Can we improve cities for people & biodiversity?

Margaret Stanley (& team!)

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Paris, France

THE UNIVERSITY OF AUCKLAND NEW ZEALAND

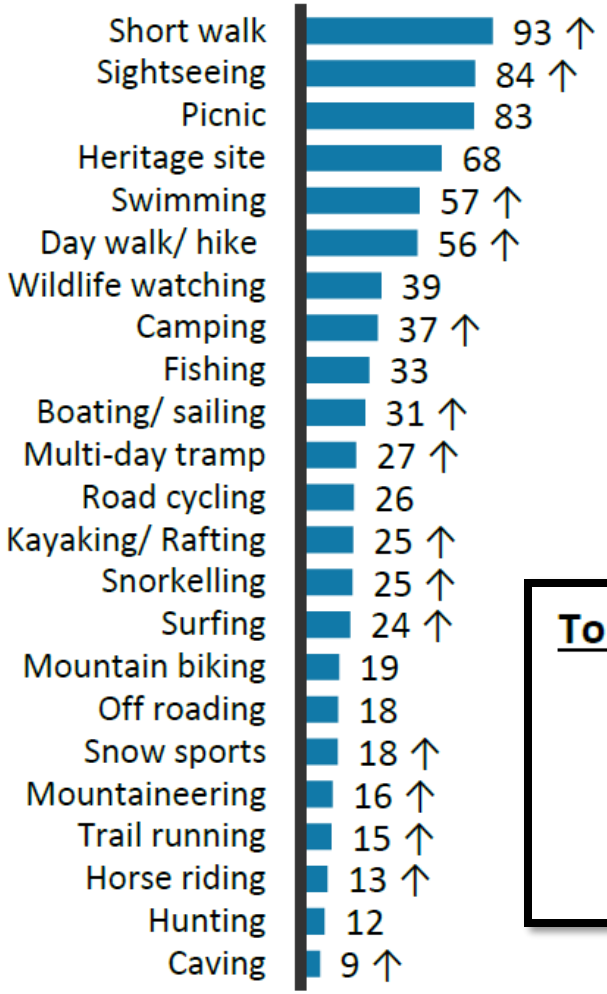
SCHOOL OF BIOLOGICAL SCIENCES
SCIENCE

Globally, people increasingly live in cities

32% of NZers live in Auckland

People only connecting with nature in cities?

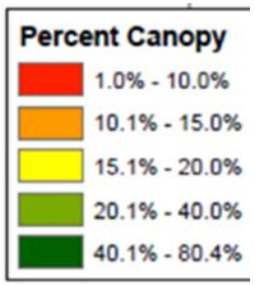
Auckland

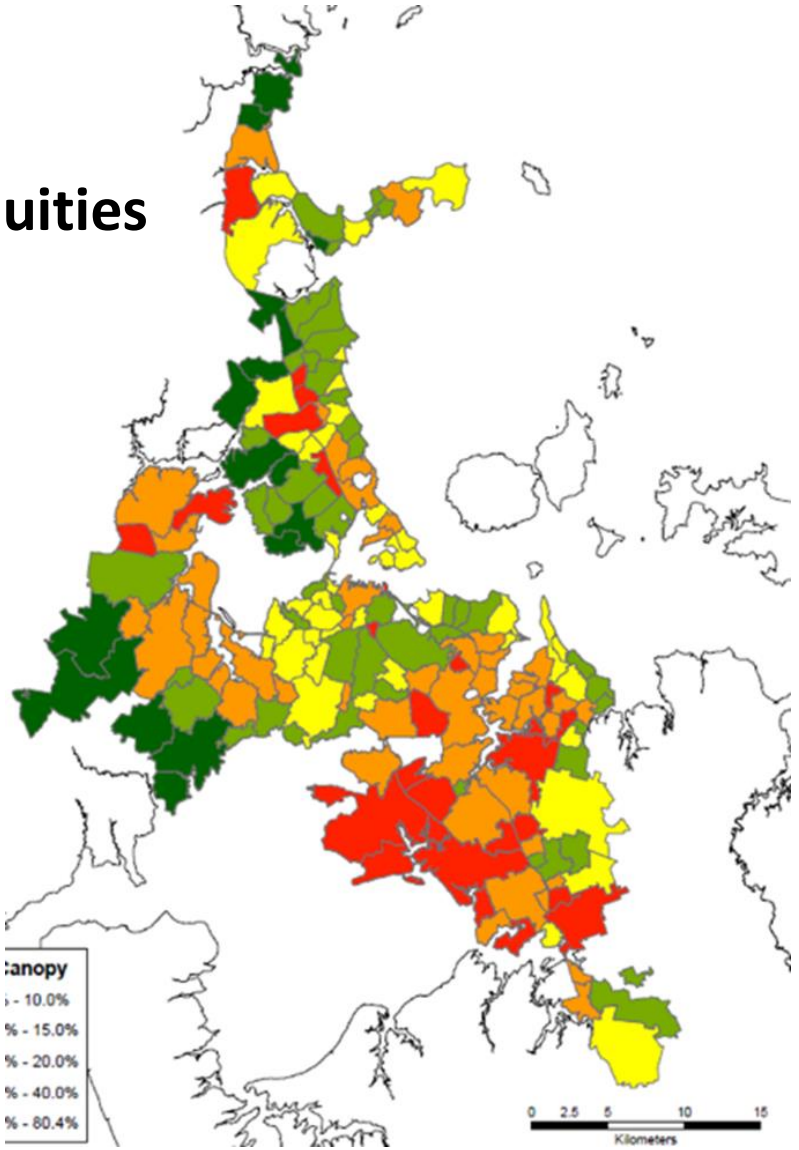


Top four outdoor recreation barriers

- **37%** - Traffic delays (↑)
- **33%** - Prefer to do other things
- **32%** - Cost too much to get there
- **32%** - Finding things that fit in with lifestage

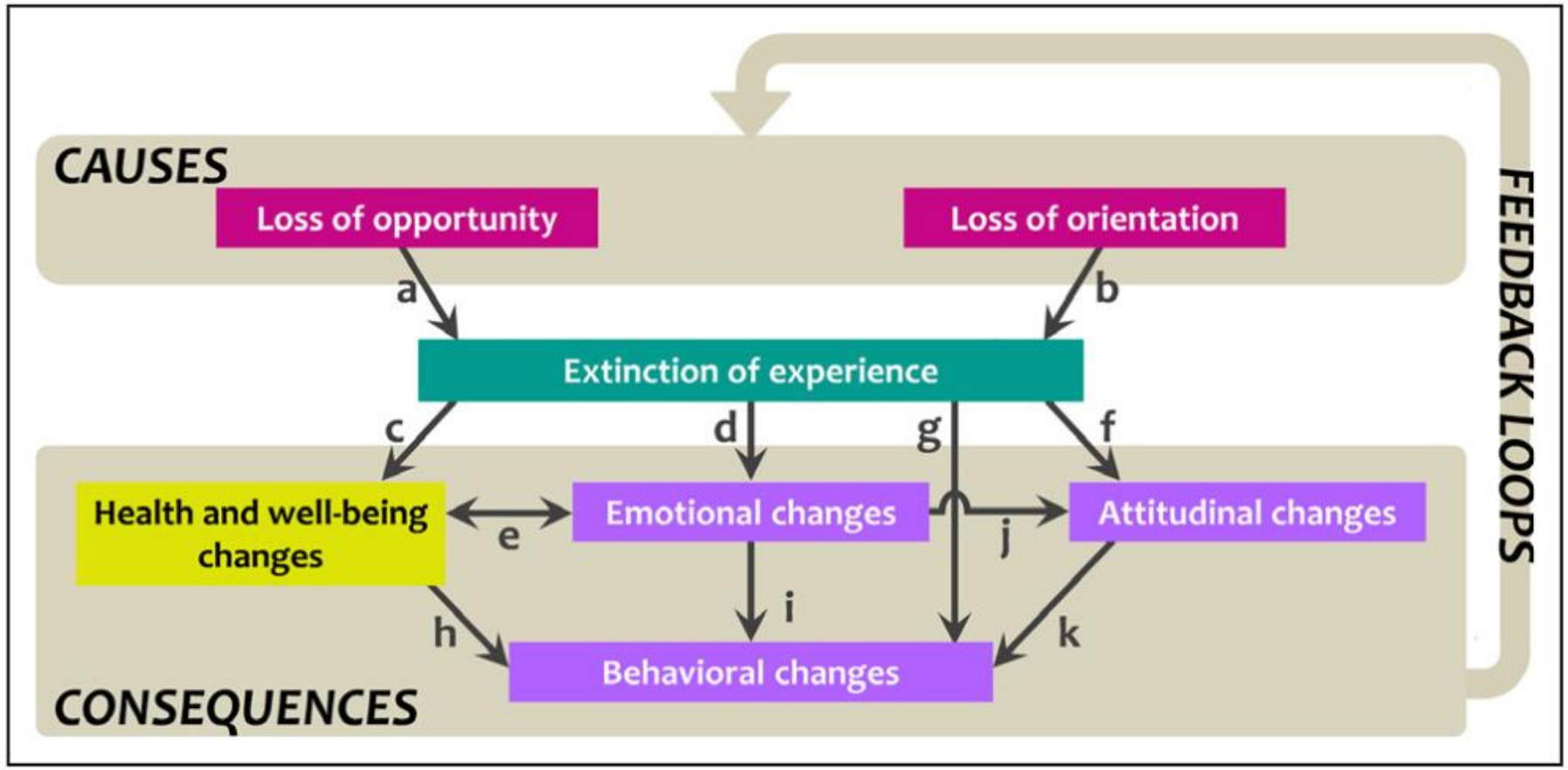
Auckland urban forest inequities





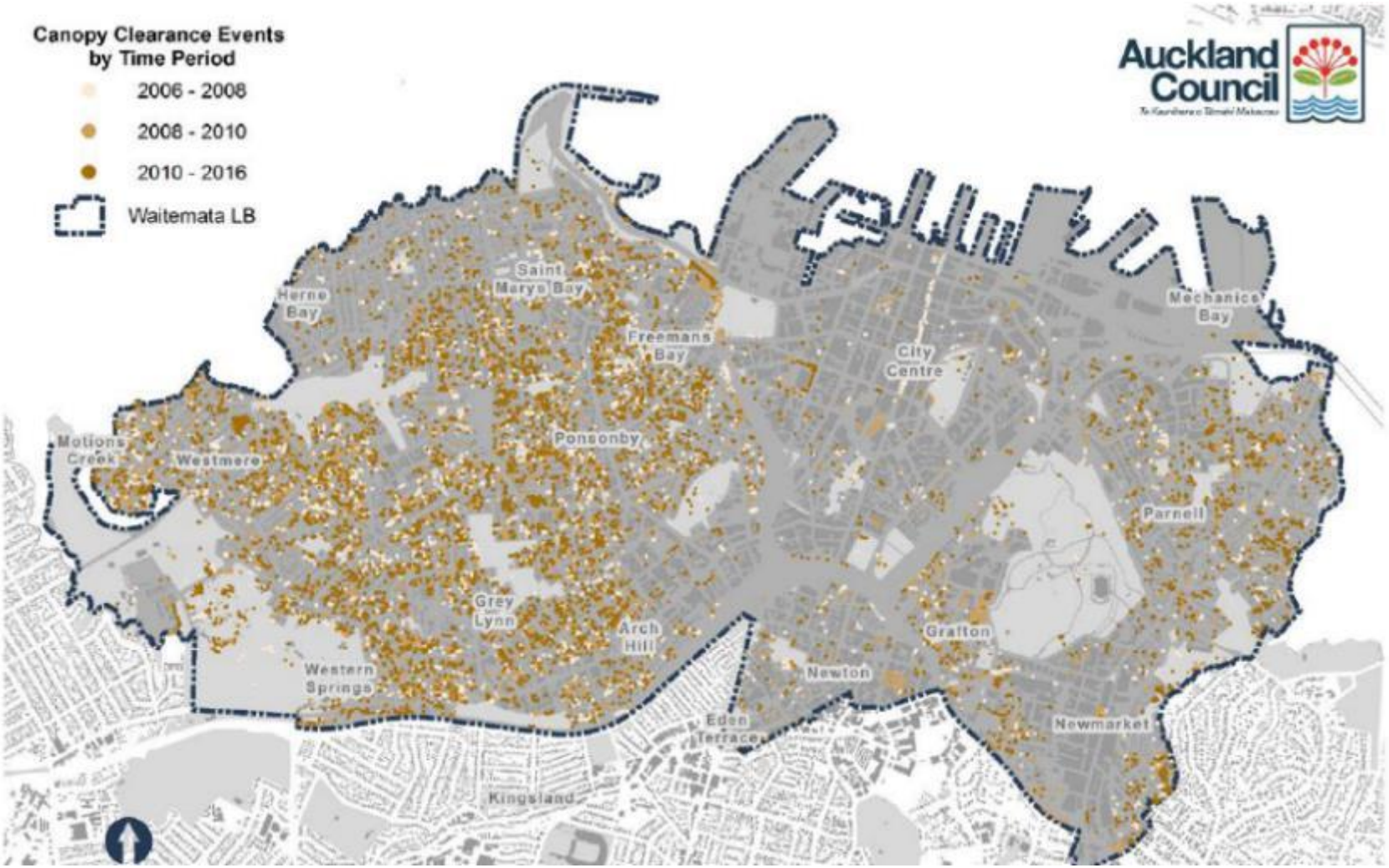
DOC (2020). New Zealanders in the Outdoors. *Domestic customer segmentation research*. DOC, Wellington

Consequences for biodiversity = apathy



Soga, M., & Gaston, K. J. (2016). Extinction of experience: the loss of human–nature interactions. *Frontiers in Ecology and the Environment,* 14(2), 94-101.

Tree loss - up to 35% urban forest

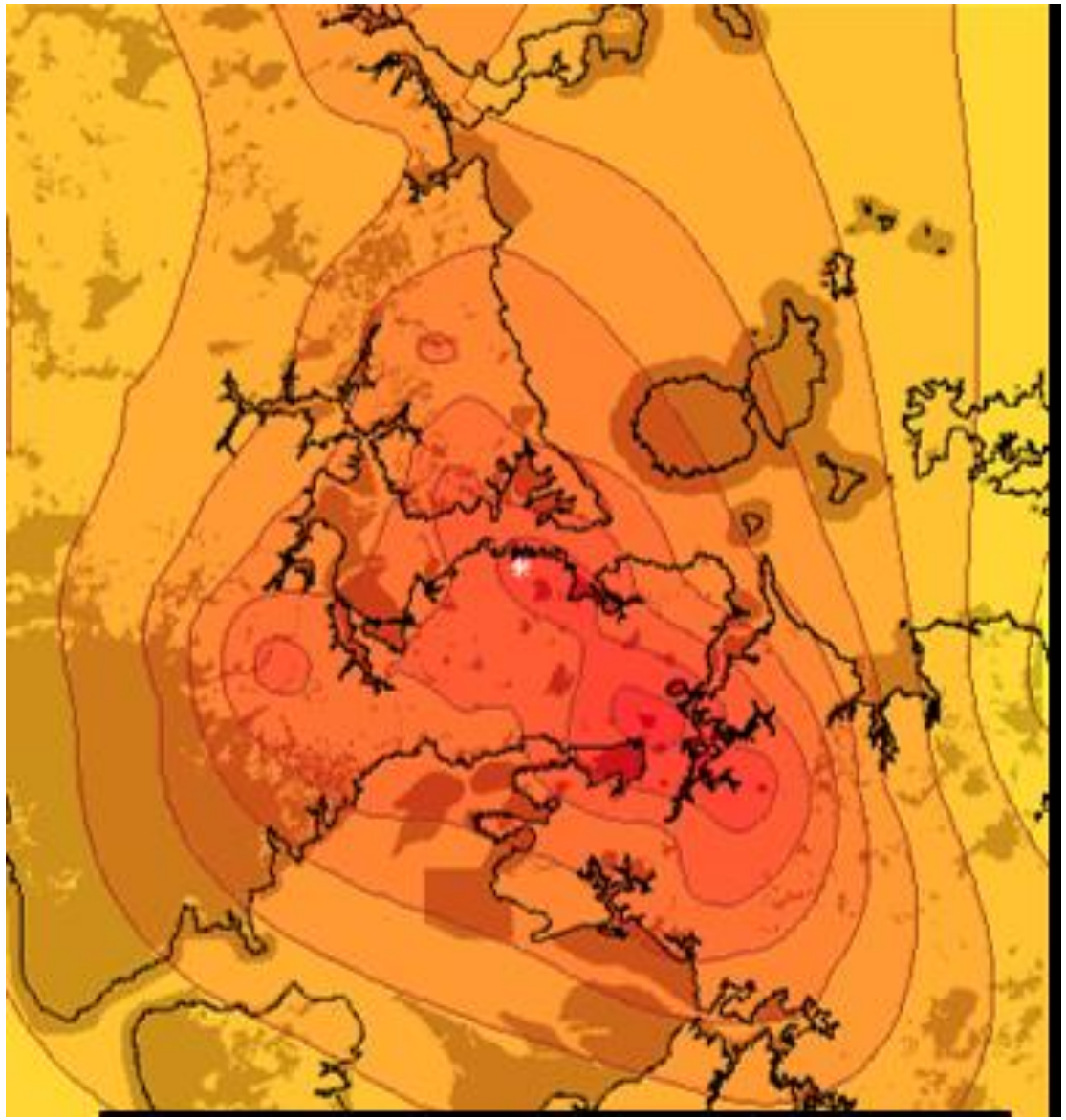


Death by a thousand cuts

"It's just one tree"

Lawrence et al 2018 Tree Loss in the Waitematā Local Board Over 10 Years, 2006-2016. Technical Report 2018/021. Auckland Council

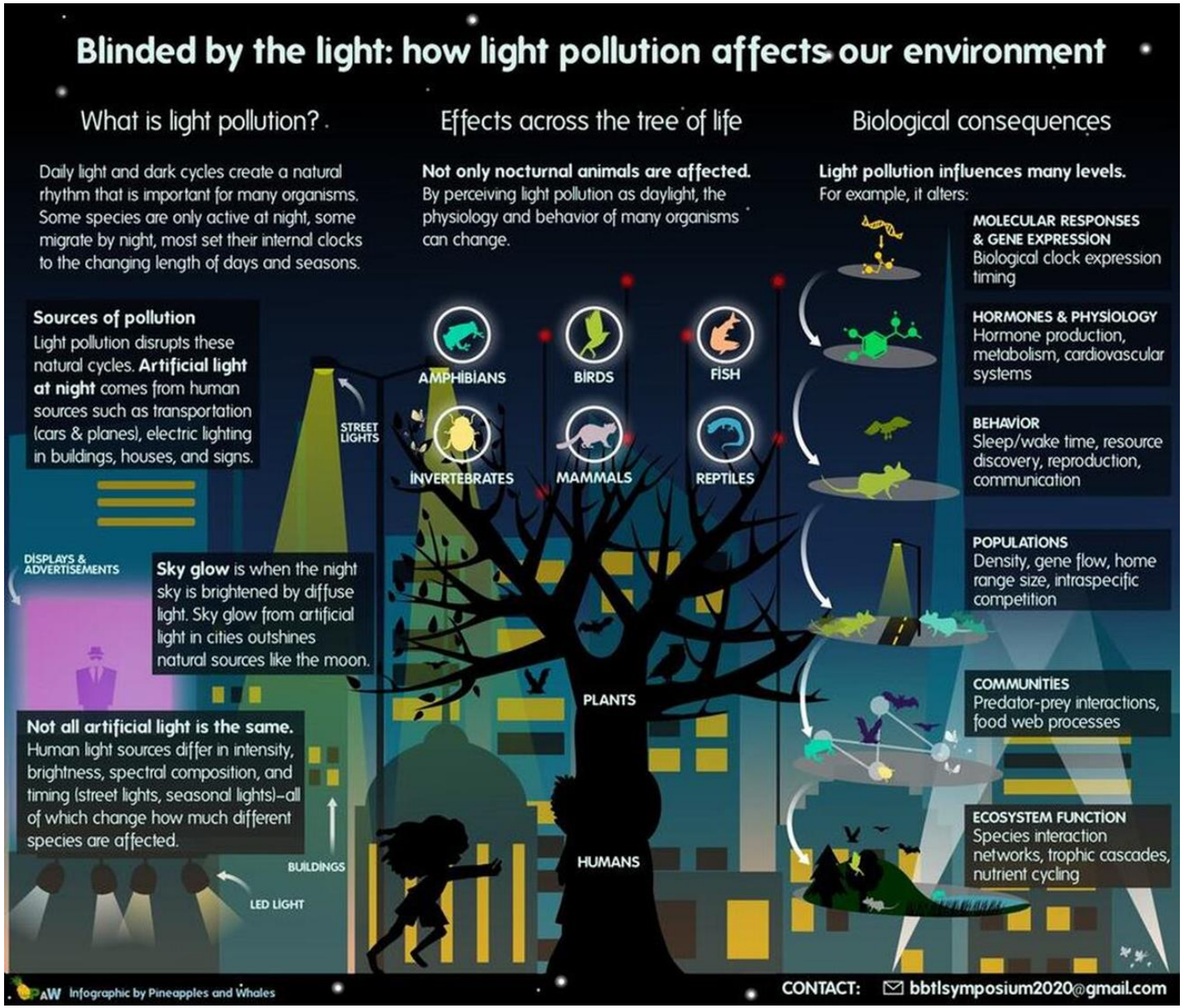
Light pollution



Lunar cycle in Auckland is partially masked by light pollution – how does that affect organisms?

McNaughton EJ, Gaston KJ, Beggs JR, Jones DN, Stanley MC. (2022). Areas of ecological importance are exposed to risk from sky glow. *Urban Ecosystems* doi.org/10.1007/s11252-021-01149-9

Light pollution



Biodiversity loss in cities

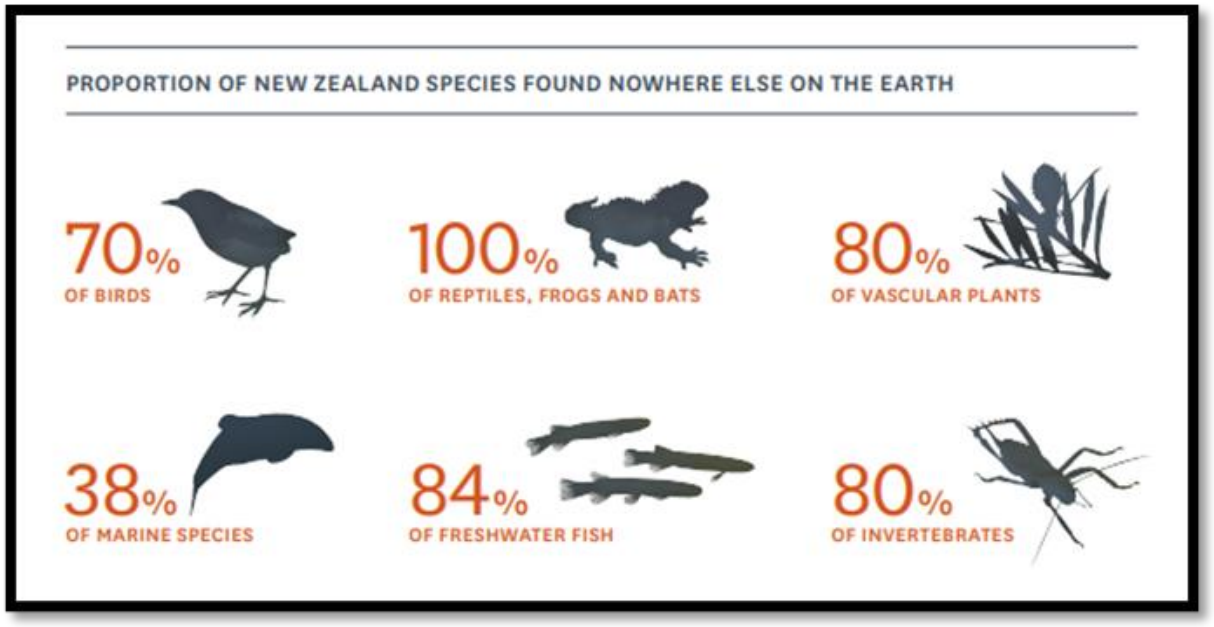
indigenous ecosystems & threatened species occur within cities



Negative biodiversity impacts =
higher in cities with high levels of endemism

Aotearoa's biodiversity

ENDEMIC – found nowhere else in the world



https://environment.govt.nz/publications/our-land-2024/

Endemism = designated one of 25 global biodiversity "hot spots"

We don't know what we're losing…

- 33% of our species are 'data deficient'
- Only ~50% of insect species described

(= 30% for wasps, bees, ants)

Auckland has biodiversity!

Beetle species in suburban Auckland

- **982 beetle species**
- **753 of them endemic!**

Kuschel, *G. 1990. Beetles in a suburban environment: a New Zealand case* study. *DSIR Plant Protection Report no.* ***3.***

Endemism of plants = high endemic biodiversity

Highly specialised evolutionary relationships

- Fungi & lichen have long evolutionary histories with endemic plants

- Herbivorous insects have evolved to specialise on 1-2 hosts' defenses = they cannot complete their life cycle on other plant species

If we don't have native plants – then we don't have the specialist endemic species that evolved on them

Cities = filled with generalists
- we lose our endemic specialists

Photo: Tim Holmes

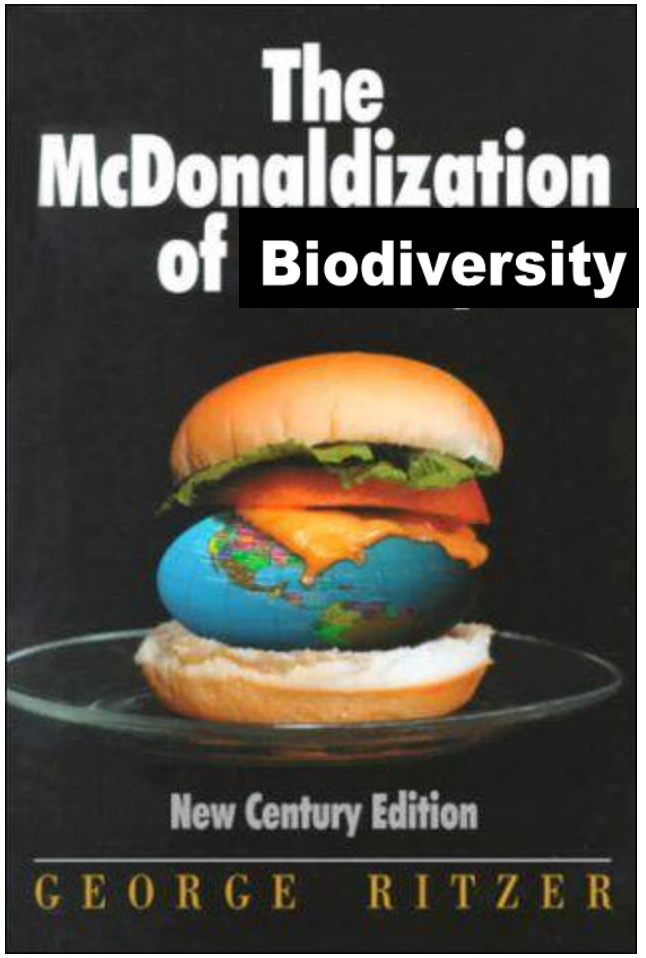
Photo: Oliver Ball

Photo: Manaaki Whenua

or the specialist endemic species that evolved to eat them!

Sense of place is critical = colonial history rather than indigenous biodiversity

Biotic Homogenisation



Street trees – heavy bias towards exotic trees

Street trees = 9% of Auckland's urban forest canopy

Surveyed 1407 trees on 47 streets across Auckland:

- 75% exotic species, 25% native species
- 12 species banned under RPMP
- Monocultures: Myrtaceae
  (risky: myrtle rust & rapid death o'hia)

MSc Student: Sandy Huang; supervisors: Burns & Stanley

Notable tree schedule

3471 natives (49 spp.) + 3517 exotics (193 spp.)

Tree species	Number of individuals
1. Pohutukawa	1430
2. Oak	903
3. London plane	619
4. Totara	513
5. Puriri	398
6. Norfolk Island pine	335
7. Kauri	294
8. Phoenix palm	253
9. Titoki	243
10. European olive	201

40% of native spp. = pōhutakawa

WYSE SV, BEGGS JR, BURNS BR, STANLEY MC (2015). Protecting trees at an individual level provides insufficient safeguard for urban forests. *Landscape & Urban Planning* 141: 112-122

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Which species provide fruit/nectar for native birds?

90% of native species

27% of the exotic species

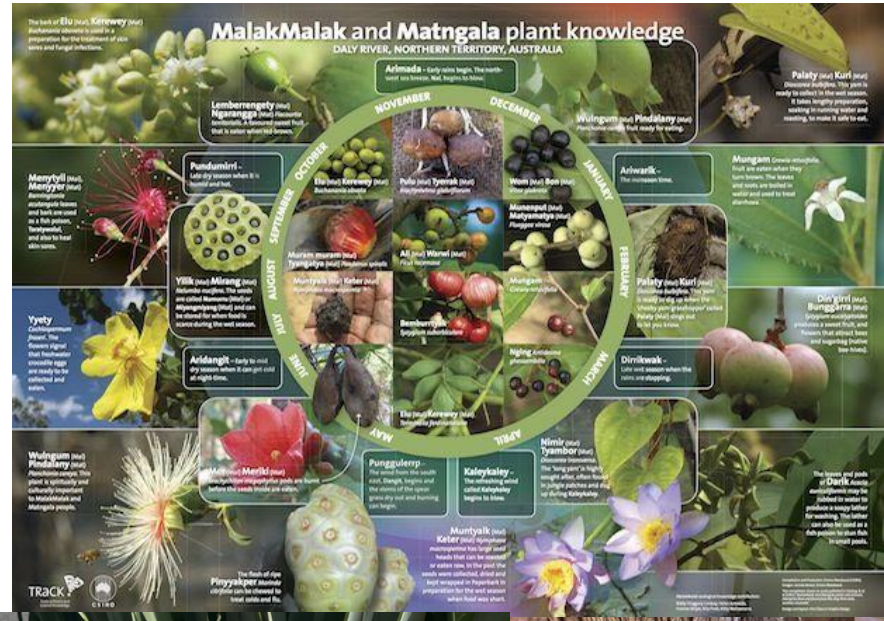
WYSE SV, BEGGS JR, BURNS BR, STANLEY MC (2015). Protecting trees at an individual level provides insufficient safeguard for urban forests. *Landscape & Urban Planning* 141: 112-122

Impacts on Indigenous people in cities

Colonisation has strongly influenced urban planning & plant choice globally

Colonisation: Indigenous peoples in urban areas have lost language & cultural practices associated with native species and their use

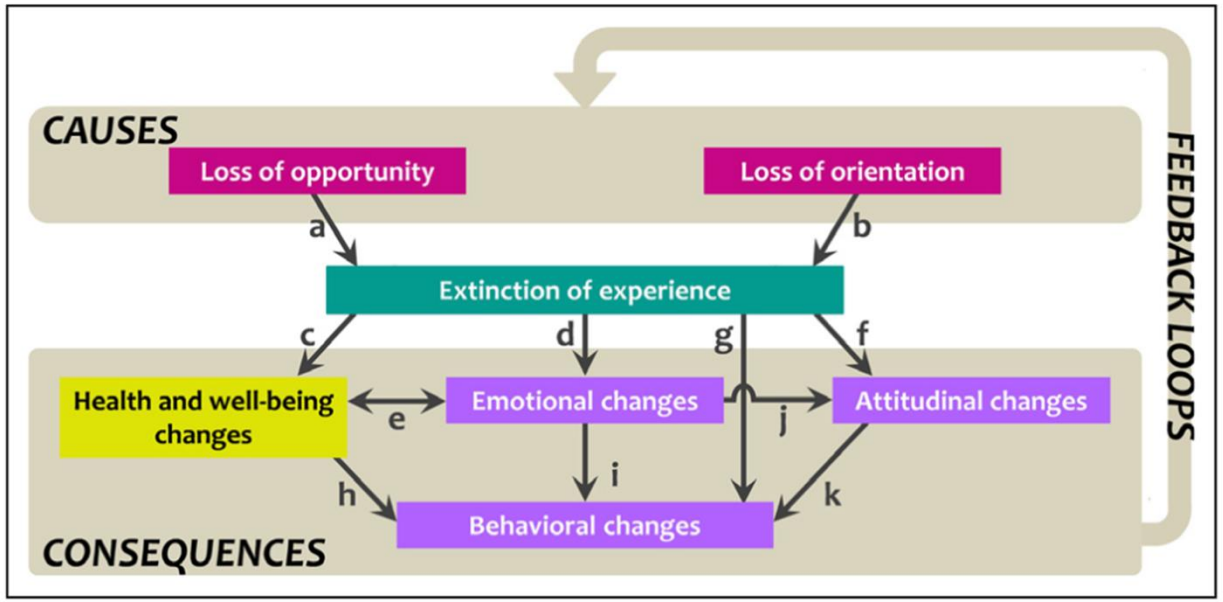
= decline in wellbeing



Rodgers et al. (2023). Plants of place: justice through (re) planting Aotearoa New Zealand's urban natural heritage. *Architecture_MPS* 25:1-25

Are residents disconnected from their local indigenous environment?

Struggle to get buy-in for enhancing biodiversity if **emotional connection** to indigenous biodiversity not present



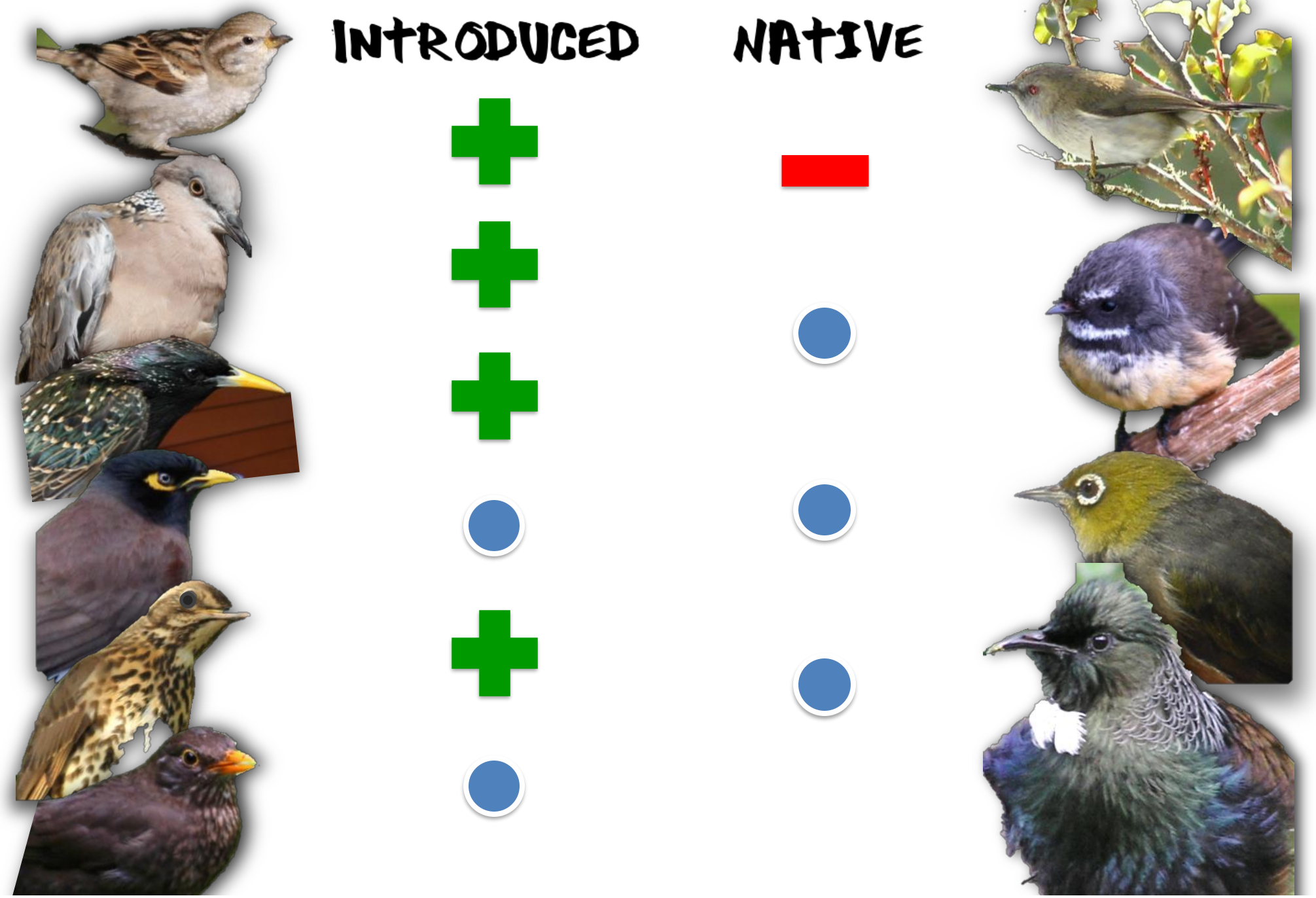
Applying non-specific wildlife gardening practices

47% New Zealanders feed birds

- **84%** feed bread
- **45%** feed seed
- **16%** feed sugar water

Galbraith et al (2014) Quantification, drivers, and risks of wild bird feeding: a multifaceted approach to understanding the consequences of a popular human pastime. *Biological Conservation* 180: 64-74

Native birds don’t eat bread & seeds!



Galbraith et al (2015) Supplementary feeding restructures urban bird communities. *PNAS* doi: 10.1073/pnas.1501489112

Encouraging people to think about local context

- No bread/seeds
- Only sugar water in winter – let birds pollinate!
- Clean, clean, clean (hot water & scrub)
- Make predator-proof

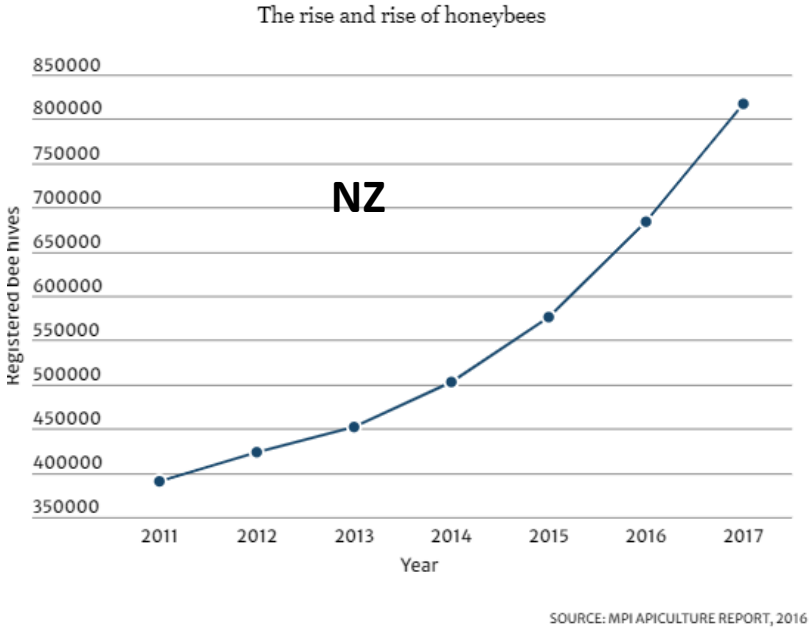
https://theconversation.com/how-to-feed-your-garden-birds-if-you-want-to-attract-and-support-native-species-195434

Recommend:

add native plants to your garden = natural food sources!

Applying non-specific wildlife gardening practices

Global 'bee crisis' - is it global?



Native bees - small, solitary and under threat

Nikki Macdonald - Canon Short-form Feature Writer of the Year - 05:00, Feb 17 2018

ANNA KOKENY

at Whangarei Heads.

- **Honeybees:**
- Outcompete native bees (28 spp.)
- Disrupt pollination of native plants
- 'Rob' nectar from native species (e.g. Kakabeak)
- Spread weeds by pollinating them
- People plant weedy species for honeybees

Ngaro huruhuru
Native bees

Art: Ngaire Hart

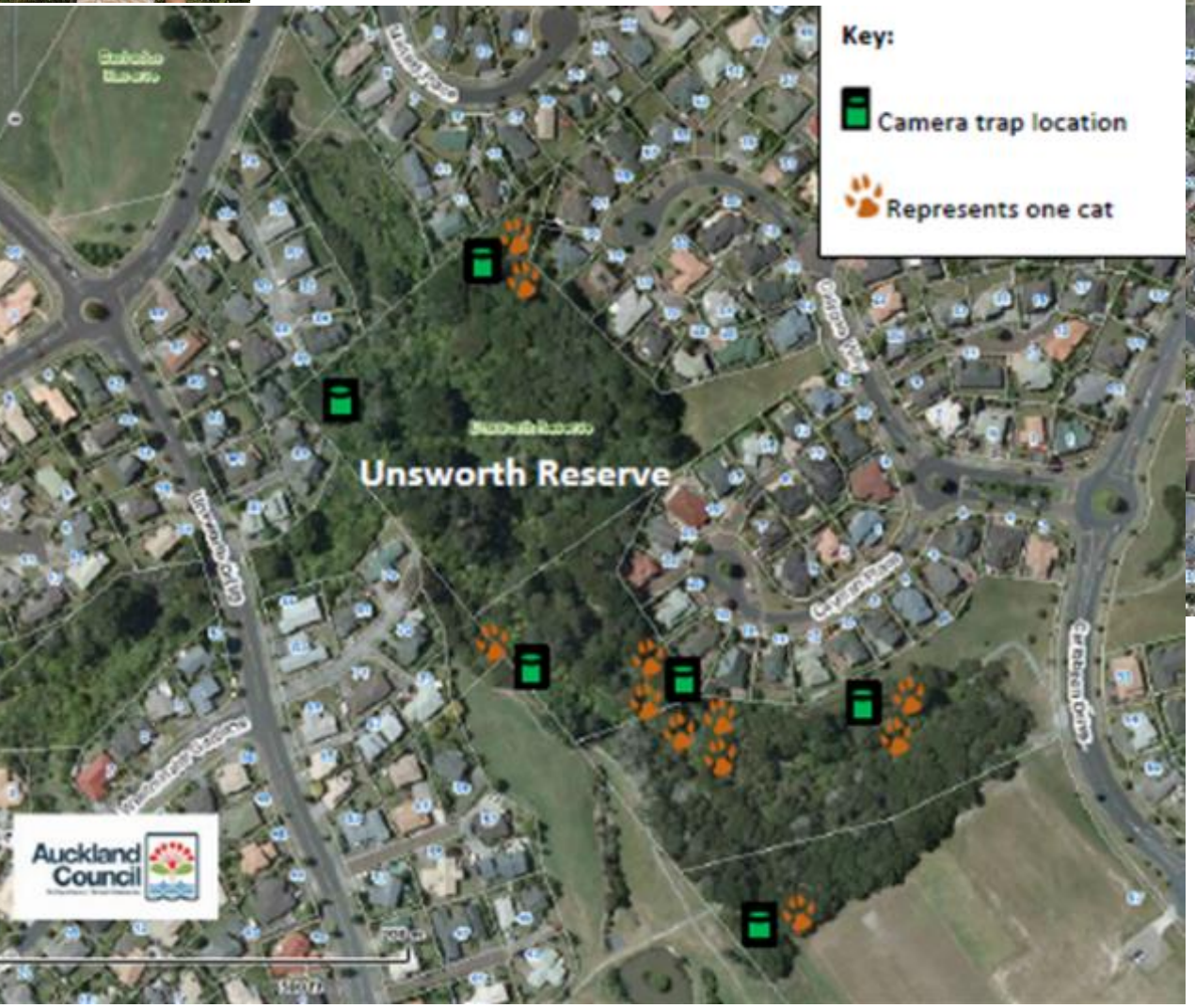
Backyards matter!

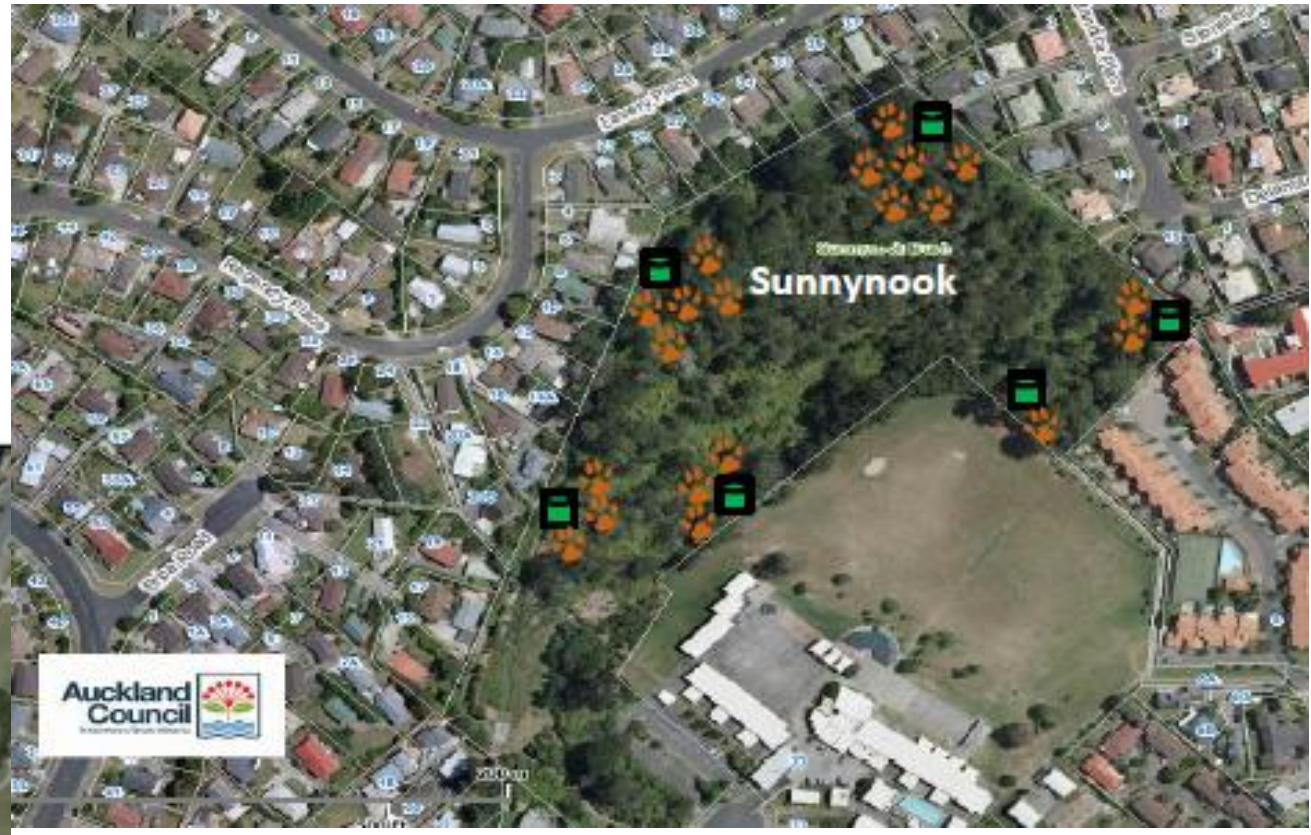
Community > individual property rights

Backyards: Connectivity to natural area

Backyards with spillover impacts: Cats

MSc student:
Sam Lincoln



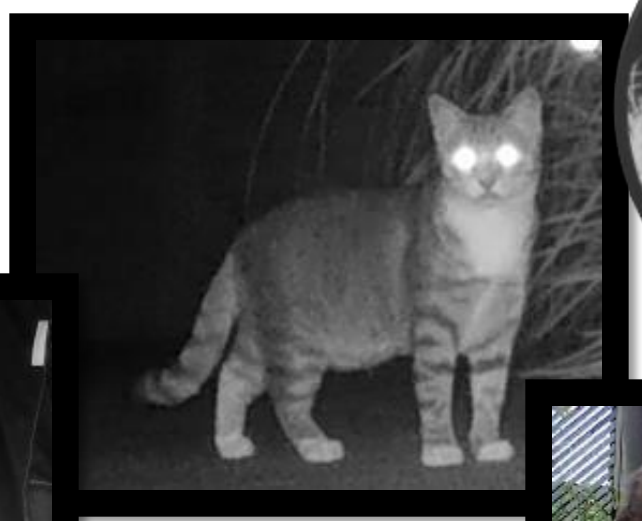


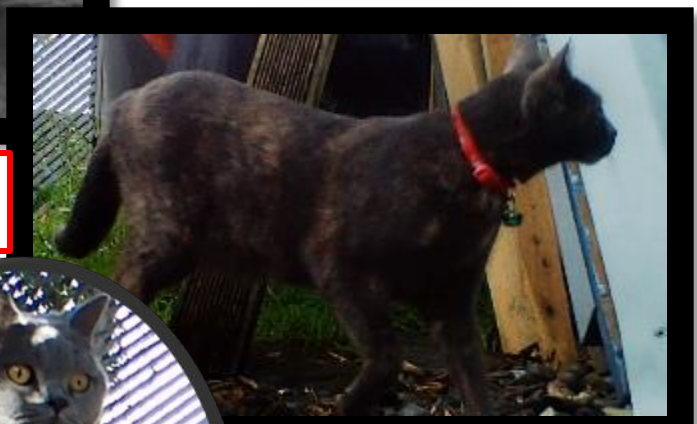
8x urban forest fragments

- **53 individual cats**

Cats visiting my (no cat) home

Suburban Saint Johns, ~500m^2 property





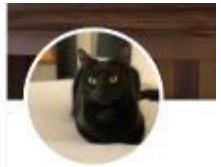
18 DIFFERENT cats in 8 months

Love your cat….keep it inside

Fenced in felines – keeping cats and wildlife safe

JULY 20, 2020 BY KATE GUTHRIE

Barbara Clarke's cats, Sammy and Smudge enjoy a fantastic view over the Pukawa bush reserve from their favourite sunspot on the deck. But because they're indoor cats that's as close as they get to the rich birdlife and insect life in the adjacent forest.



Bernard Of K Road
@BernardOfKRoad

https://predatorfreenz.org/stories/indoor-cats-pukawa/

Fewer vet bills

= safe from traffic

= safe from cat fights

No fleas!

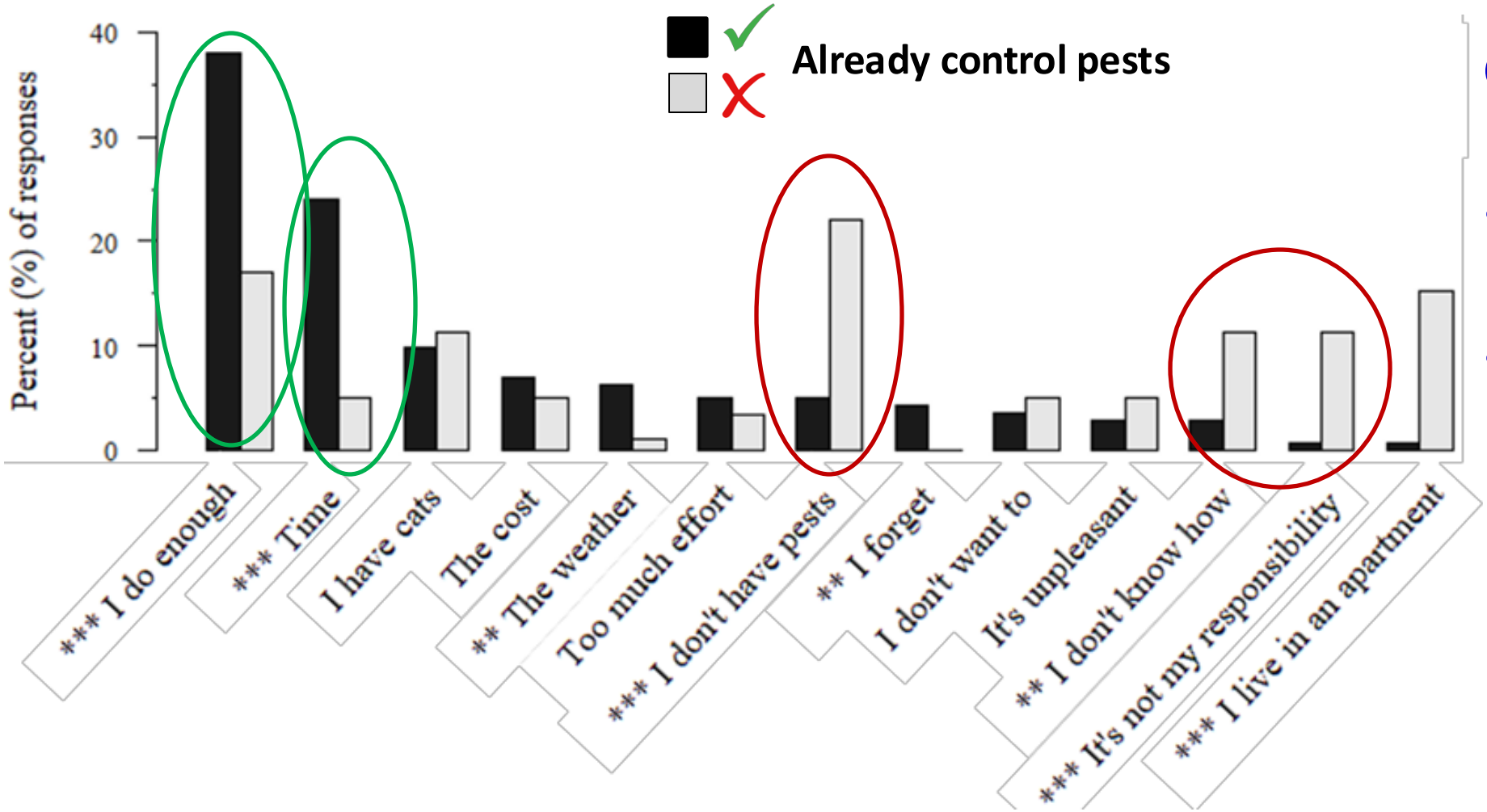
Backyard rats!

When you do **rat** control in your backyard =

- Get more native birds
- Higher nest success – chicks survive!

Gerolemou et al (2024). Outcomes of community-led urban rat control on avifauna. *Biological Invasions* **26**, 3639–3655 https://doi.org/10.1007/s10530-024-03401-7

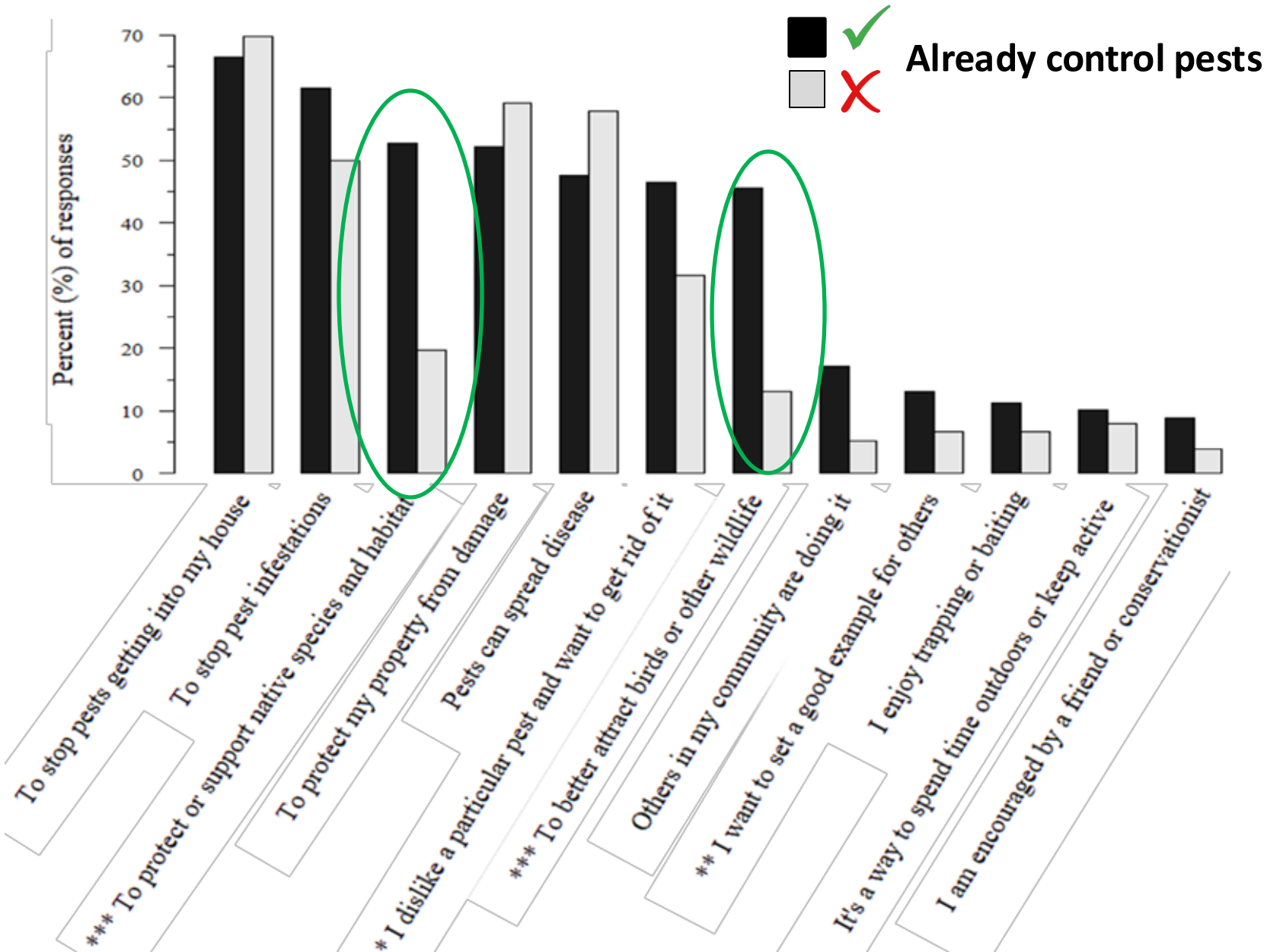
What are barriers to you controlling pests?



General population:

- Pests not visible?
- Not my job

What would motivate you to control pests?

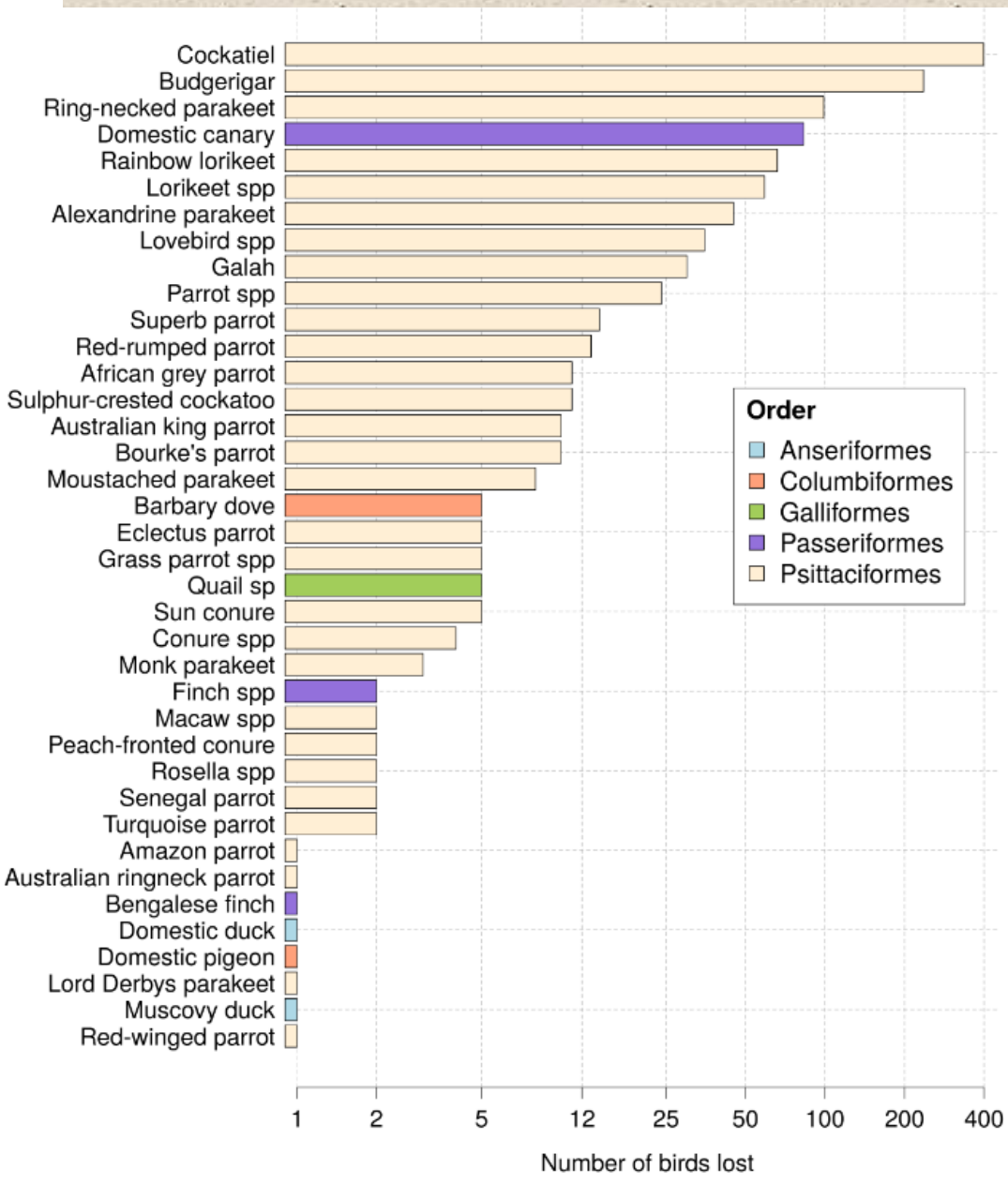


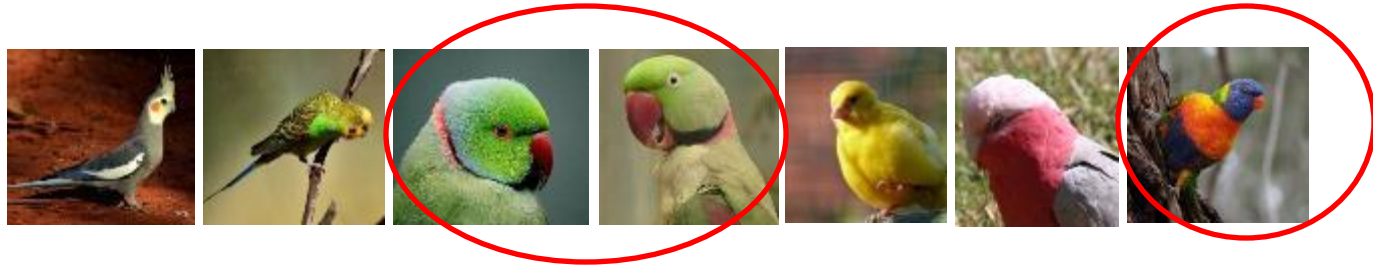
General population motivated by:

Self-interest
(e.g. property damage)

NOT for biodiversity reasons

The next wave…invasive parrots



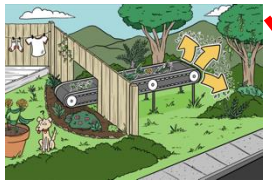


>80% prob. of a male-female pair at large in the same local board area at any given time

Stanley et al. (2023). Cumulative propagule pressure exerted by escaped parrots. *Journal of Applied Ecology*

Backyards as gateways for invasive weeds

30 000 introduced species



20/yr

~2158 native plant species

>2600 wild introduced plant species

386+ environmental weeds

58% environmental weeds originally ornamental plants

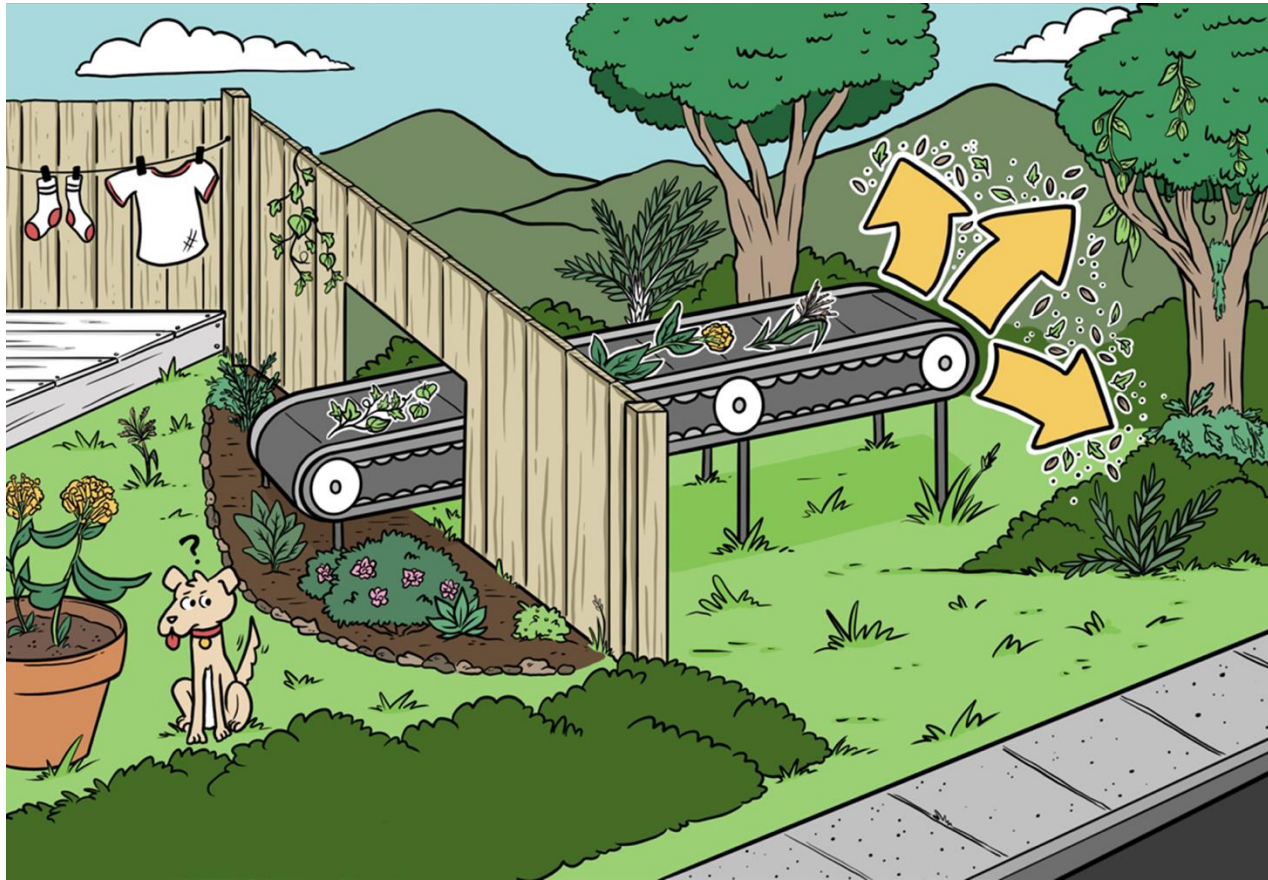


Photo: Robyn Simcock

Native plants need better PR!

Co-benefits of using native plant species =
+ biodiversity: native invertebrates + fungi + lichens...
+ cultural significance

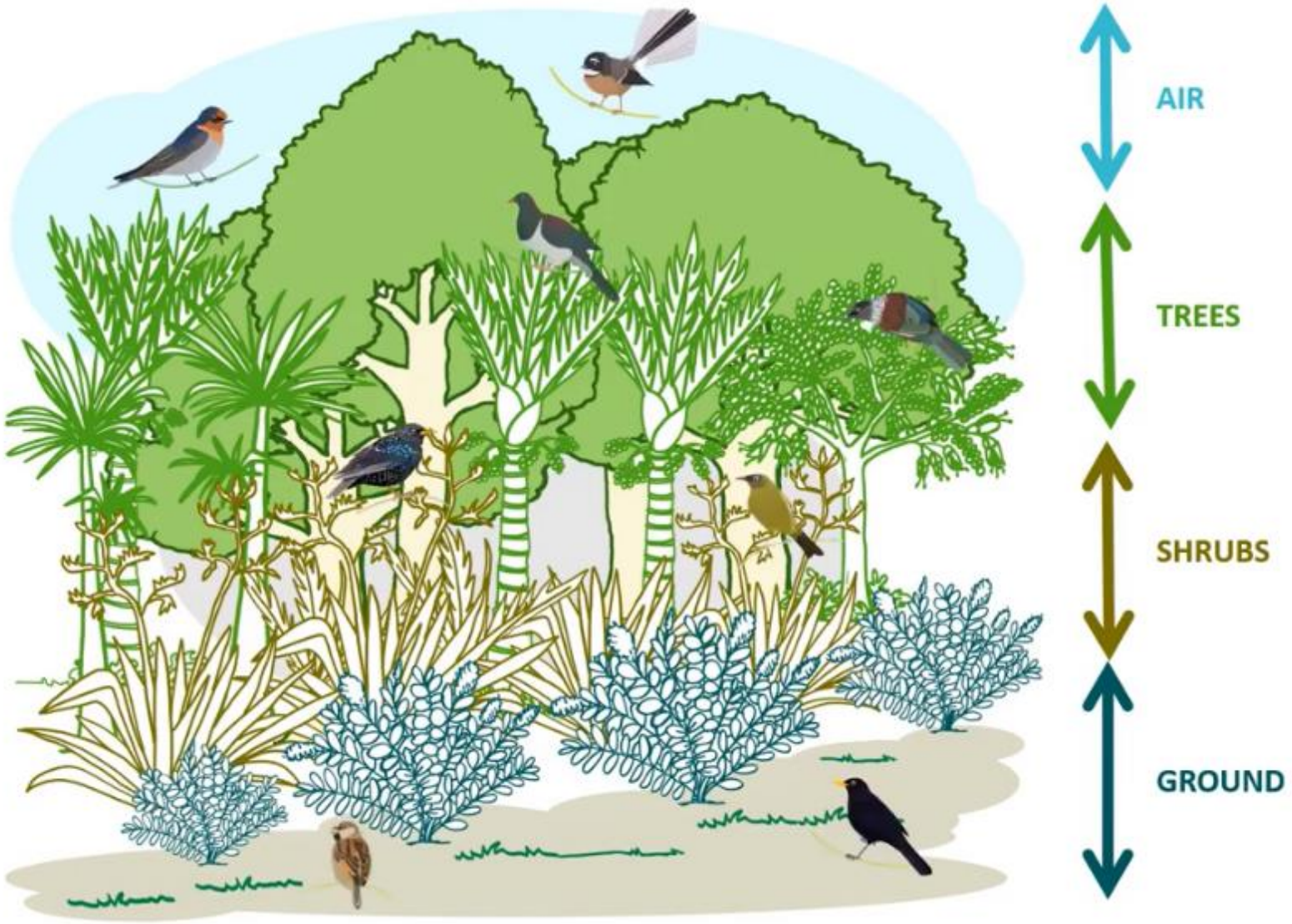
Reconnecting people with nature: Perverse outcomes

Extra pressures on green spaces: maintenance (tidy & open!)

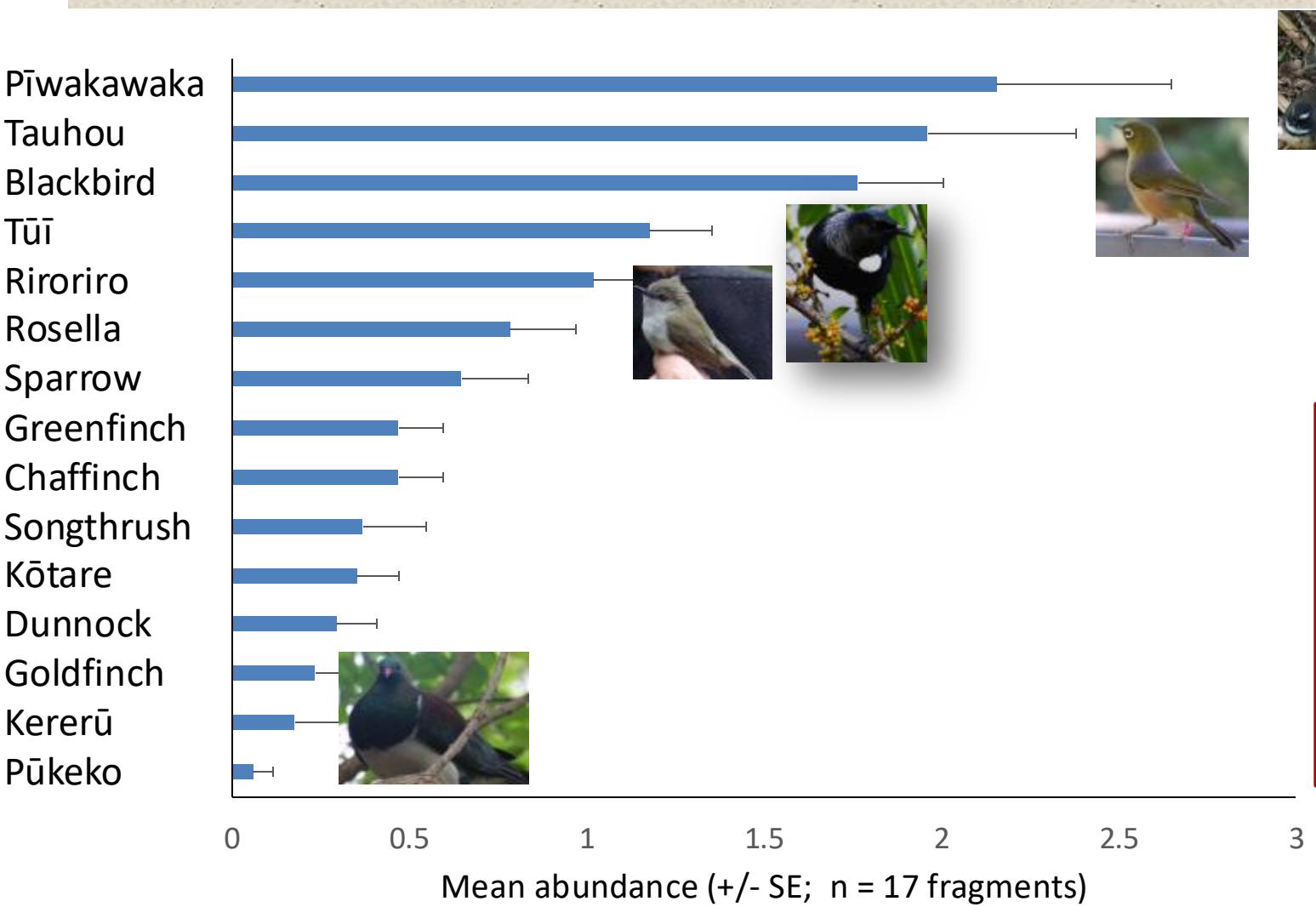
Crime Prevention Through Environmental Design (CPTED)

Stanley et al (2015) Emerging threats in urban ecosystems: a horizon scanning exercise. *Frontiers in Ecology & Environment* 13(10), 553-560.

Focus on habitat: we need complex vegetation!



Birds in urban Auckland bush patches



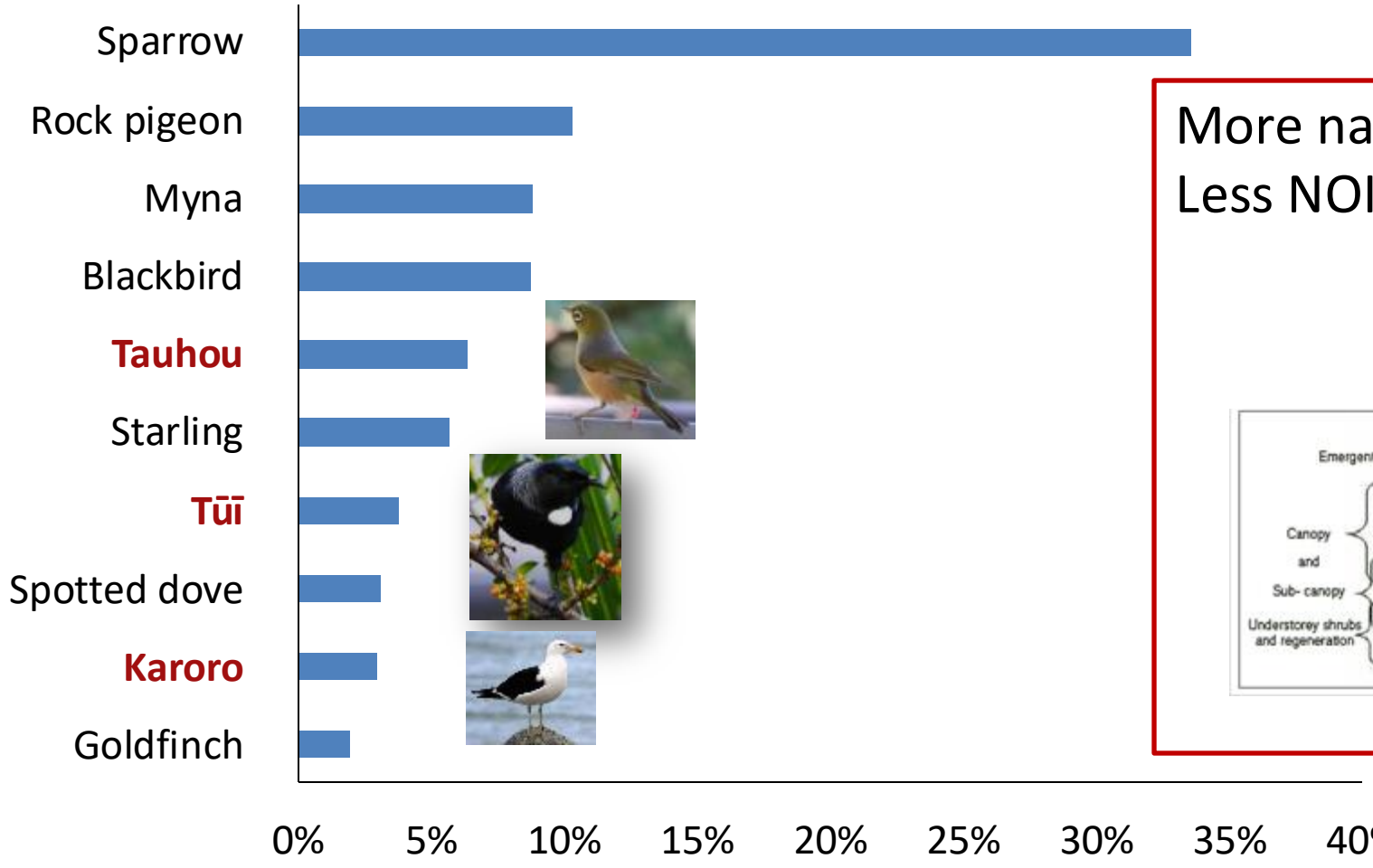
MSc student:
Sam Heggie-Gracie

Less NOISE + human density

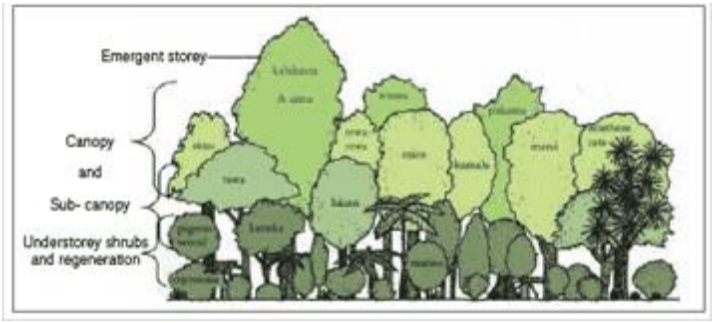
= more native birds

Heggie-Gracie et al. (2020). Urban divide: predictors of bird communities in forest fragments and the surrounding urban matrix. *Emu: Urban Birds Special Issue* 120: 333-342

What birds are in the urban matrix?

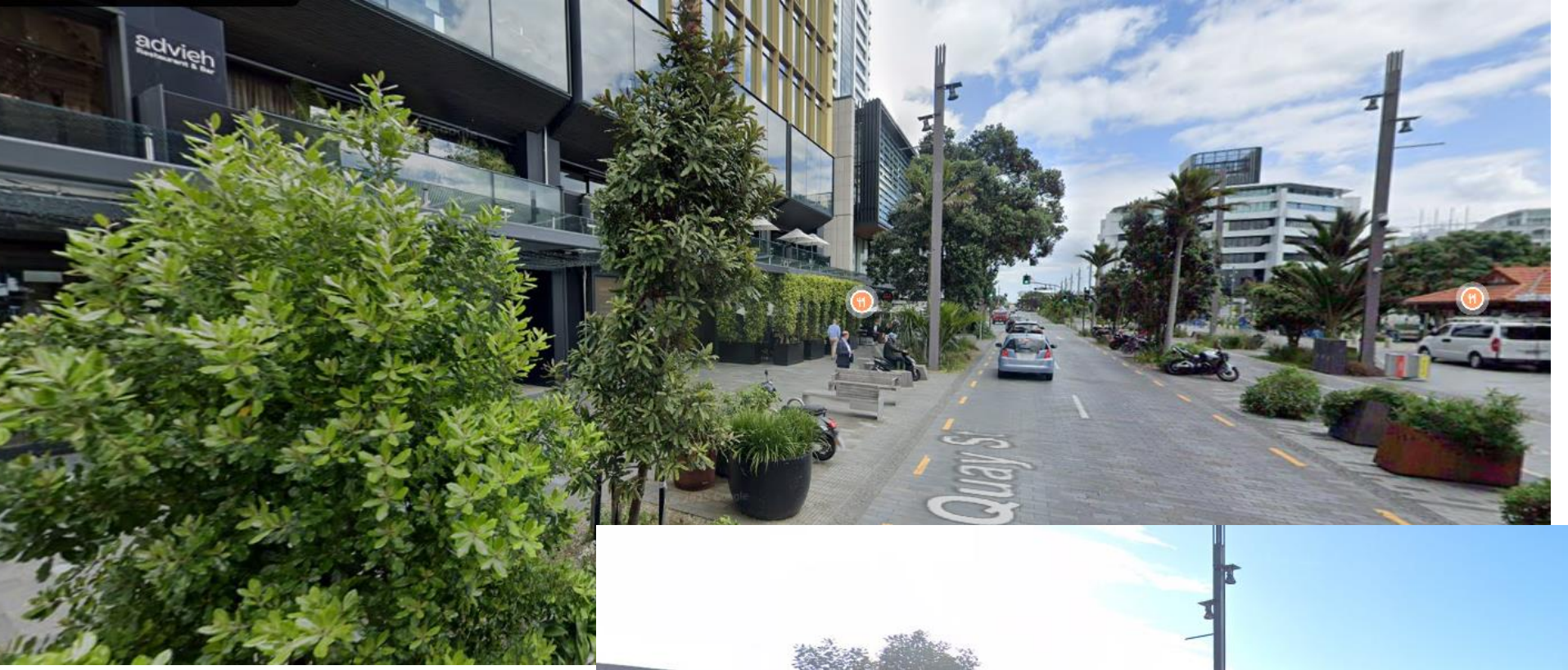


More native birds =
Less NOISE + more trees & <u>SHRUBS</u>



Heggie-Gracie et al. (2020). Urban divide: predictors of bird communities in forest fragments and the surrounding urban matrix. *Emu: Urban Birds Special Issue* 120: 333-342

Where’s the shrub layer?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BUS
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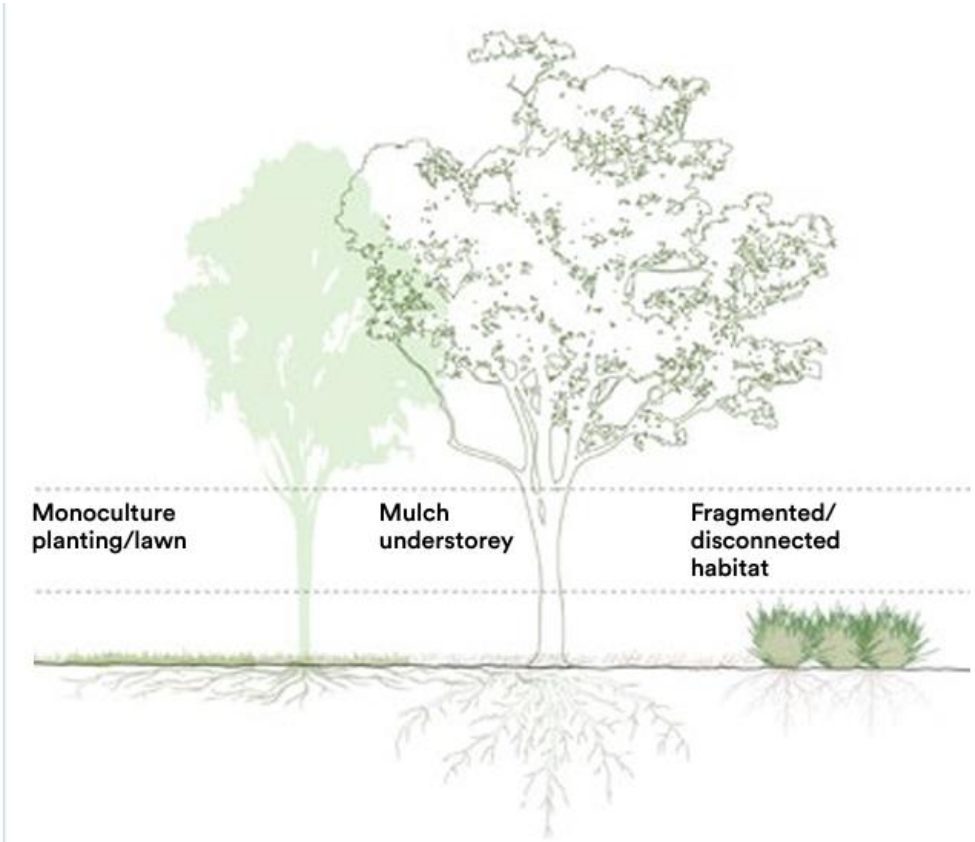
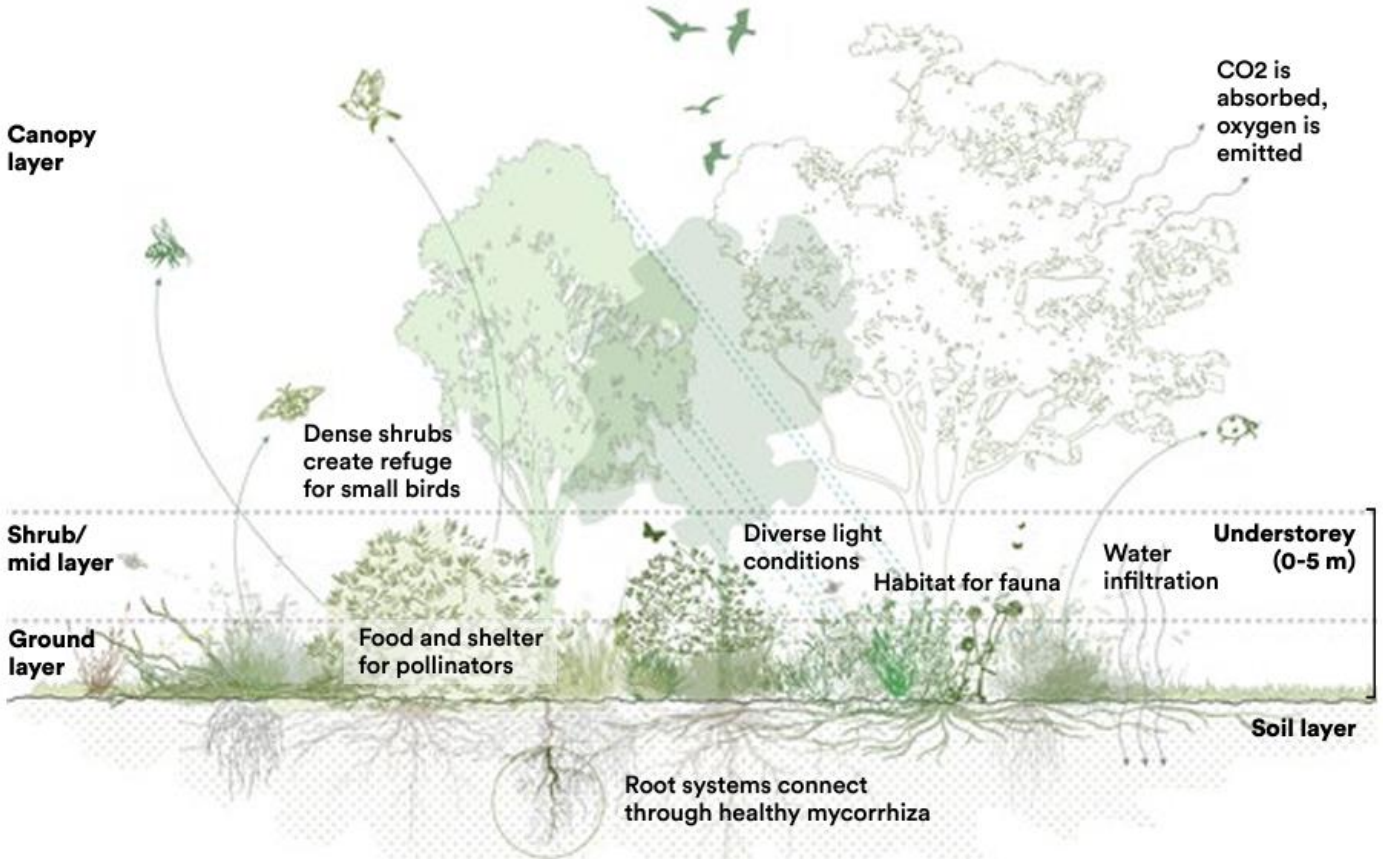
Business as Usual



Biodiversity in Place



Moving away from business as usual

These are examples of projects underway that are already working towards building biodiversity in our urban environments, primarily working with existing spaces.

Replacing failed monocultural plantings
Sydney Metro planting trials.
Images: Hassell

Revitalising leftover spaces in Centennial Park
Centennial Park Cultural Garden.
Images: Brett Boardman for Arcadia

Retrofitting a street and introducing planting for biodiversity
Clowes Street, Melbourne.
Images: City of Melbourne

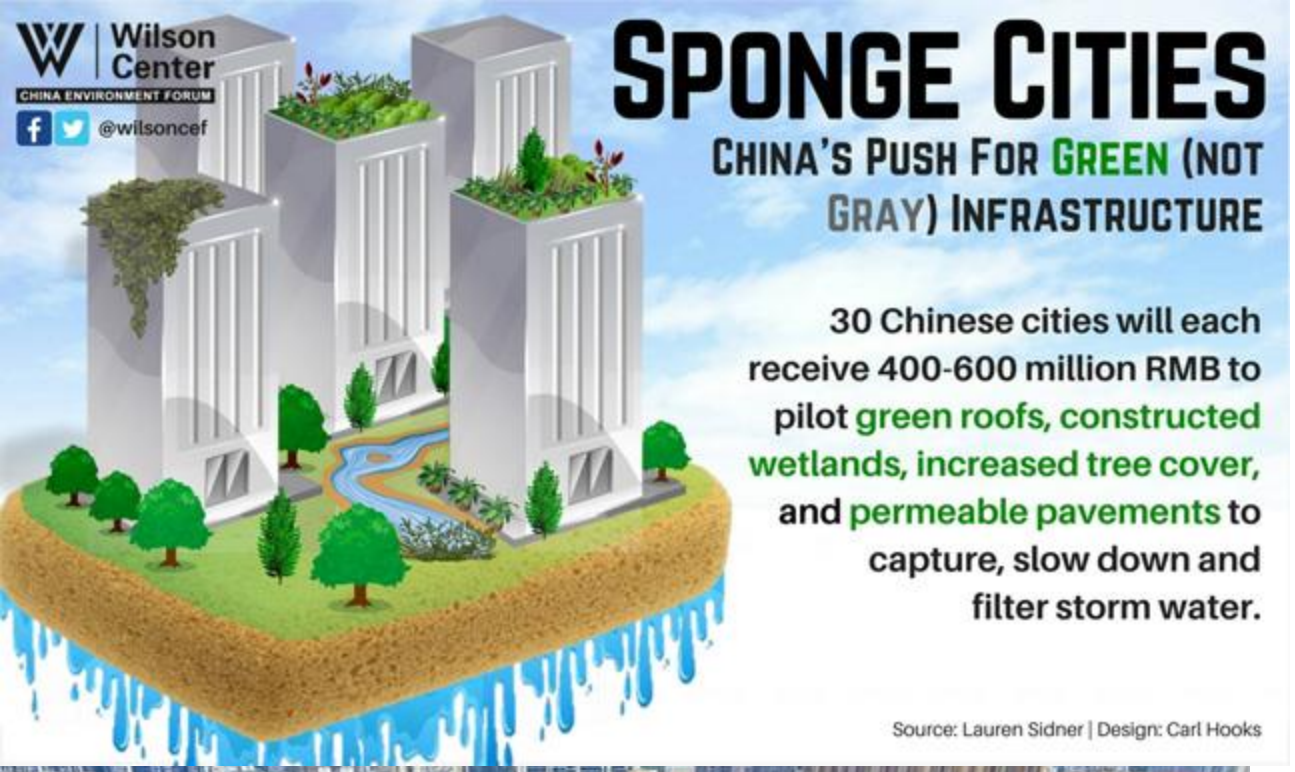
Can urban greening help make cities more resilient to the ongoing impacts of extreme events?

Published online: February 2023

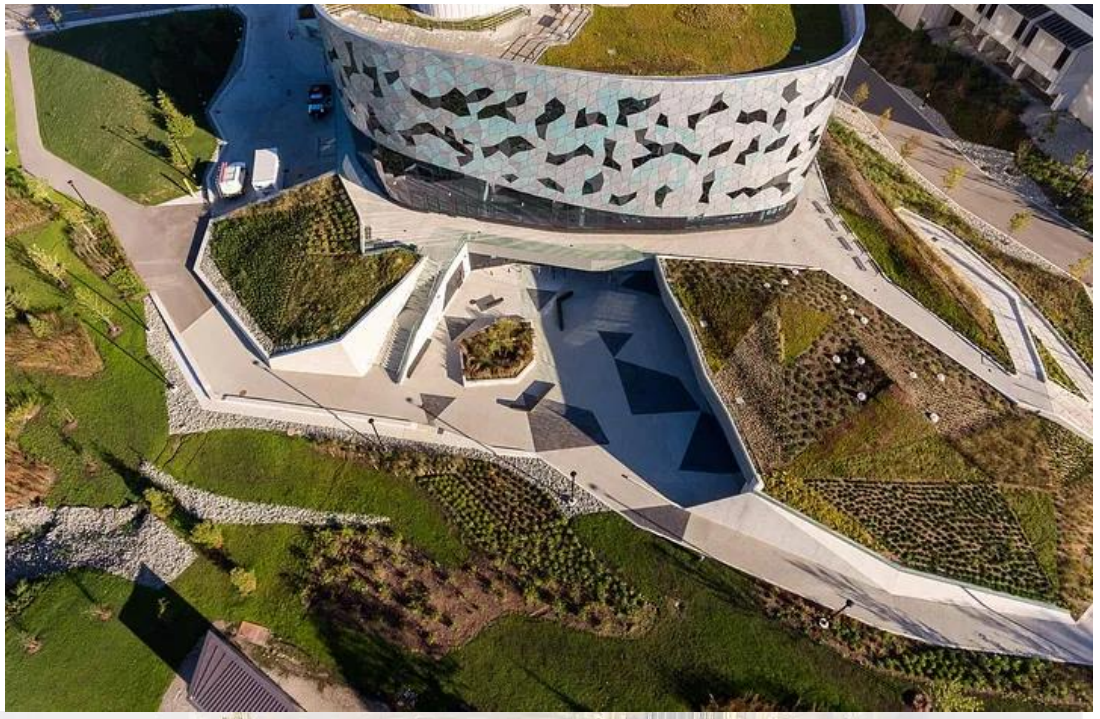
Synthesis by: Prof. Margaret Stanley, School of Biological Sciences, Waipapa Taumata Rau/University of Auckland (mc.stanley @ auckland.ac.nz, Twitter: @mc_stanley1)

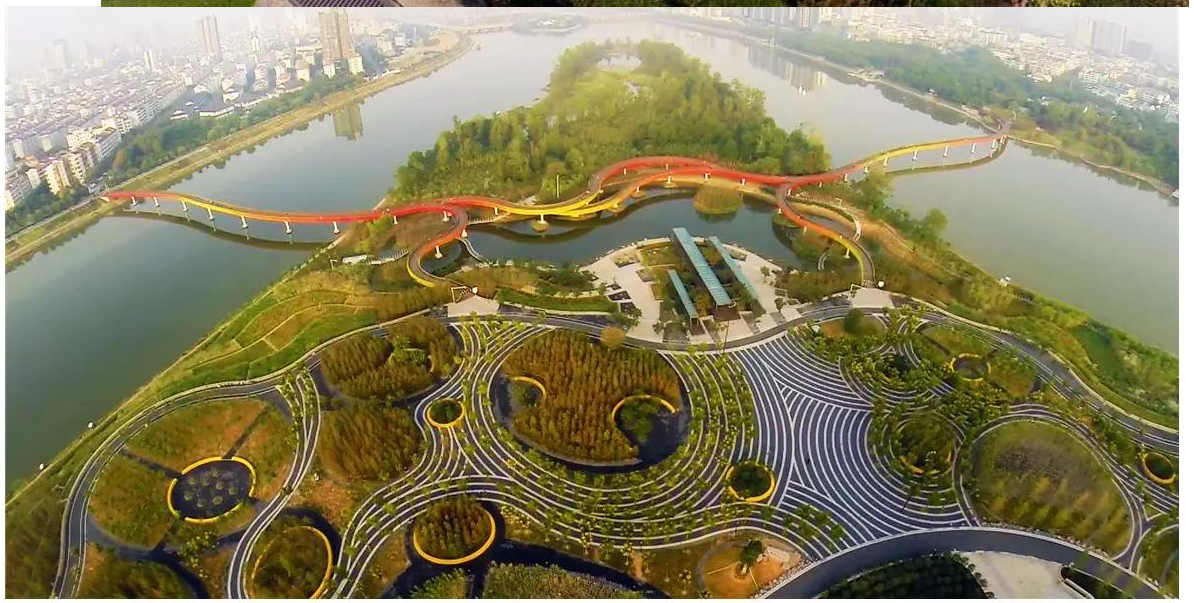
https://newzealandecology.org/can-urban-greening-help-make-cities-more-resilient-ongoing-impacts-extreme-events

https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/Documents/blue-green-networks.pdf



In 2016 Toronto became the first city in North America to mandate green roofs on all new construction.

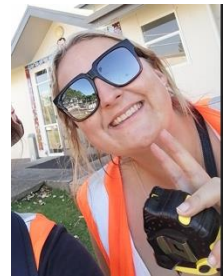




Opportunities: multifunctional spaces - playgrounds

Opportunities: multifunctional spaces - schools

MSc: Abi Cunninghame



Surveyed 64 Auckland primary schools

Cunninghame & Stanley (2024). Vegetation complexity and greenspace diversity in urban schools. *Urban Forestry & Urban Greening 101:* 128544 https://doi.org/10.1016/j.ufug.2024.128544

Opportunities: multifunctional spaces - schools

MSc: Abi Cunninghame

- Dominated by sportsfields
- Introduced spp. > native spp.
- Pōhutukawa (monoculture?)
- Most lacked shrub layer
- 33% had environmental weeds
- 36% had a forest patch
- Every school had 1 (or more) species associated with weaving (e.g. both harakeke & tī kōuka at 83% of schools)

Cunninghame & Stanley (2024). Vegetation complexity and greenspace diversity in urban schools. *Urban Forestry & Urban Greening 101:* 128544 https://doi.org/10.1016/j.ufug.2024.128544

Opportunities: multifunctional spaces - schools

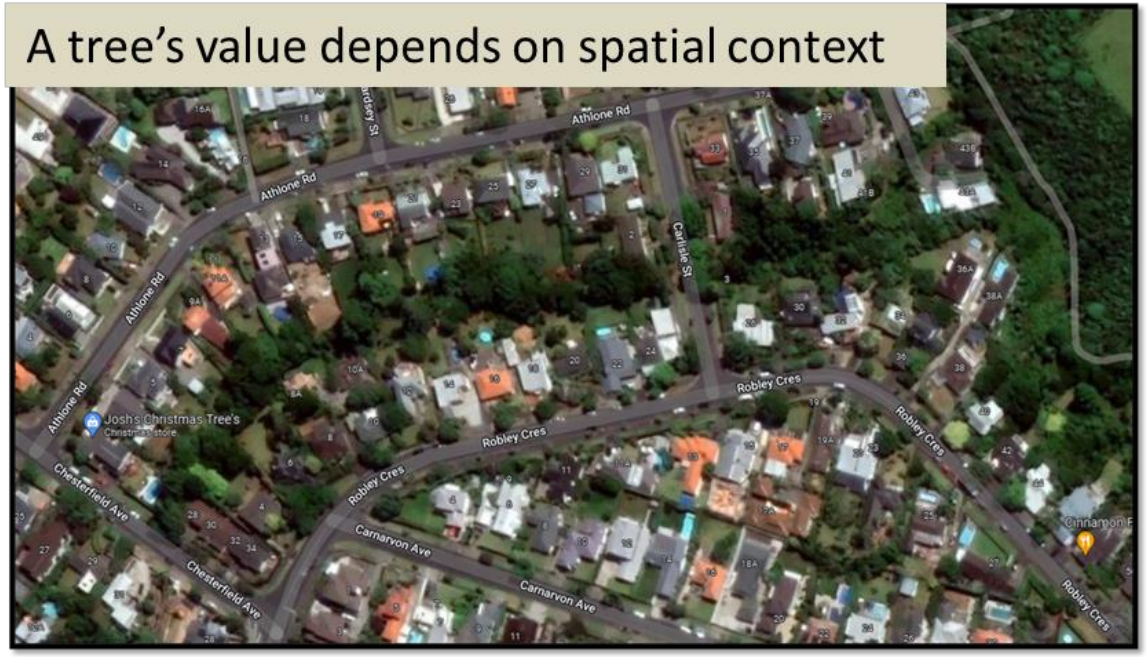
MSc: Abi Cunninghame

Cunninghame & Stanley (2024). Vegetation complexity and greenspace diversity in urban schools. *Urban Forestry & Urban Greening 101:* 128544 https://doi.org/10.1016/j.ufug.2024.128544

Opportunities: Trees to link existing habitat patches

https://www.songbird.org.nz/events-media/ecological-corridors

A tree's value depends on spatial context



Biggest Challenges: sourcing native plants

Biggest challenges: Perceptions

Winning Garden: 2018

Deficit thinking – disdvantages of trees & native trees

Not valuing ($/KPIs): biodiversity or cultural co-benefits

Stanley & Galbraith (2024). Connecting people with place-specific nature in cities reduces unintentional harm. *Environmental Research: Ecology* DOI 10.1088/2752-664X/ad3f22

Backyards = critical: how can you contribute?

Native species please!

Don't let pets (cats + birds) out!

Shield outside security lights & put on sensor

Pest control (weeds & mammals!)

Diverse & complex plantings: food & structure for insects & birds

Don't feed birds bread & seeds

Peer influence: tell everyone what you're doing!

Be a Tidy Kiwi