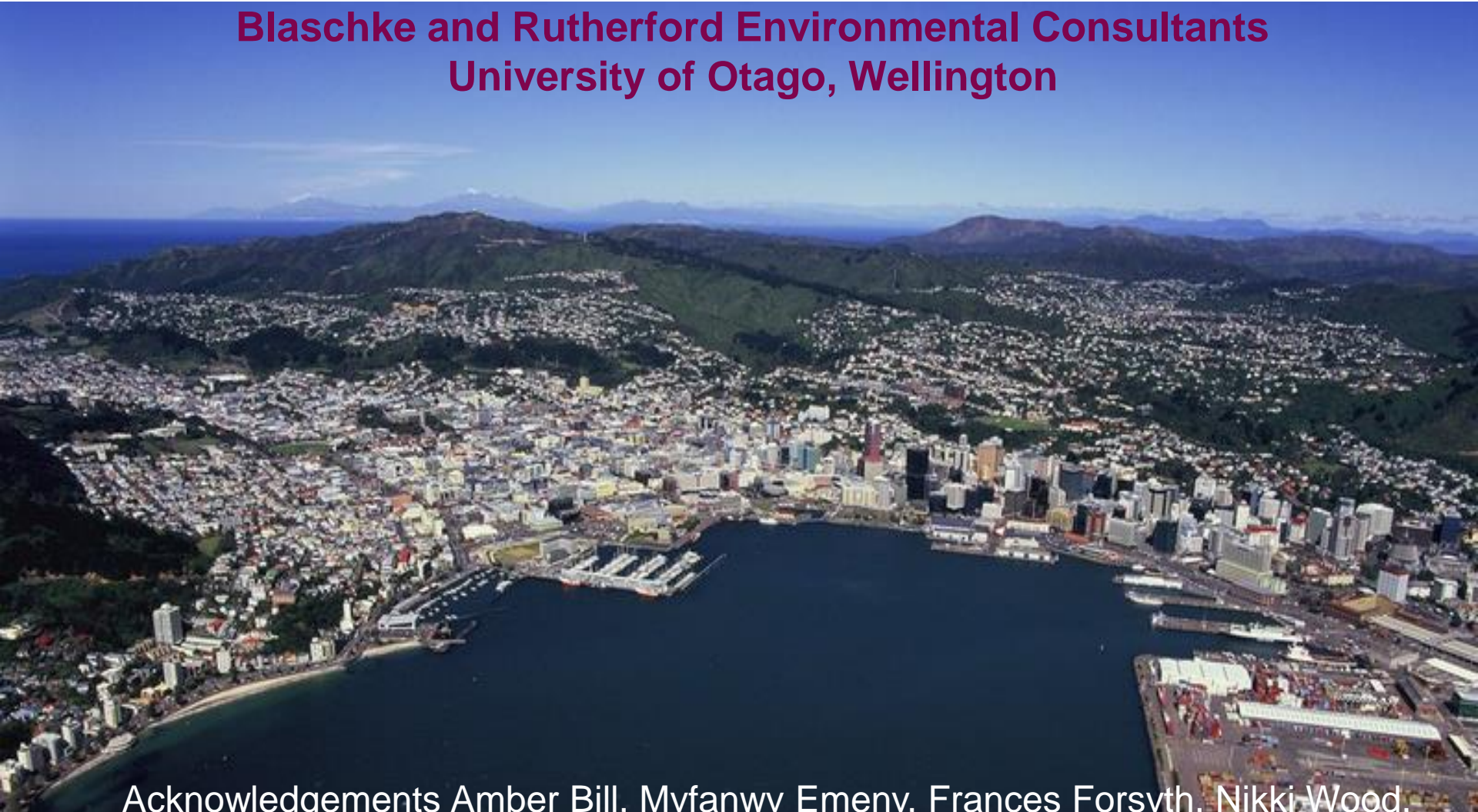


# **Science in support of a water-sensitive Wellington**

**Paul Blaschke**

**Blaschke and Rutherford Environmental Consultants  
University of Otago, Wellington**



Acknowledgements Amber Bill, Myfanwy Emeny, Frances Forsyth, Nikki Wood.

# Introduction

- Urban ecosystem services
- Wellington's waterways
  - Catchment basis
  - Riparian zones
  - Water quality
- NZ research
  - Links between water sensitivity, ecological restoration and resilience
- Scientific questions for Water-Sensitive Wellington

Integrated Catchment Management Plan development:

[http://www.capacity.net.nz/uploads/editor\\_files/icmp\\_stage\\_1\\_report\\_\(lr\).pdf](http://www.capacity.net.nz/uploads/editor_files/icmp_stage_1_report_(lr).pdf)

Greater Wellington water monitoring (annual monitoring report and SOE reporting):

<http://www.gw.govt.nz/ser/> and <http://www.gw.govt.nz/Annual-monitoring-reports/>

# Services provided by ecosystems for humans

- **Ecosystem services:** “the *benefits* that *human* populations derive, directly or indirectly, from *functioning ecosystems*”

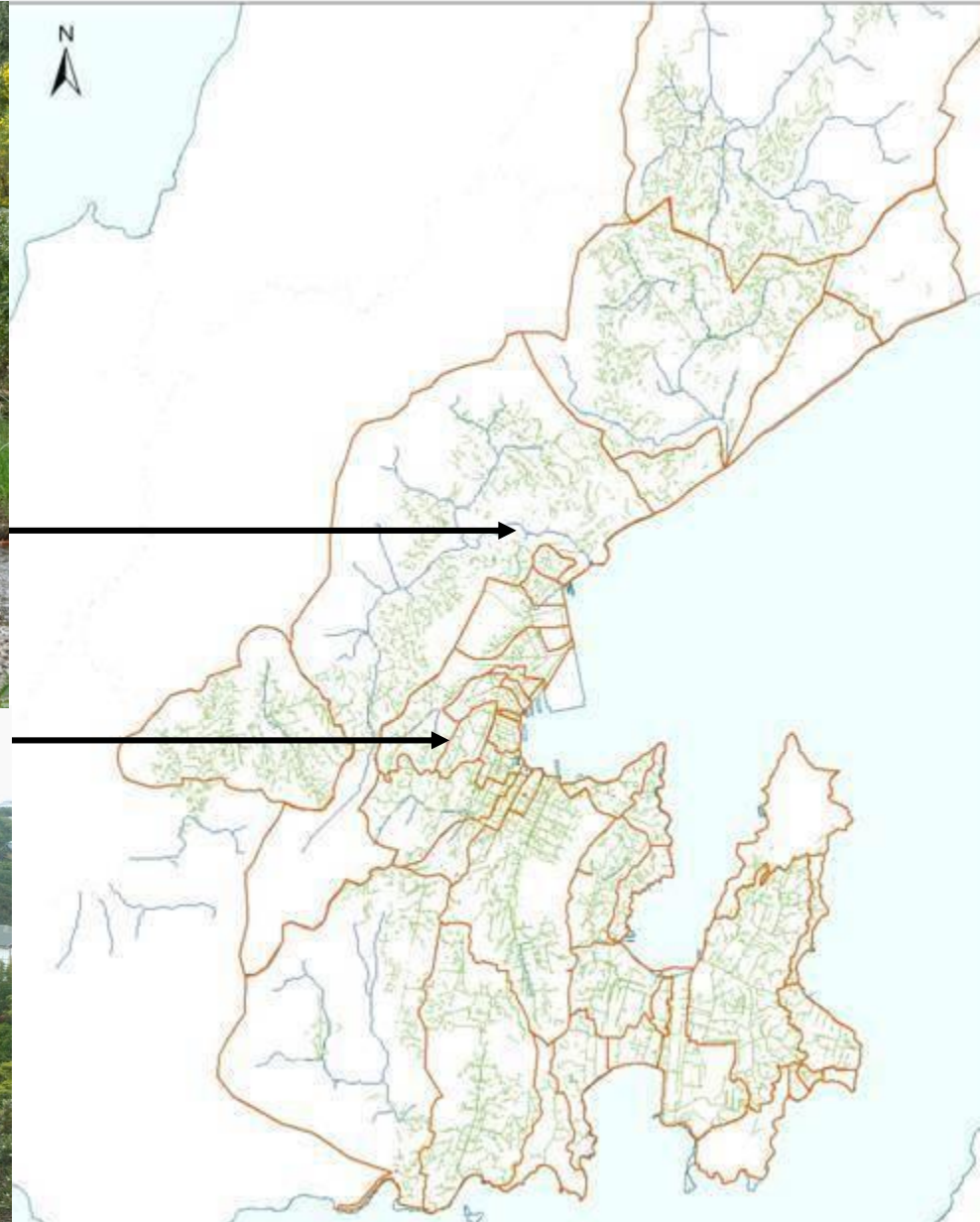
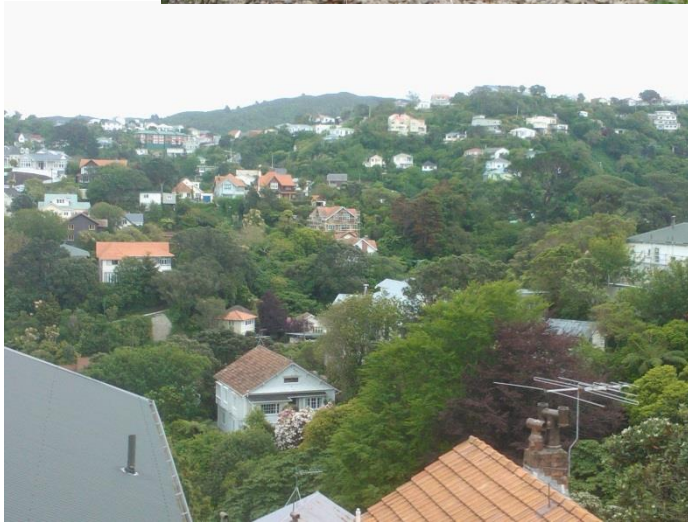


# Ecosystem services in New Zealand urban areas

<u>Provisioning services</u>	<u>Regulating services</u>	<u>Cultural Services</u>
1. Crops	8. Climate regulation	17. Spiritual & religious values
2. Animal products	9. Runoff and stormwater regulation	18. Aesthetic and amenity values
3. Fibre, fuel and biomass energy	10. Water purification, waste water and solid waste treatment	19. Cultural diversity and heritage values
4. Other energy provision	11. Human disease regulation	20. Health and wellbeing
5. Freshwater supply	12. Pest regulation	21. Tourism
6. Genetic Resources	13. Pollination	22. Education
7. Physical support for structures	14. Air quality	
	15. Natural hazard and erosion regulation	
	16. Provision of natural habitat and species niches	

Meurk CD, Blaschke PM, Simcock RC 2013. Ecosystem services in New Zealand cities. *In* Dymond JR ed. Ecosystem services in New Zealand – conditions and trends. Manaaki Whenua Press, Lincoln, New Zealand.

# Wellington as stream catchments



# Wellington streams

What we had.....

- Changes to natural stormwater flows – hard surfaces
- Modification of streams – piped or channeled

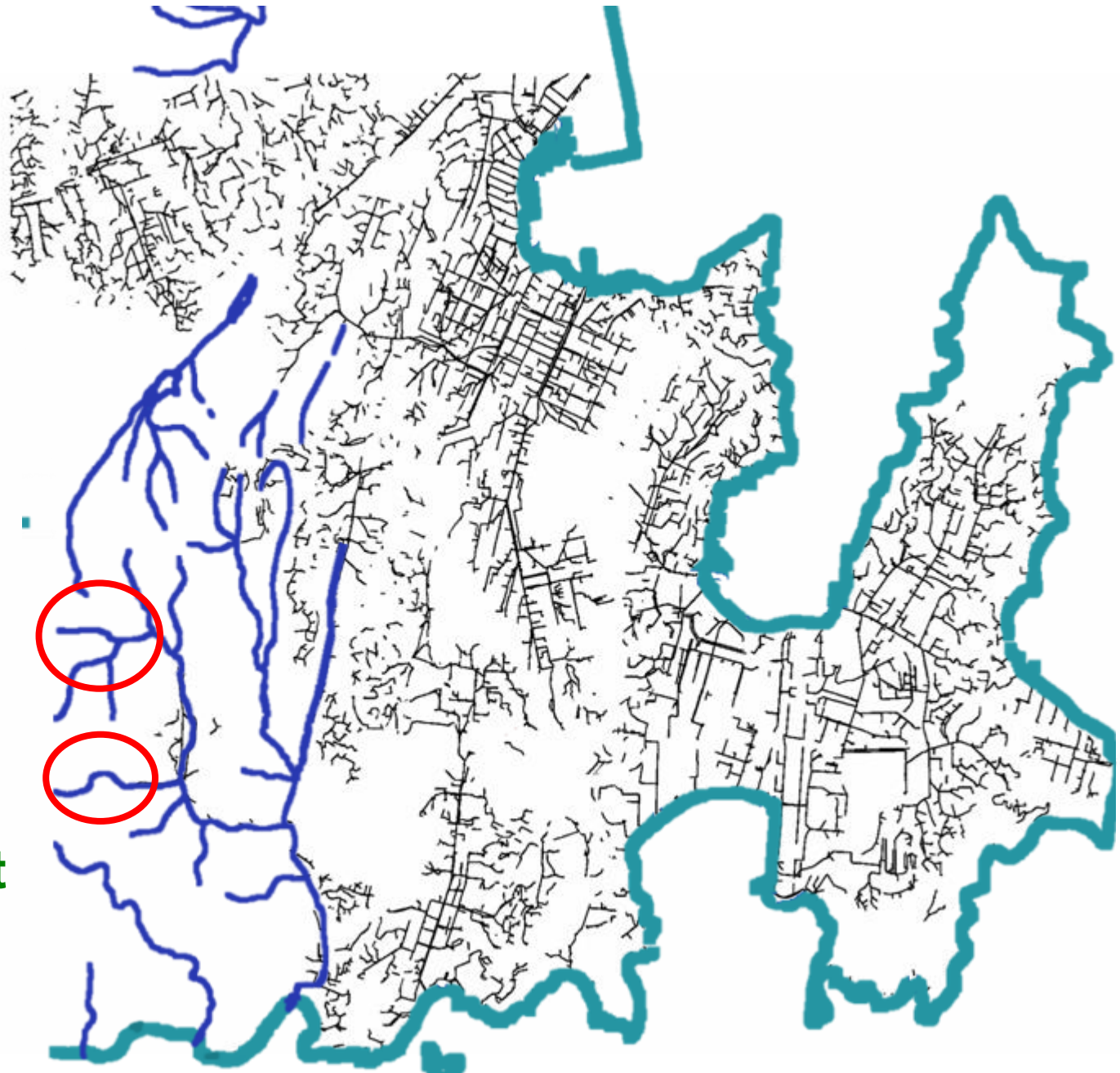






**Stormwater  
network**

**Remaining  
Open streams**



**What we've got  
left.....**

- 550 km pipes
- 25 km open stream
- **Continuing loss**

# Riparian zones: linking blue and green

- Remaining stream sections have reasonable riparian zones
- Riparian planting now comprises 22% of yearly planting.
- Planting prioritised across key catchments
- Riparian planting seen to improve stream habitat quality as well as amenity

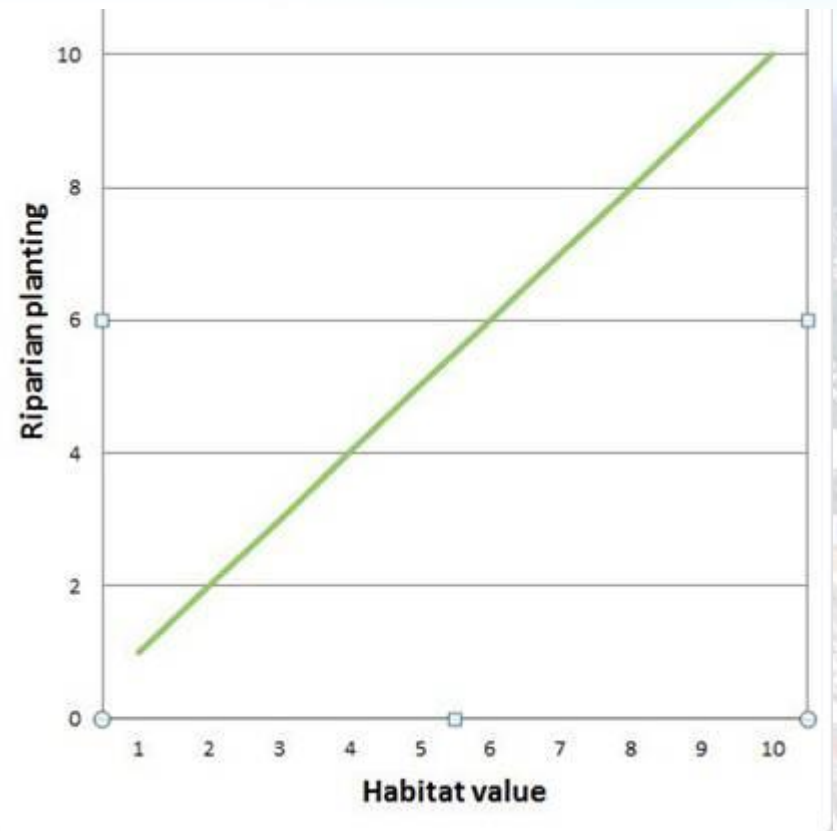




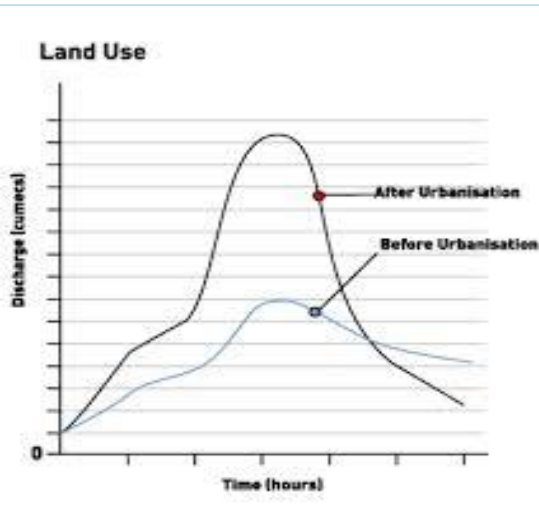
# Assumptions behind the riparian planting strategy

Assumed positive relationship with:

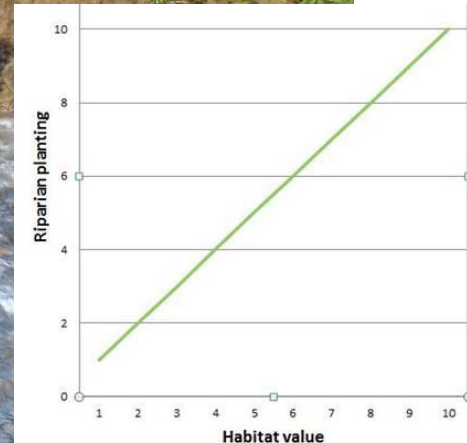
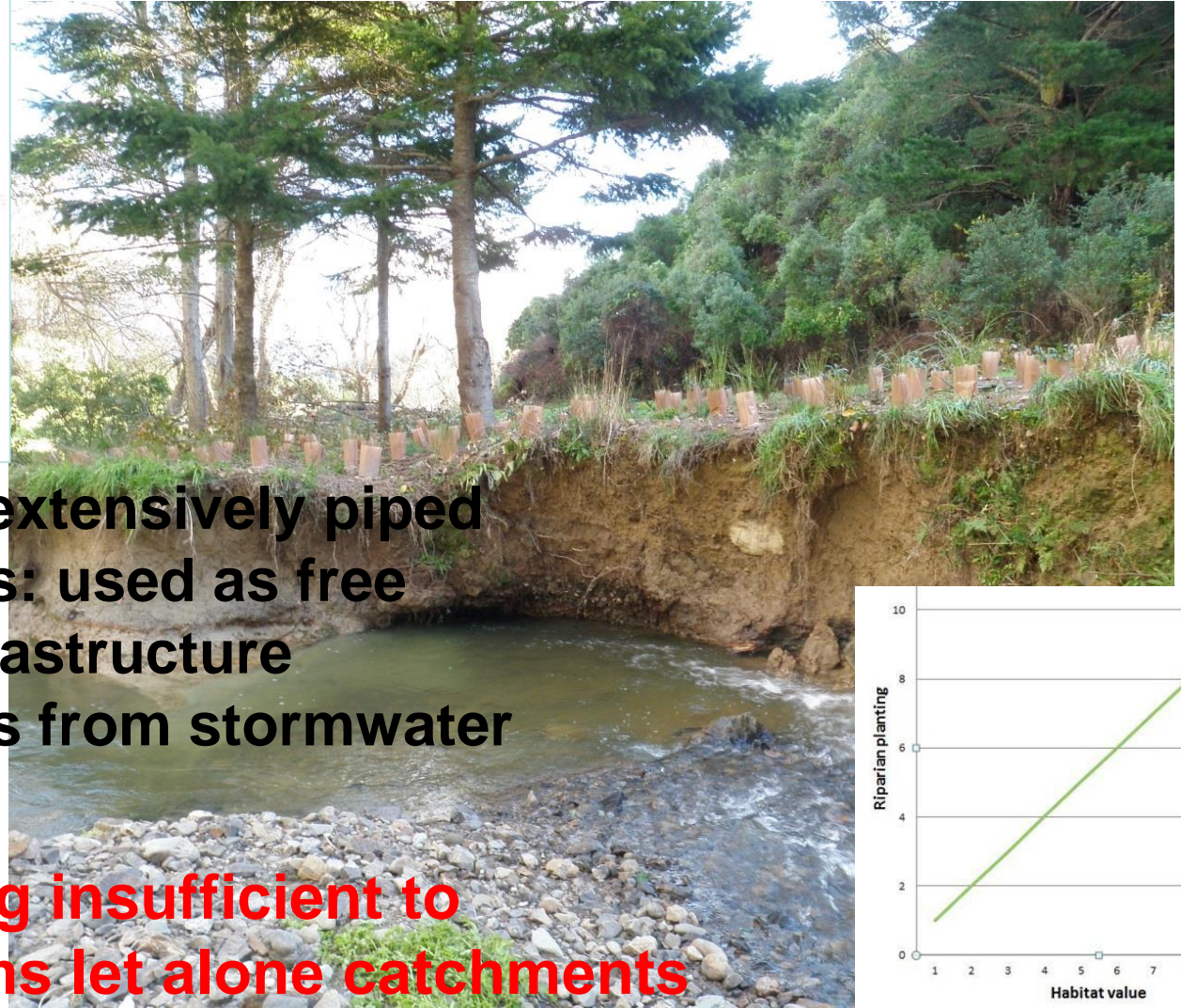
- In-stream habitat
- Water quality
- Terrestrial biodiversity
- Amenity
- Social outcomes



# Riparian planting: setting up for failed expectations?



- Mid reaches: extensively piped
- Lower reaches: used as free stormwater infrastructure
- Multiple inputs from stormwater network



**Riparian planting insufficient to  
“restore” streams let alone catchments**



# Wellington streams - geomorphic control

- Headwater are steep, hard bottomed, fault defined
- Intense rainfall several times a year
- Sediment transport from headwaters
- Continual delivery of gravel even under a 60 yr old tree canopy



# Water quality issues

- Human health
  - Faecal coliform contamination
  - Surrogate for water quality
- Ecosystem health
  - Sedimentation
  - Chemical pollutant contamination (heavy metals, ??detergents)





# Blue (freshwater aquatic) values

## Suburban streams

- Porirua Stream 56 km<sup>2</sup>  
9 native fish spp.
- Karori Stream 30 km<sup>2</sup>  
7 spp.
- Kaiwharawhara Stream 19 km<sup>2</sup> 11 spp.
- Owhiro Stream 10 km<sup>2</sup>  
9 spp

## Central city streams

- Waitangi/ Newtown stream 4 spp.
- Waimapihi/ Central Park stream 2 spp.
- Kumutoto Stream 1 sp.
- Pipitea Stream spp?
- Waipiro Stream spp?
- Tiakiwai Stream spp?
- Tutaenui Stream spp?



Giant kokopu *Galaxias argenteus*  
Kaiwharawhara Stream

# Restoration and WSUD in urban ecosystems

- Reconciliation ecology is about encouraging biodiversity in human-dominated ecosystems
- WSUD (Water-Sensitive Urban Design) links the need to have functioning ecosystems with the recognition this is a highly urbanised environment
- Applies to blue and green restoration – “novel ecosystems”
- WSUD enables an adaptive, practical approach to catchment management.



New Plymouth fish pass

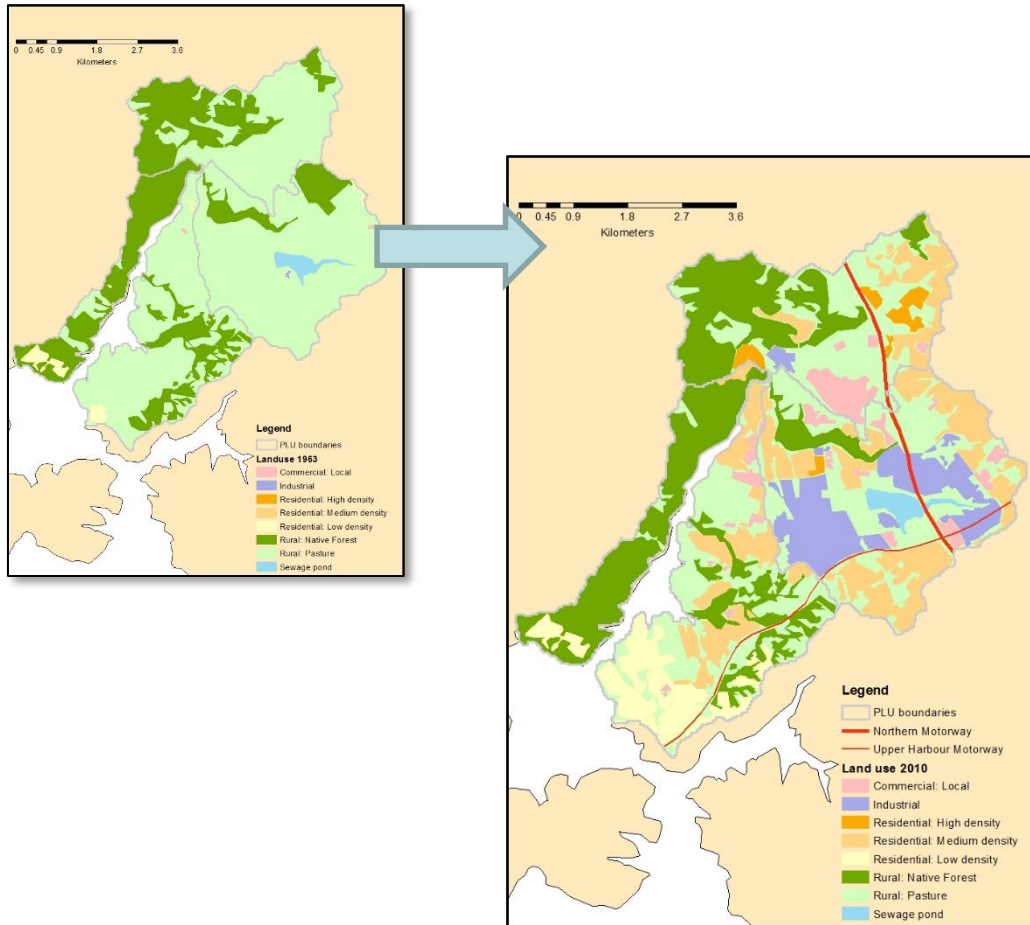


# Resilient Urban Futures

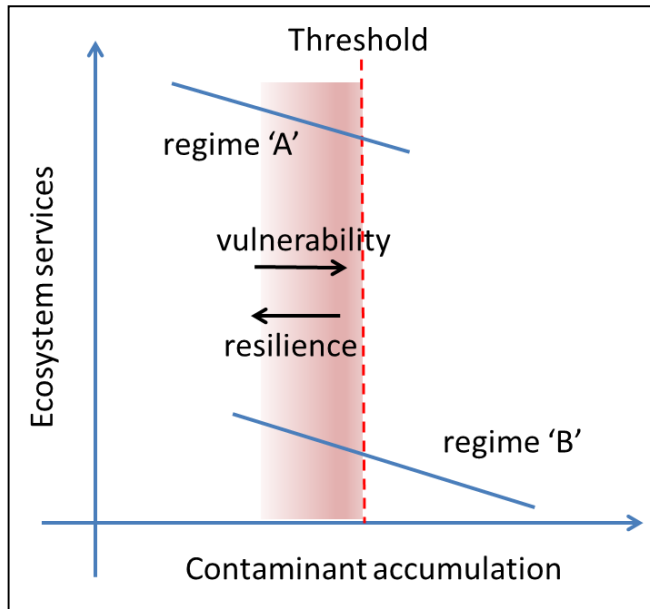
- MBIE funded 4-year research programme
  - **Which potential urban futures will result in the most resilient, liveable and competitive cities?**
  - Led from **NZ Centre for Sustainable Cities**
  - Links Otago, Auckland, Massey, Victoria, Canterbury universities, Motu, NIWA, with end-users from local / central government, iwi, developers, community
  - Multi-disciplinary approach, cities as systems
- 9 strands of research in 3 areas:
  - **Urban development trajectories** - Drivers of urban change, Costs / benefits of compact v dispersed urban development, Residential choice and community formation, Infrastructure links, ACTIVE travel, WILUTE model
  - **Urban environmental impacts** - Effects of development on urban water, Modelling air quality, traffic emissions and energy
  - **Māori role in urban development** - Tāone Tupu Ora

- [www.sustainablecities.org.nz](http://www.sustainablecities.org.nz)

# RUF: Resilience of Urban Water Bodies







# Scientific issues for Water-Sensitive Wellington

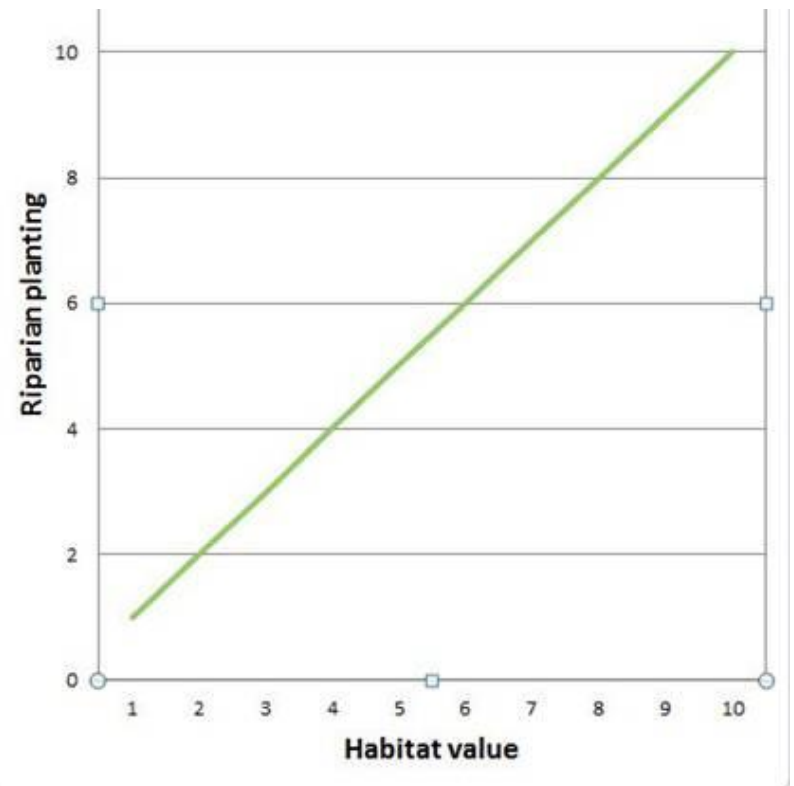
- Treating rainwater as a resource not a waste product
- Freshwater-marine relationships
  - Flows
  - Water quality
  - Biology
    - *For both pipe network and stream remnants' contribution*
- Catchment management for more natural flows and better water quality
- Which water-related ecosystem services need to be particularly well protected to maximise urban resilience in Wellington?



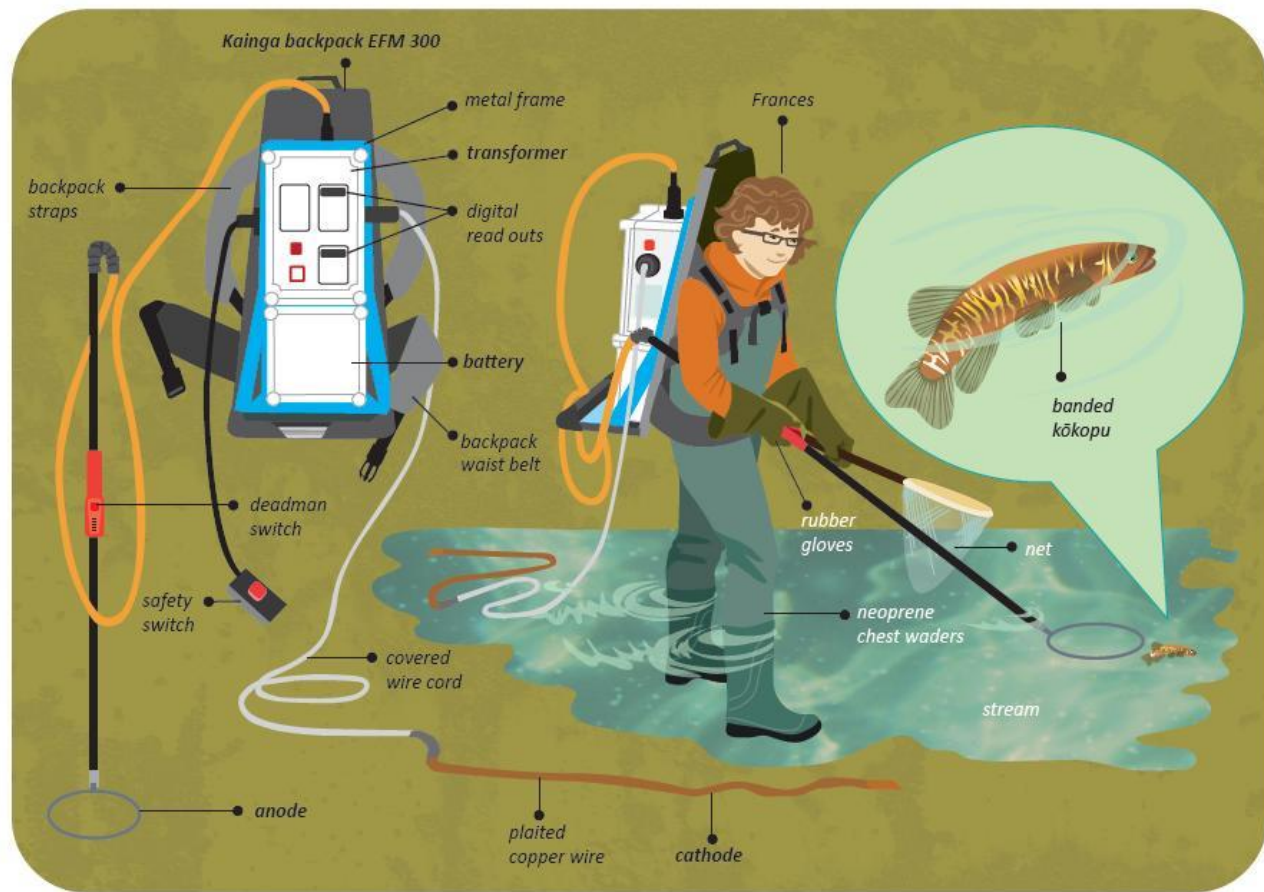
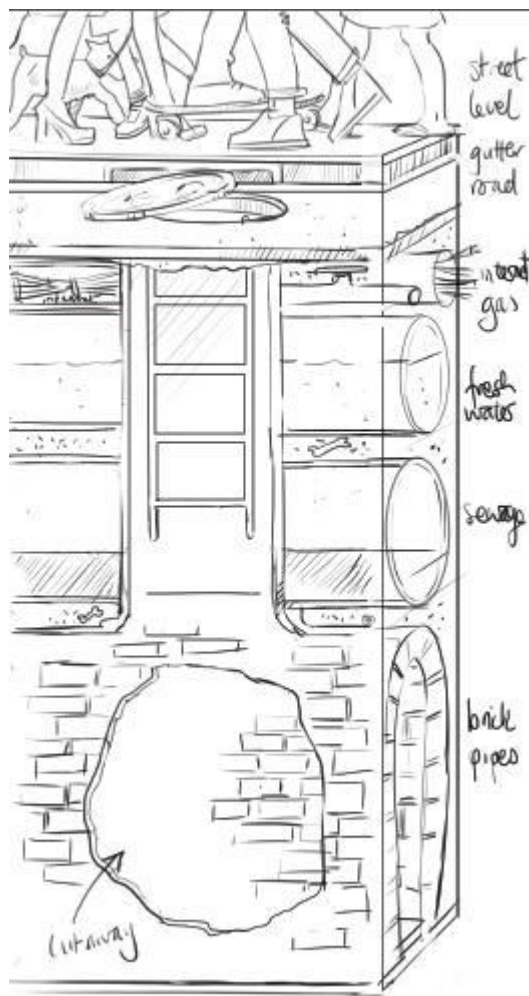


# Achieving the blue-green balance

- Inform citizens & raise the profile of WSUD
- Concept of WSUD normalised in the media
- Politicians standing on a WSUD platform
- **Streams are more than free infrastructure**
- **Moving the planting/improvement relationship from assumed to real**

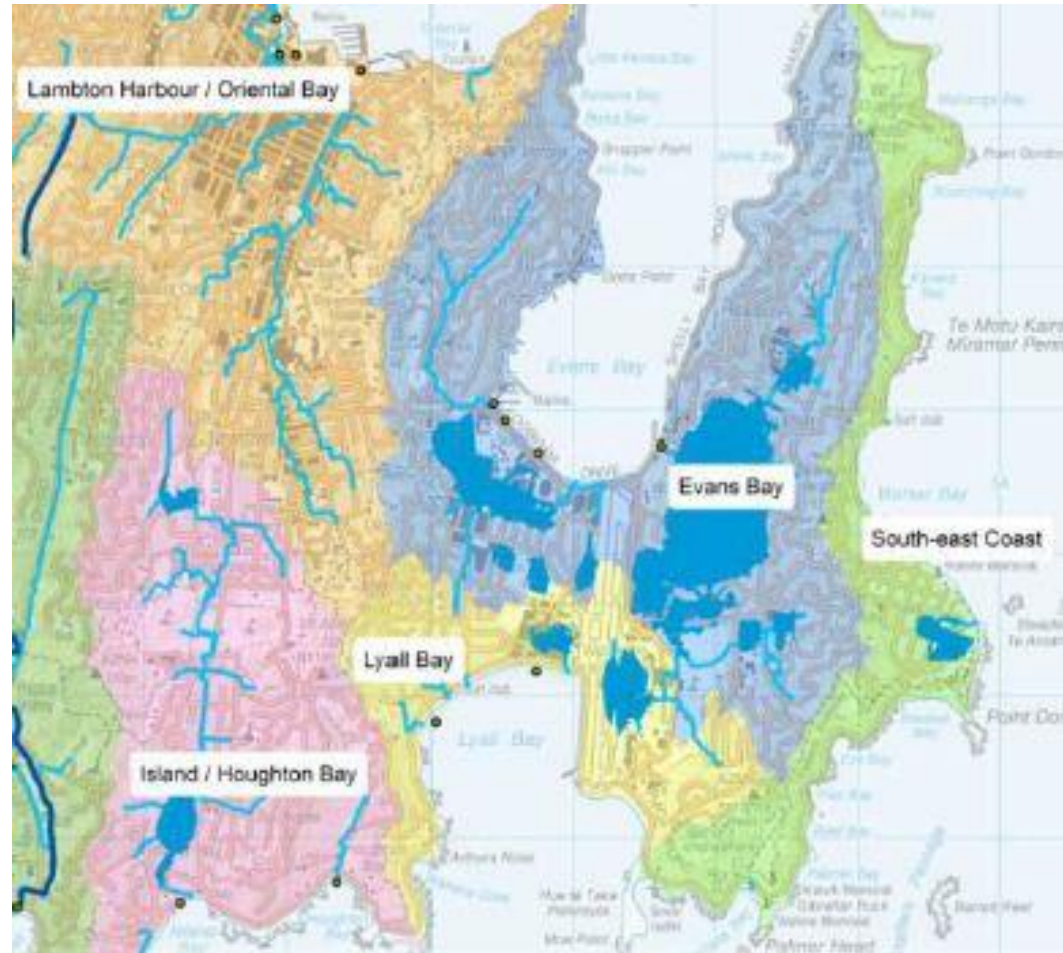






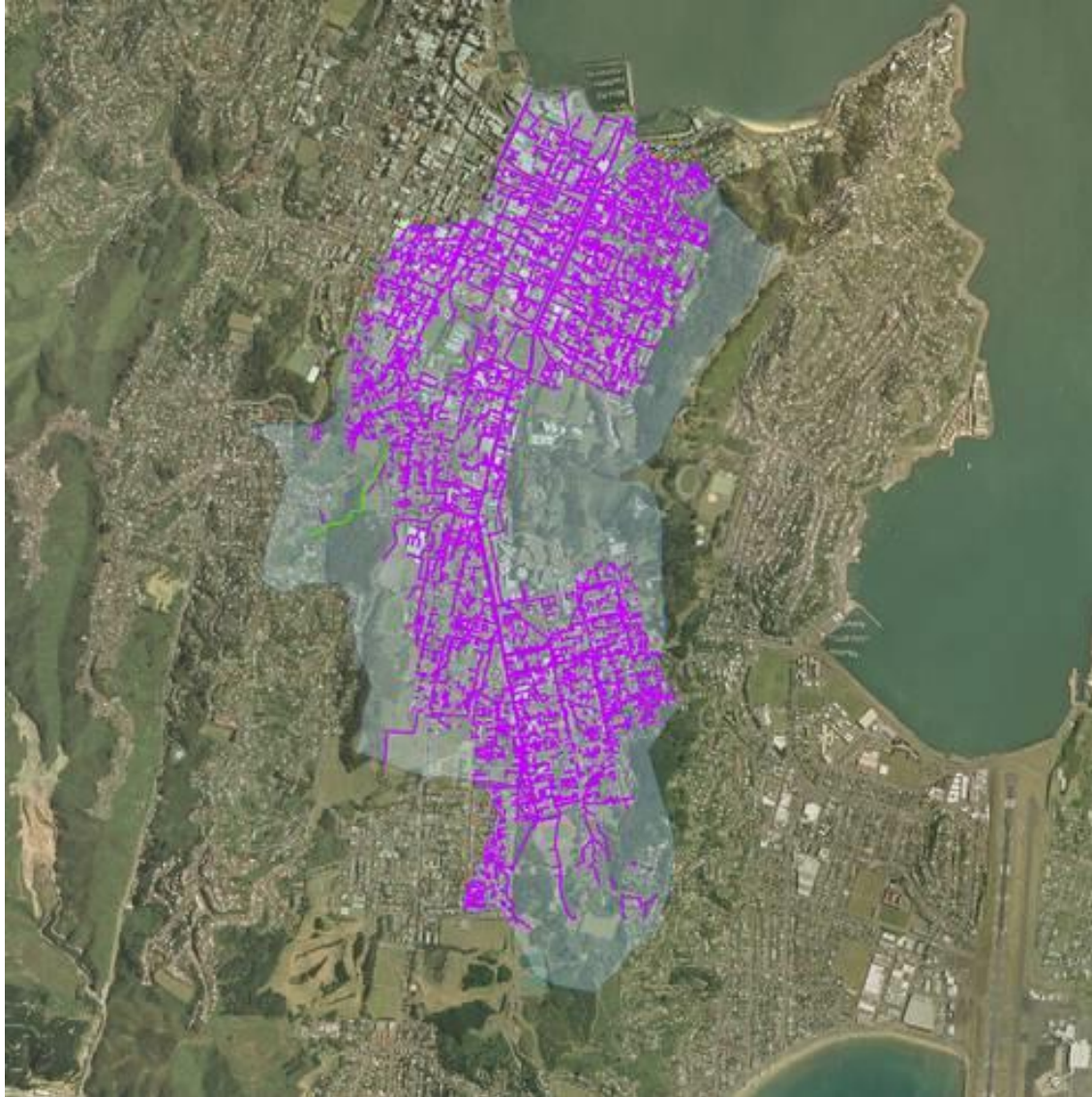
School Journal illustrations  
Adele Jackson Life Education

# Catchment management plans





# Example: Waitangi catchment





**Water Sensitive Urban Design (WSUD)** is an approach to stormwater management that uses plants and natural water systems to address both water quantity and quality issues



# Wellington applications for WSUD



Large scale drainage swale in Churton Park



Waitangi Park



# Moving from green to blue-green

- Citizen participation in care groups raises awareness of water sensitive solutions
- Requiring training in ecological issues (SEV) for SW engineers
- Bring WSUD in from high profile CBD sites into suburban area throughout Wellington

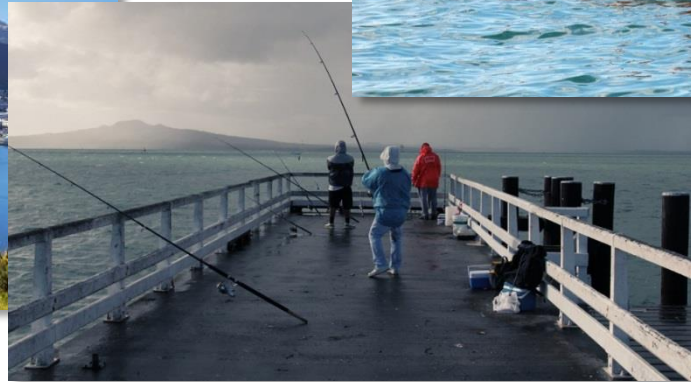
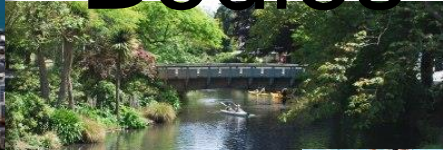


- Blue Belt project – celebrate and conserve Wellington Harbour





# Resilience of Urban Water Bodies



Jonathan Moores

National Institute of Water and Atmospheric Research Ltd (NIWA)



