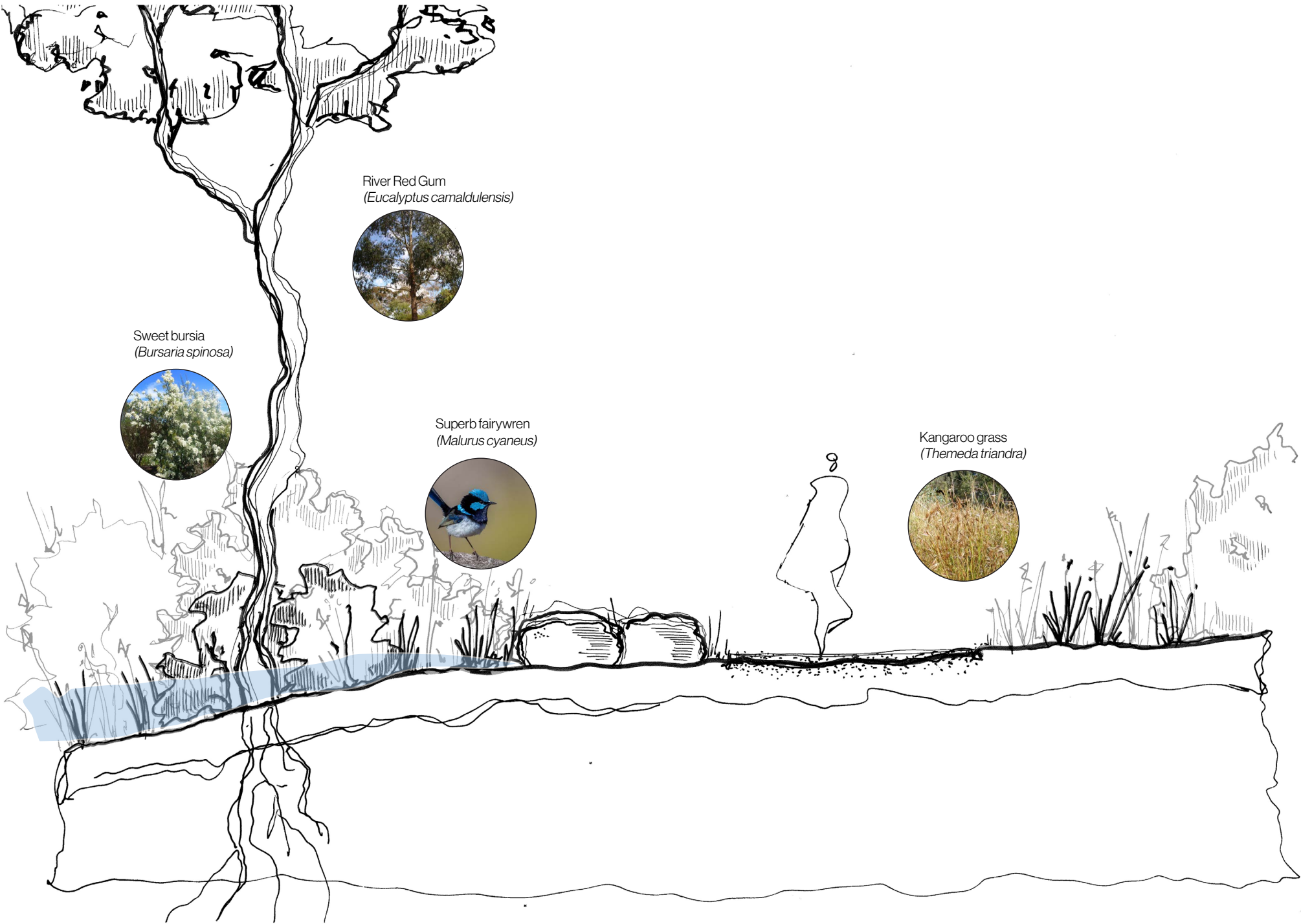
// Fast growing pioneer species



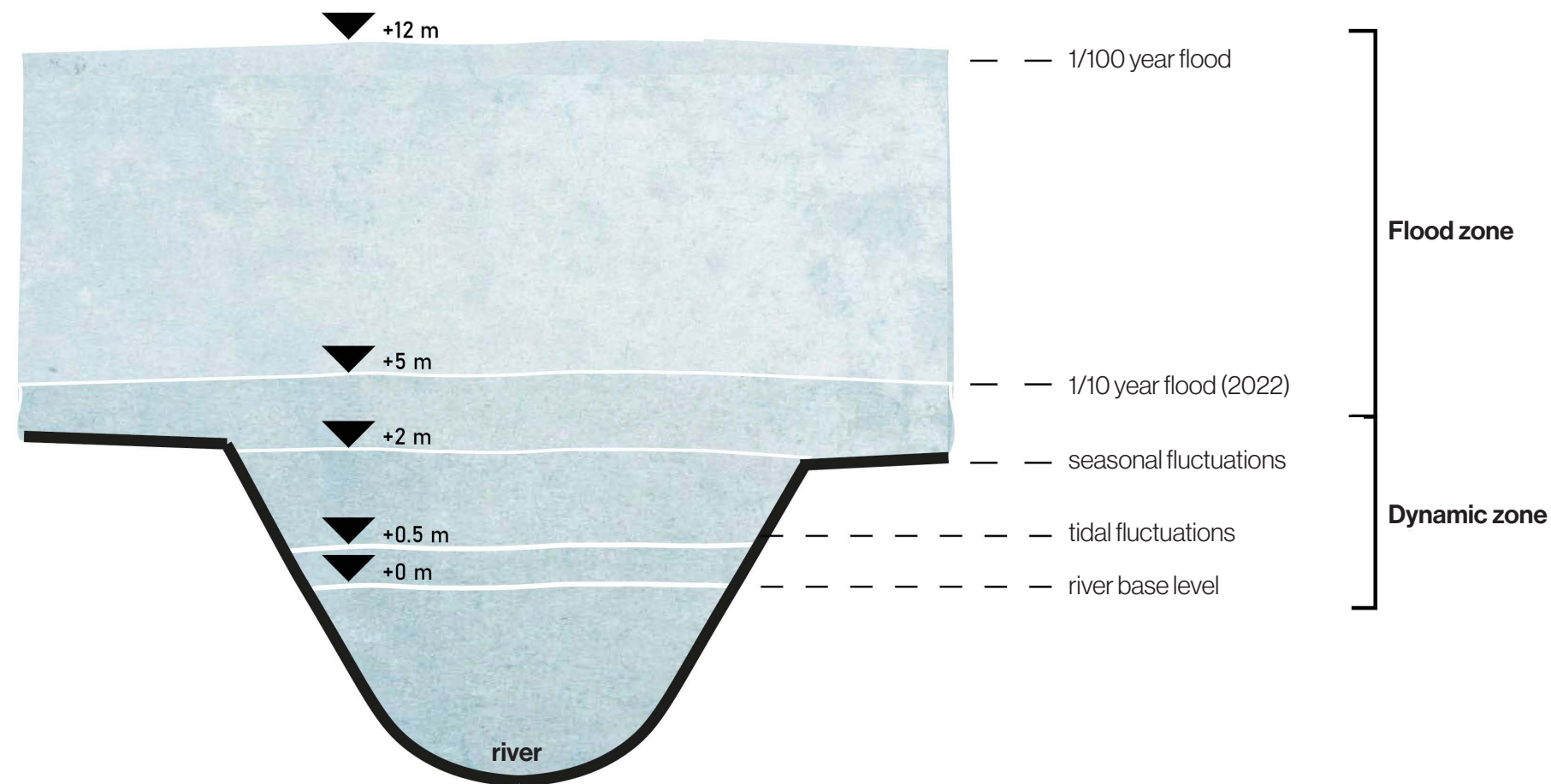
Revegetation pattern based on existing vegetation



Target species define (spatial) conditions



River dynamics



Flooding in the city





Legend

- Flooded area
- Waterway
- Remnant of Billabong
- Riparian woodland
- Wetland
- Urban green context
- Existing trails
- - - New trails
- Recreational destination
- i Viewpoint
- P Parking

Proposed trails & programming

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap



Legend

- Flooded area
- Waterway
- Remnant of Billabong
- Riparian woodland
- Wetland
- Urban green context
- Existing trails
- - - New trails
- Recreational destination
- ⛶ Viewpoint
- P Parking

Seasonal flooding

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

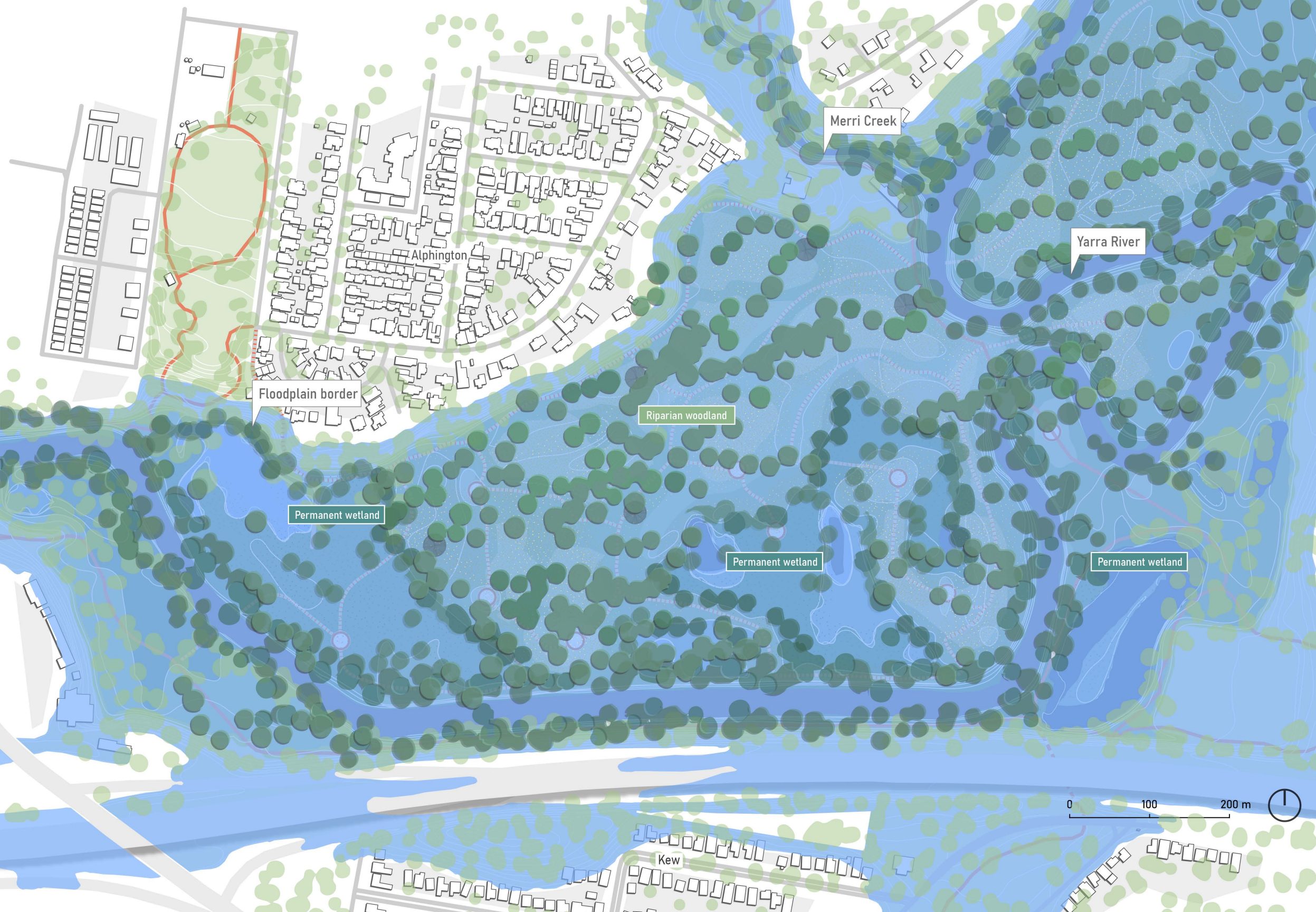


Legend

- Flooded area
- Waterway
- Remnant of Billabong
- Riparian woodland
- Wetland
- Urban green context
- Existing trails
- - - New trails
- Recreational destination
- Ⓣ Viewpoint
- Ⓟ Parking

1/10 year flooding

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
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Legend

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Legend

- Flooded area
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- Existing trails
- New trails
- Recreational destination
- T Viewpoint
- P Parking

Trails and landscape interaction

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

Dynamic wetland

Current golf course wetland

// little to no inundation events

// no public access due to
surrounding golf courses



Source: (Friends of Yarra Flats Park, n.d.)

Dynamic wetland

Proposed golf course wetland

// improved vegetation gradient

// improved access and experience of wetlands through boardwalks and platforms



River Red Gum
(*Eucalyptus camaldulensis*)



Superb fairywren
(*Malurus cyaneus*)



Kangaroo grass
(*Themeda triandra*)

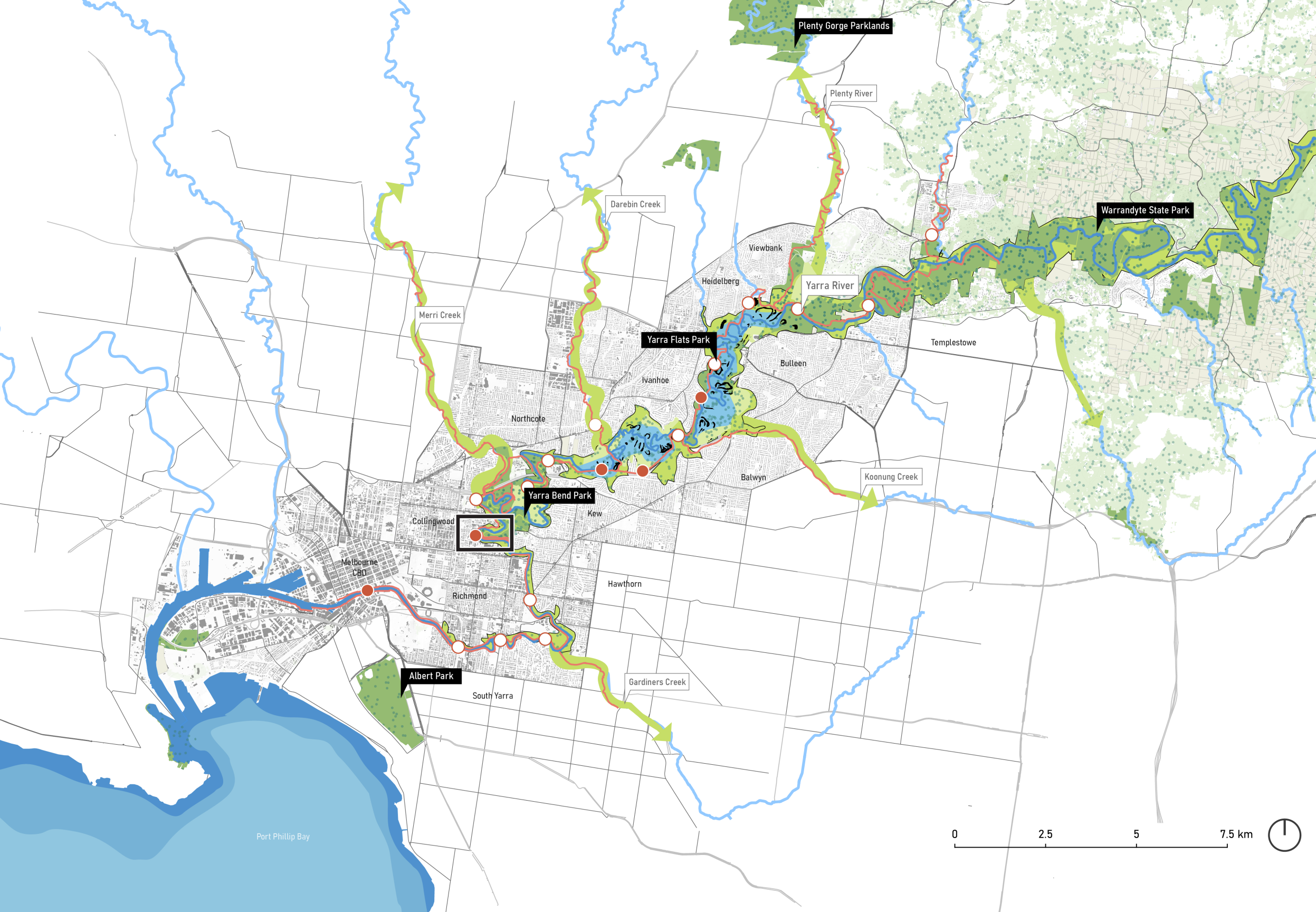


Growling Grass Frog
(*Ritoria Raniformis*)



Water Ribbon
(*Triglochin procera*)





Legend

Strategies

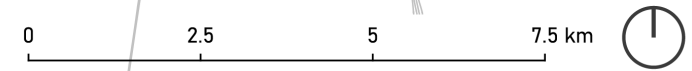
- Riparian regeneration
- (Re)connecting habitats
- Floodplain water retention
- Improved riparian access

Context

- Yarra River
- Creeks
- Forested land
- Parks and Reserves
- Agriculture
- Golfcourses
- Privatized land
- Main infrastructure
- Trails along waterways
- Existing riparian access
- Sites of detailed design interventions

Downstream

Map made by author, based on data from:
DataVic, Melbourne Water Open Data Hub, NEXTGIS,
DEECA's Spatial Data, GoogleEarth, Vicmap

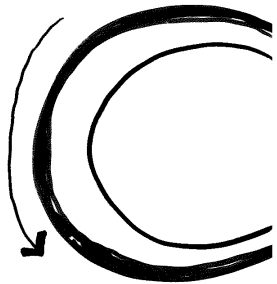


Yarra Bend Park

Current lower bank

// poor accessibility

// no interaction with river



Yarra Bend Park

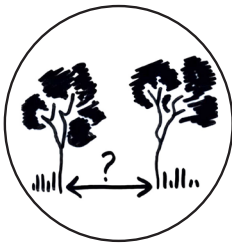
Proposed lower bank

// improved access from
upper to lower bank

// routing with boardwalks for
experiencing river dynamics and
riparian vegetation



Yarra Bend Park



Target species define (spatial) conditions



Sightlines and trails encourage slow recreation



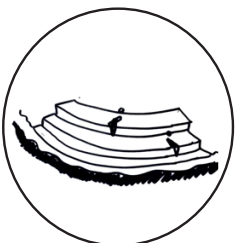
Revegetation pattern based on existing vegetation



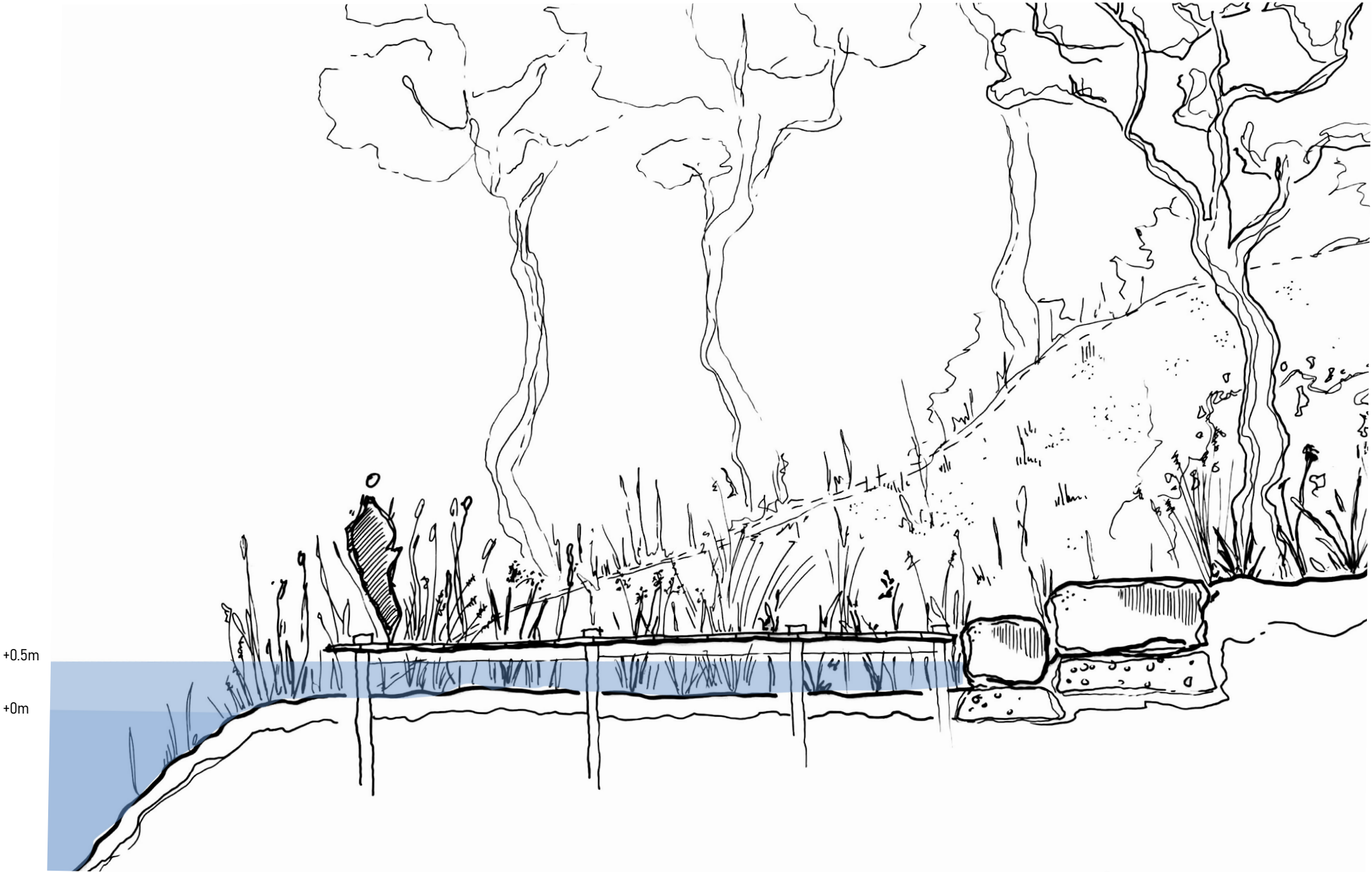
Activating public space on riparian zone



Materiality as a tool to indicate transitions

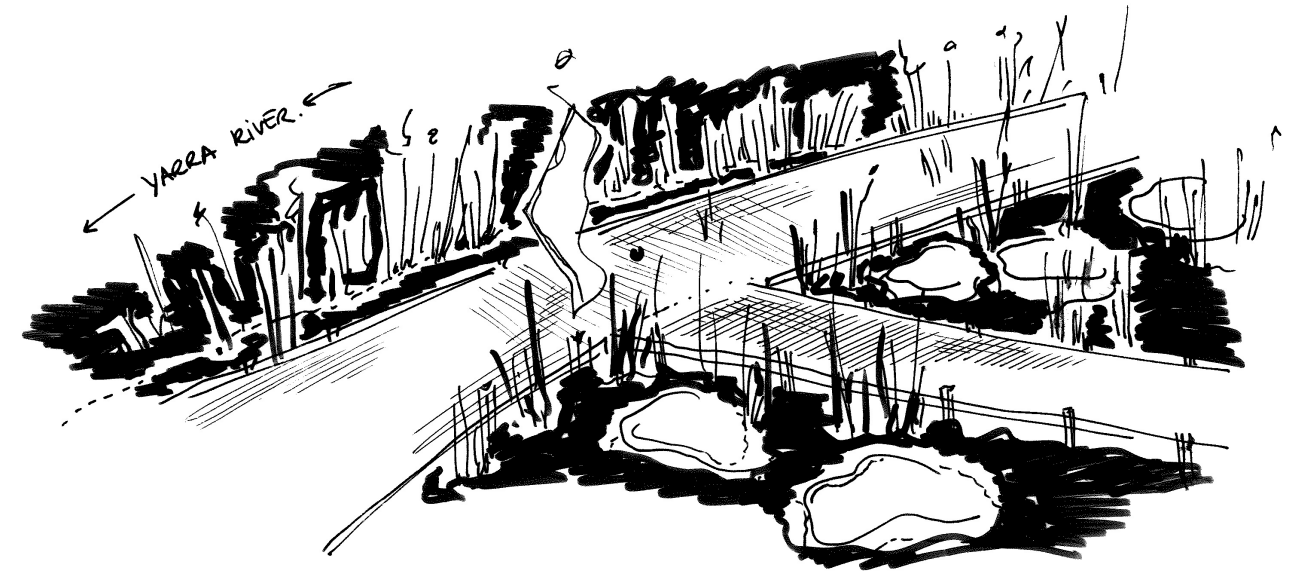


Activated banks through architectural artifacts



Limitations & Recommendations

- // Research Through Design
- // Simplification of the system
- // Viability and transferability to other river systems
- // Integration into Melbourne's green network
- // Indigenous values and knowledge

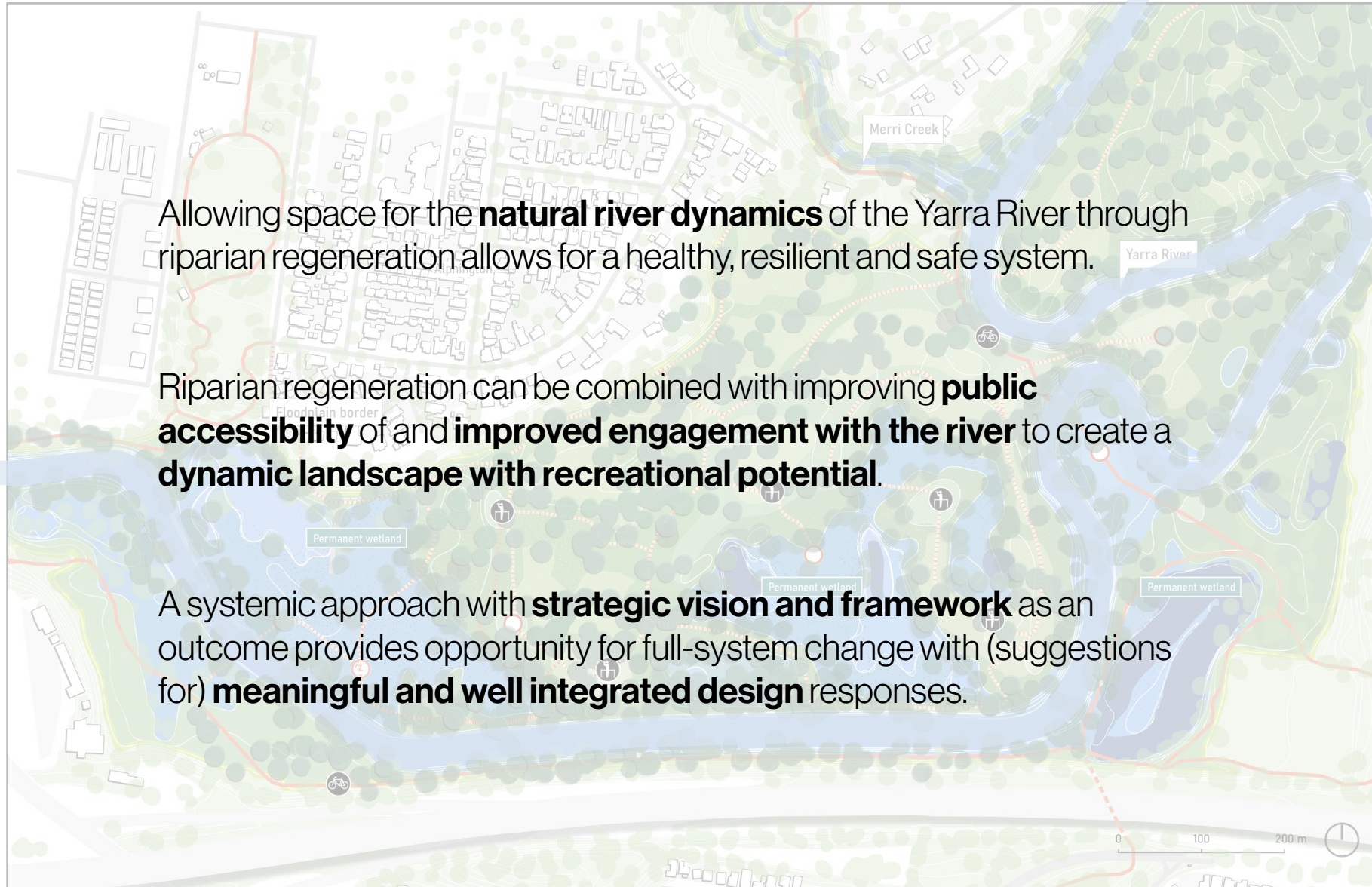


Conclusion

Allowing space for the **natural river dynamics** of the Yarra River through riparian regeneration allows for a healthy, resilient and safe system.

Riparian regeneration can be combined with improving **public accessibility** of and **improved engagement with the river** to create a **dynamic landscape with recreational potential**.

A systemic approach with **strategic vision and framework** as an outcome provides opportunity for full-system change with (suggestions for) **meaningful and well integrated design** responses.



Rethinking Birrarung

Regenerating a dynamic
Yarra River corridor



Lotte van Elst

MSc Architecture, Urbanism and Building Sciences
Track: Landscape Architecture

Research supported by:



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Cool-burning as a maintenance principle

