

# Mountain Biking

## Social and Environmental Perspectives



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- >300 publications, research on social and environmental aspects of mountain biking and other recreational activities
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Giving educators access to Indigenous cultural knowledge

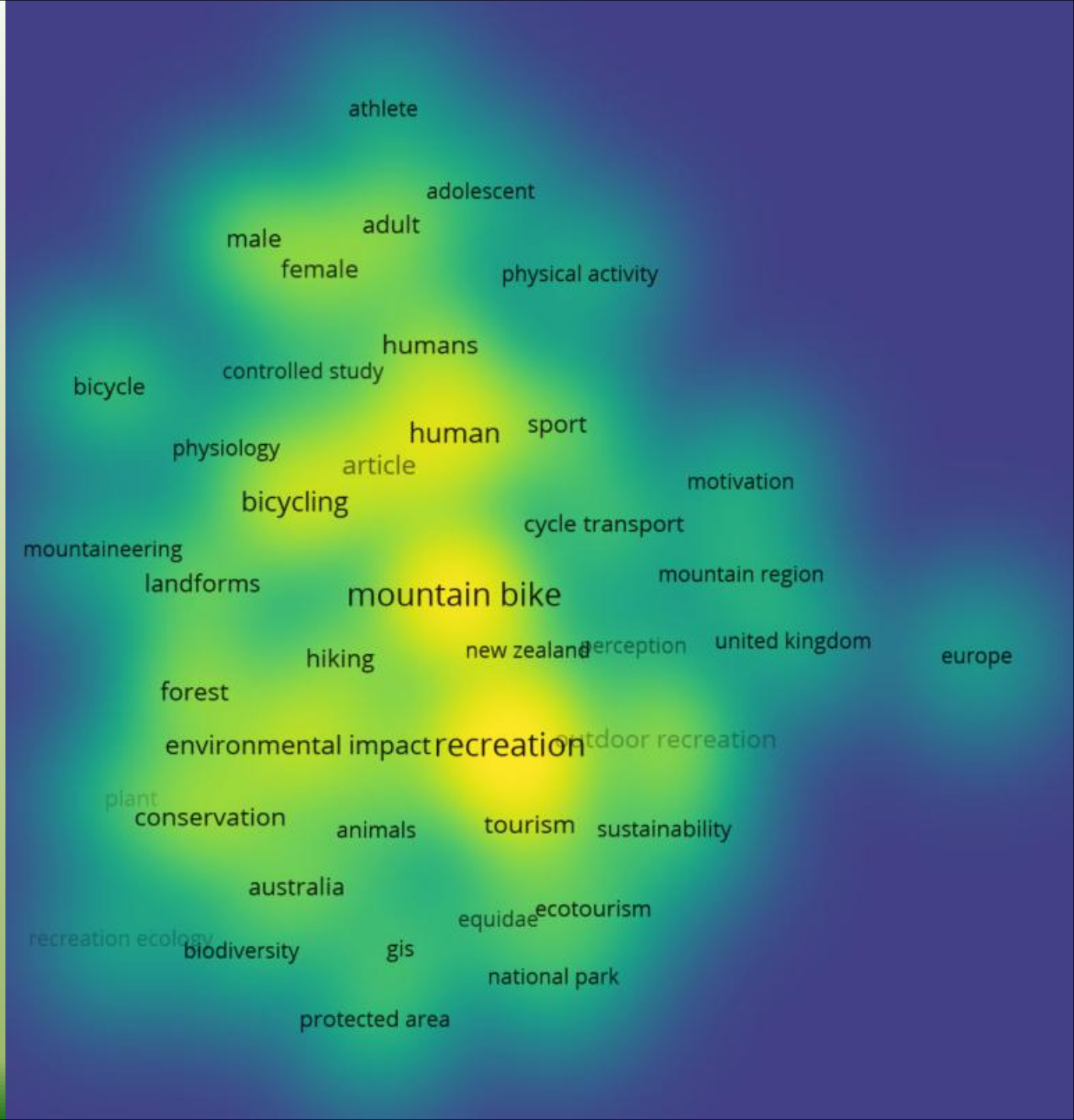


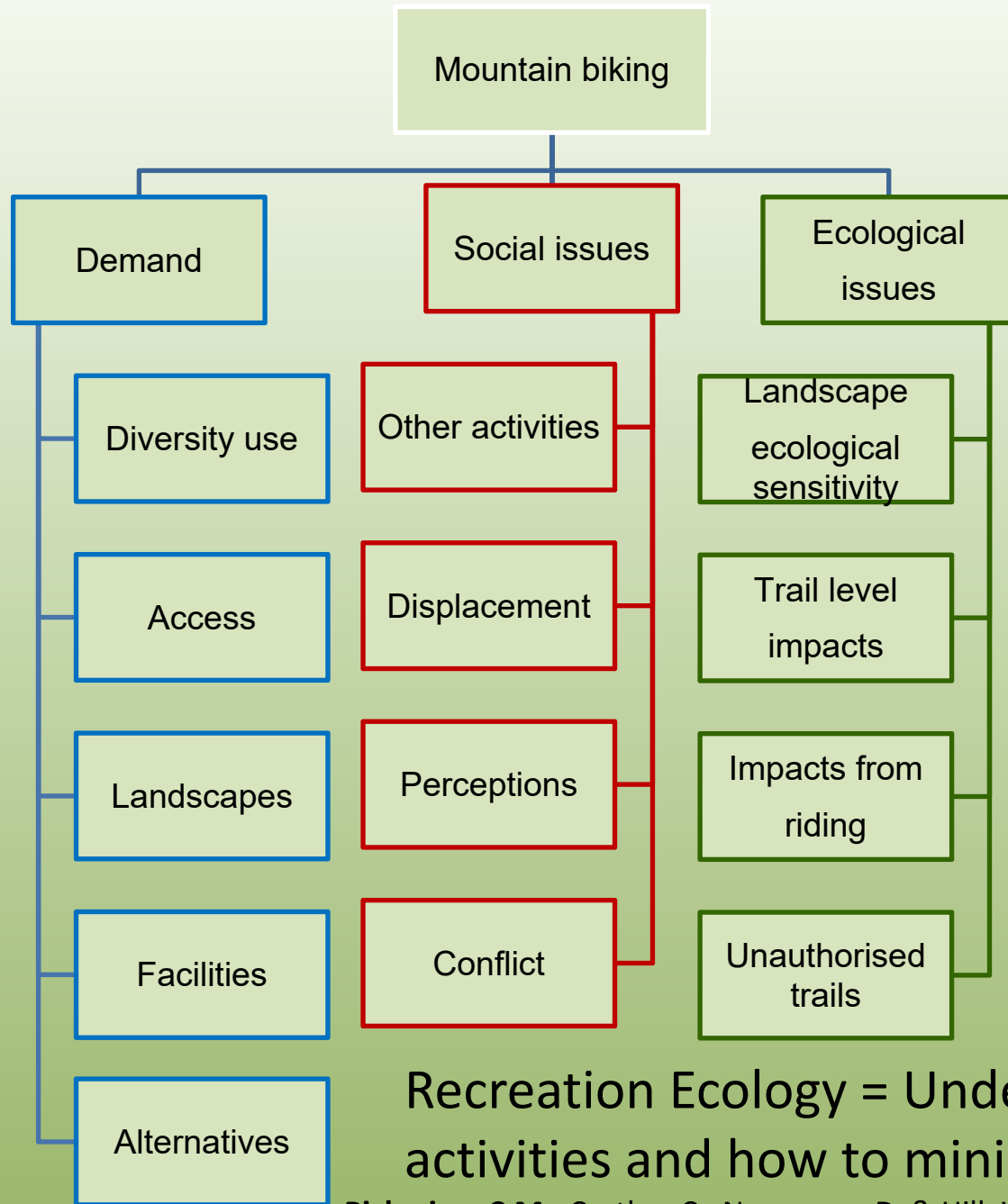
**I acknowledge the traditional custodians of the land on which we are meeting. I pay my respects to elders past, present, and emerging.**

# Why is research about mountain biking important?

- Increasing number, diversity and places people riding, different types of bikes
- Potential social conflict including perceptions about appropriateness of activities among stakeholders & land managers
- Minimising environmental impacts (recreation ecology)
- Therefore research to inform debate & decisions

(you may like some of what I say, but not other things)

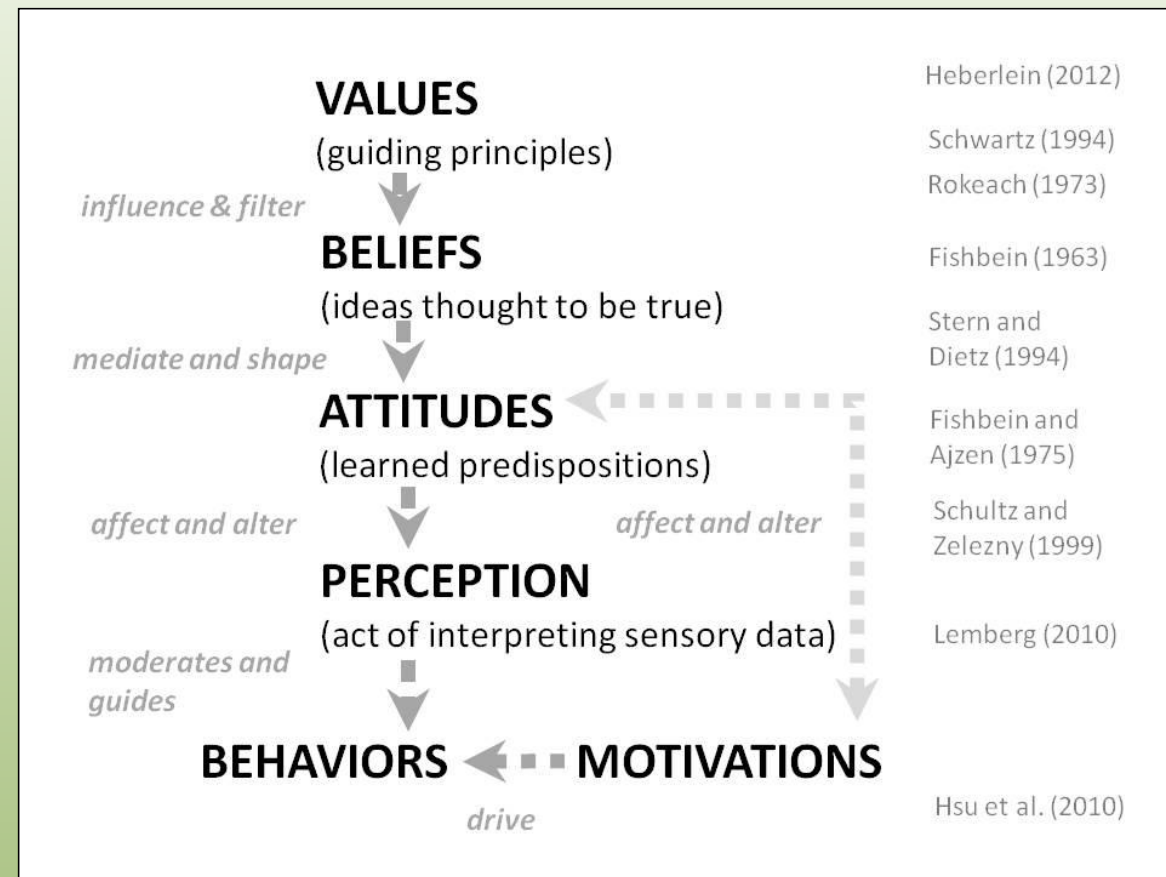




Recreation Ecology = Understanding ecological impacts of different types of activities and how to minimise them

Pickering, C.M., Castley, C., Newsome, D. & Hill, W. (2010). Environmental, safety and management issues of unauthorised trail technical features for mountain bicycling. *Landscape and Urban Planning*. 97: 58-67.

Social factors important - how people engage with nature, landscapes, activities and each other



Rossi, S. (2015). Factors affecting people-park relationships in peri-urban national parks. PhD thesis, Griffith University, Gold Coast <https://research-repository.griffith.edu.au/handle/10072/366840>

# Social research: Who, where, when, why?

## Who goes riding?

- Mostly men, often younger, and well educated

## Where do they go riding?

- Urban parks through to remote National Parks (but urban areas very popular)
- Multi-use trails, single use trails and off trail
- Also long distance touring trails, adventure racing

## What do riders want in trails?

- Can differ from hikers and runners (some bikers want longer, steeper, single track, more technical challenges, others want flat, wide easy to ride family style trails)
- Often want more trails/riding opportunities (e.g. unmet demand can result in riding where not authorised)

**Special issue of the Journal of Outdoor Tourism and Recreation on Mountain Biking:** <https://www.sciencedirect.com/journal/journal-of-outdoor-recreation-and-tourism/vol/15/suppl/C>

# Where in Australia?

Natural areas popular but particularly <2km of cities (similar to other activities)

Research across 40 National Parks in SE

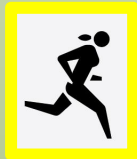
Queensland

Number of routes overall (size of icon)

Walking (blue)



Running (yellow)

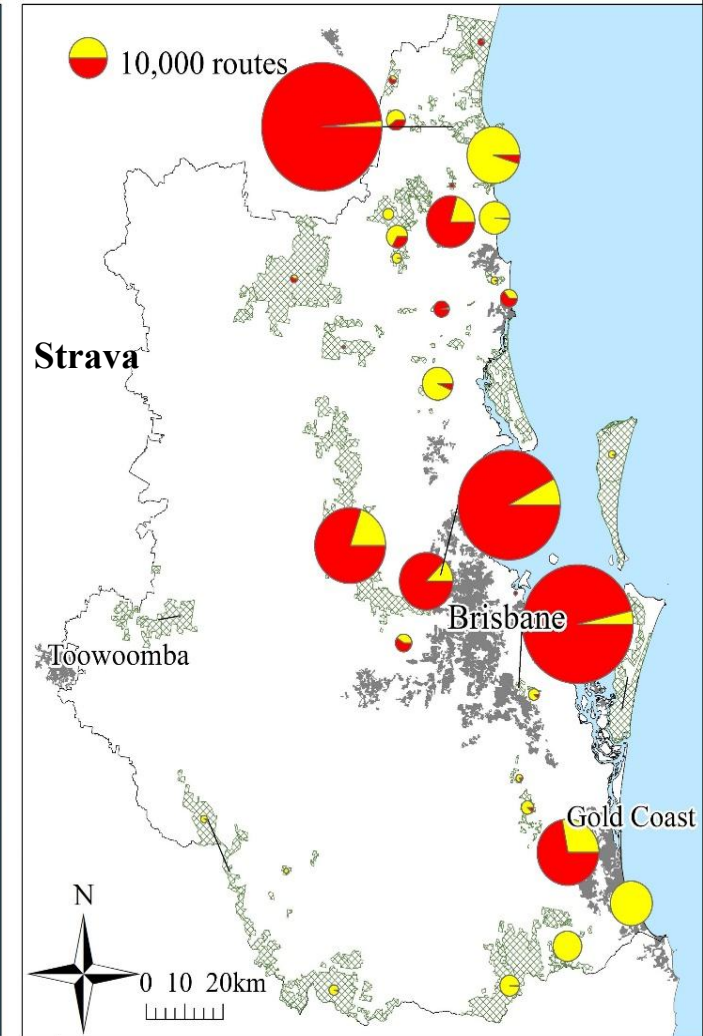
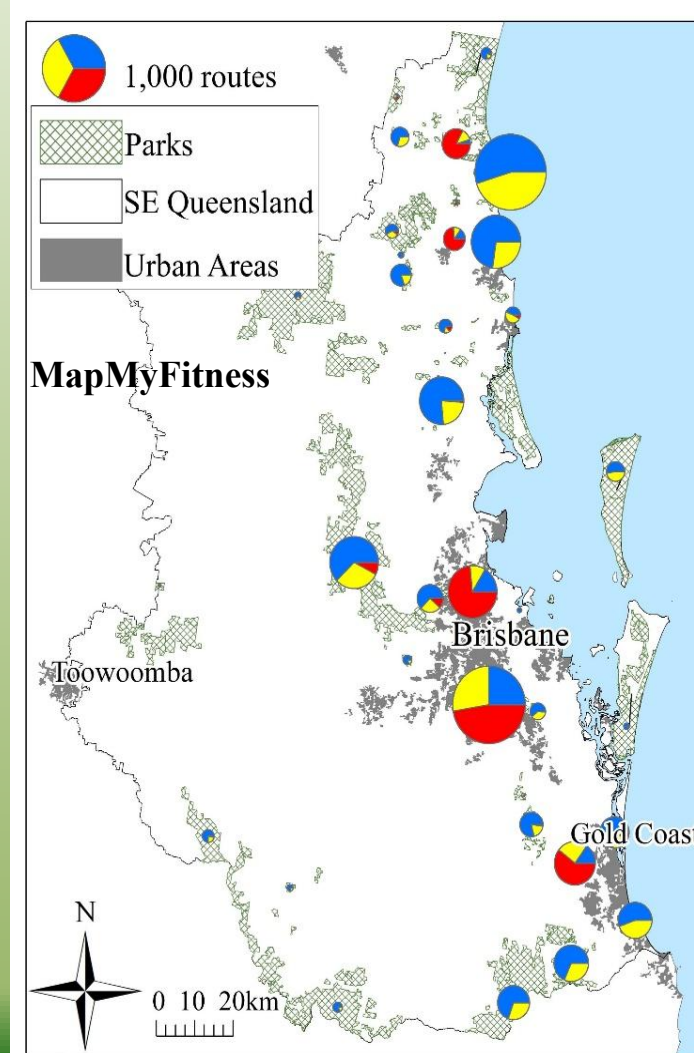


Mountain biking (red)



Norman, P. and Pickering, C.M. (2019). Factors influencing park popularity for mountain bikers, walkers and runners as indicated by social media route data.

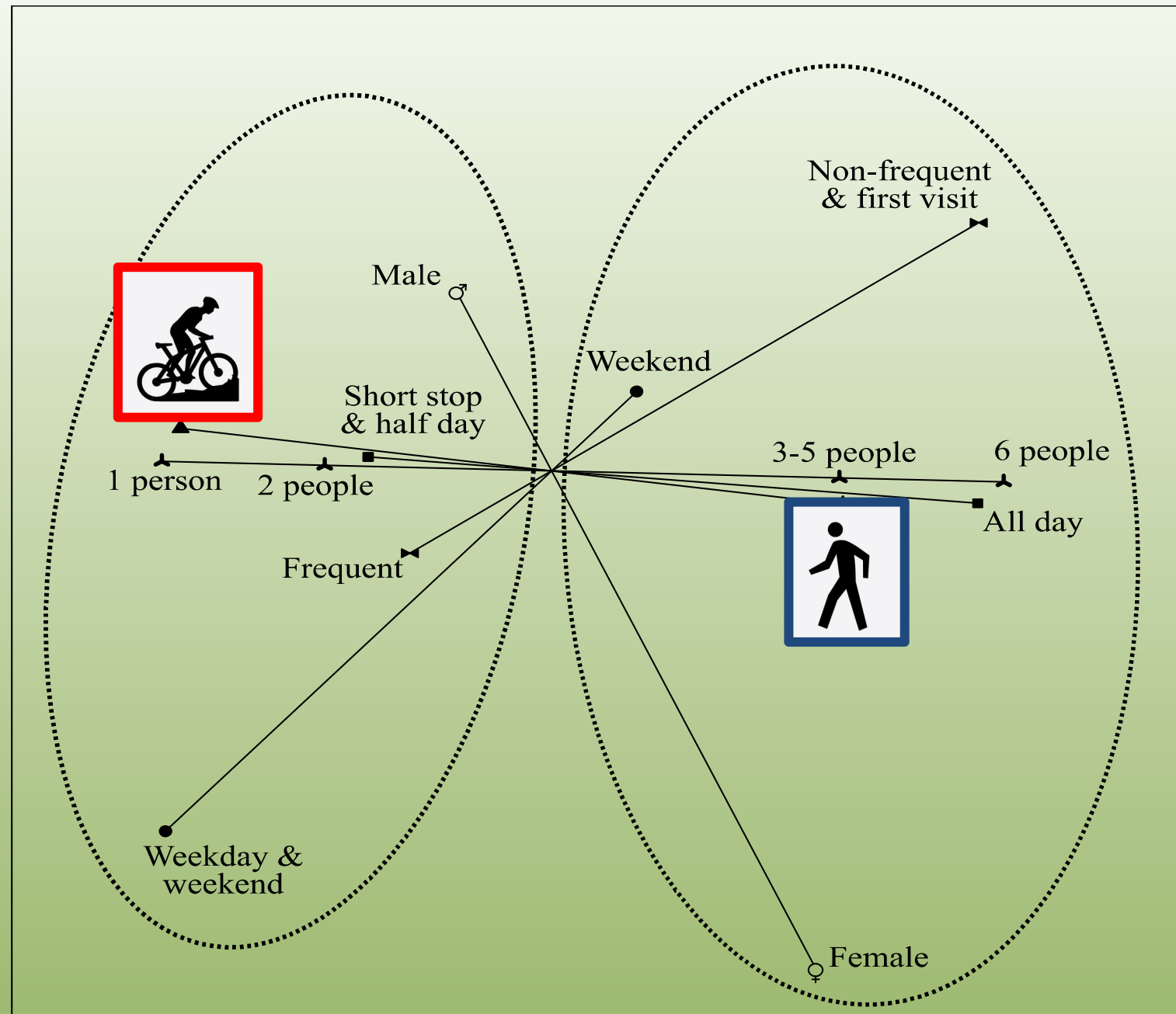
*Journal of Environmental Management.* 249: 109413



# Who goes mountain biking?

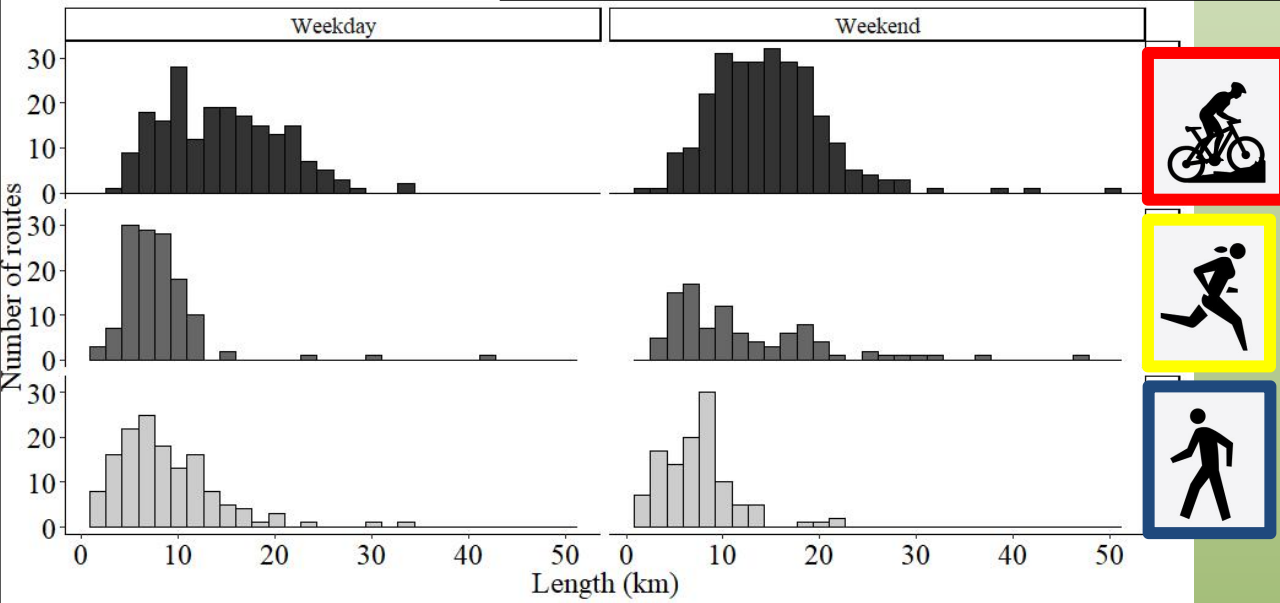
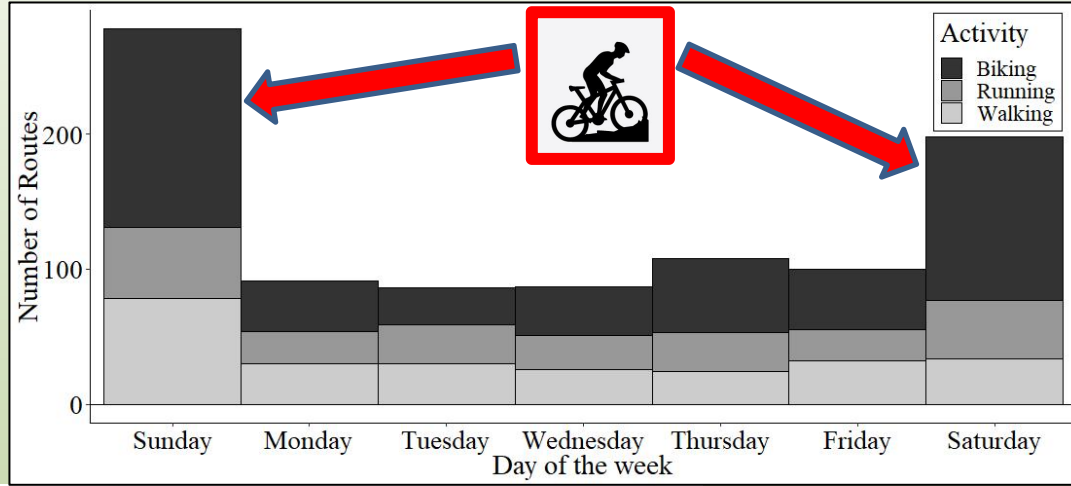
**Intercept surveys in parks in Queensland:**  
Mountain bike riders: male (83%), university educated (54%), and between 25 and 54 years old (88%), visit frequently (84%), more often smaller groups than hikers

Similar - 93% male, and 66% between 30 and 50 years old - Trailforks for 40 National Parks in Queensland, 2019-2021

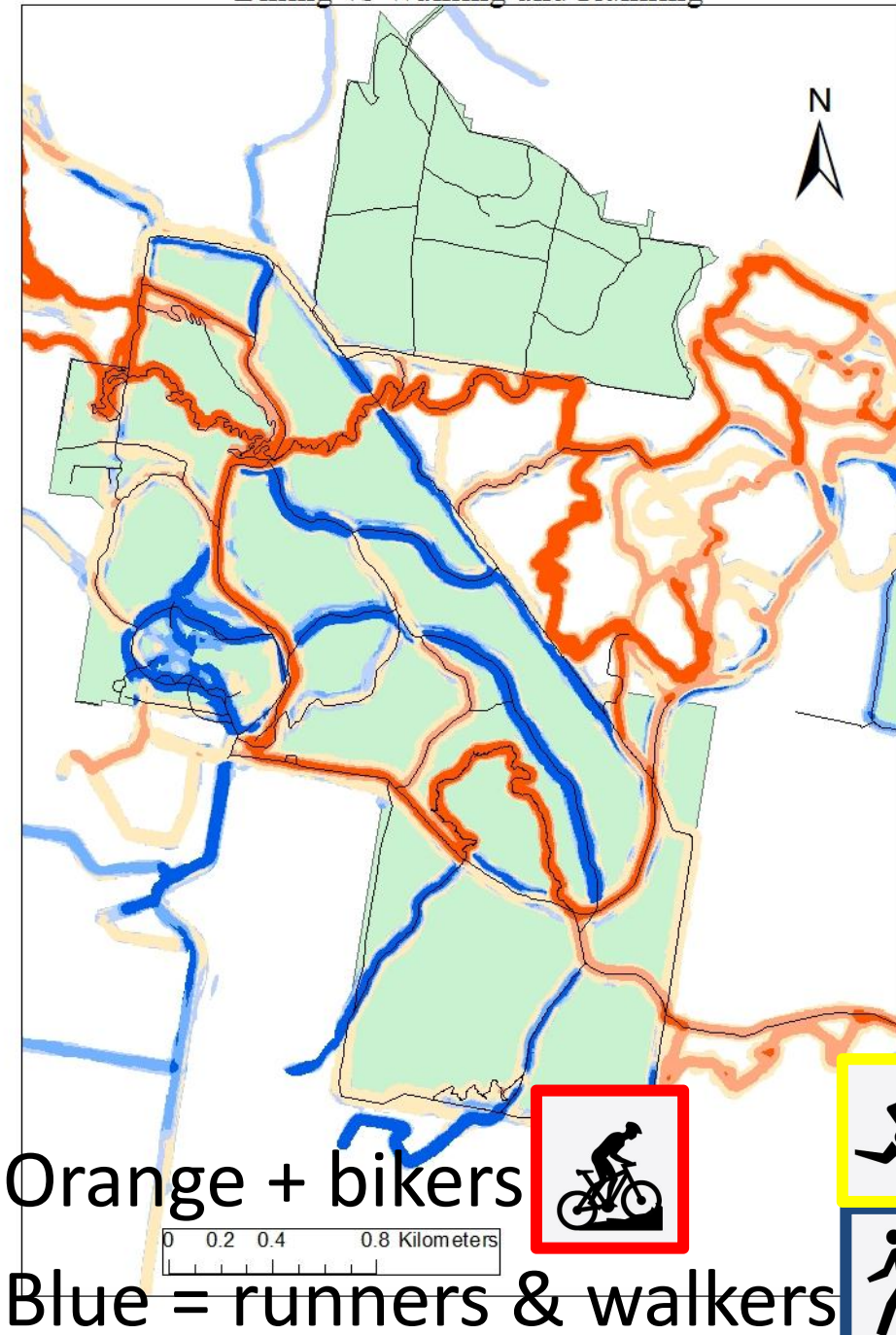


# How & when use parks differs

Three linked parks/reserves in Brisbane = Daisy Hill and others



Biking vs Walking and Running



Norman, P., Pickering, C.M., and Castley, J.G. (2019). What can volunteered geographic information tell us about the different ways mountain bikers, runners and walkers use urban reserves? *Landscape and Urban Planning*. 185: 180-190



# Differences in motivations but not perceptions or values

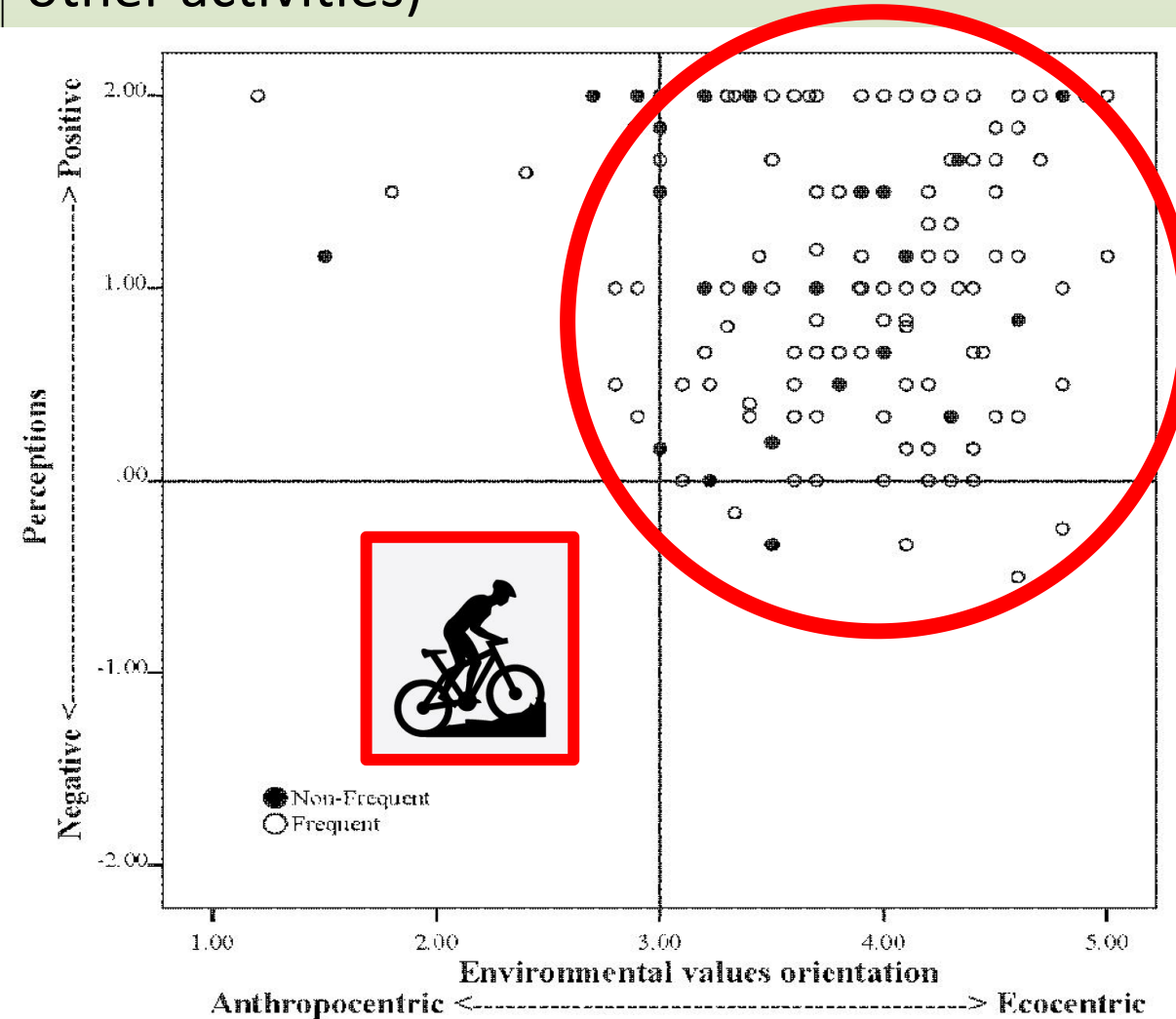


Mountain bikers

Chi Squared test:  
 \*\*  $\chi^2(1) = 10.105, p < 0.05$   
 \*  $\chi^2(4) = 6.644, p > 0.05$



Nearly all riders value nature (ecocentric)  
 Generally positive perceptions (but not some other activities)



# Trails have impacts

## On trail impacts

- Loss trees, shrubs, understory and litter
- Soil compaction/creation bogs\*
- Changes in water flow and waterways\*
- Soil erosion\*
- Increased light and wind
- Changes in wildlife behaviour

## Edge effects

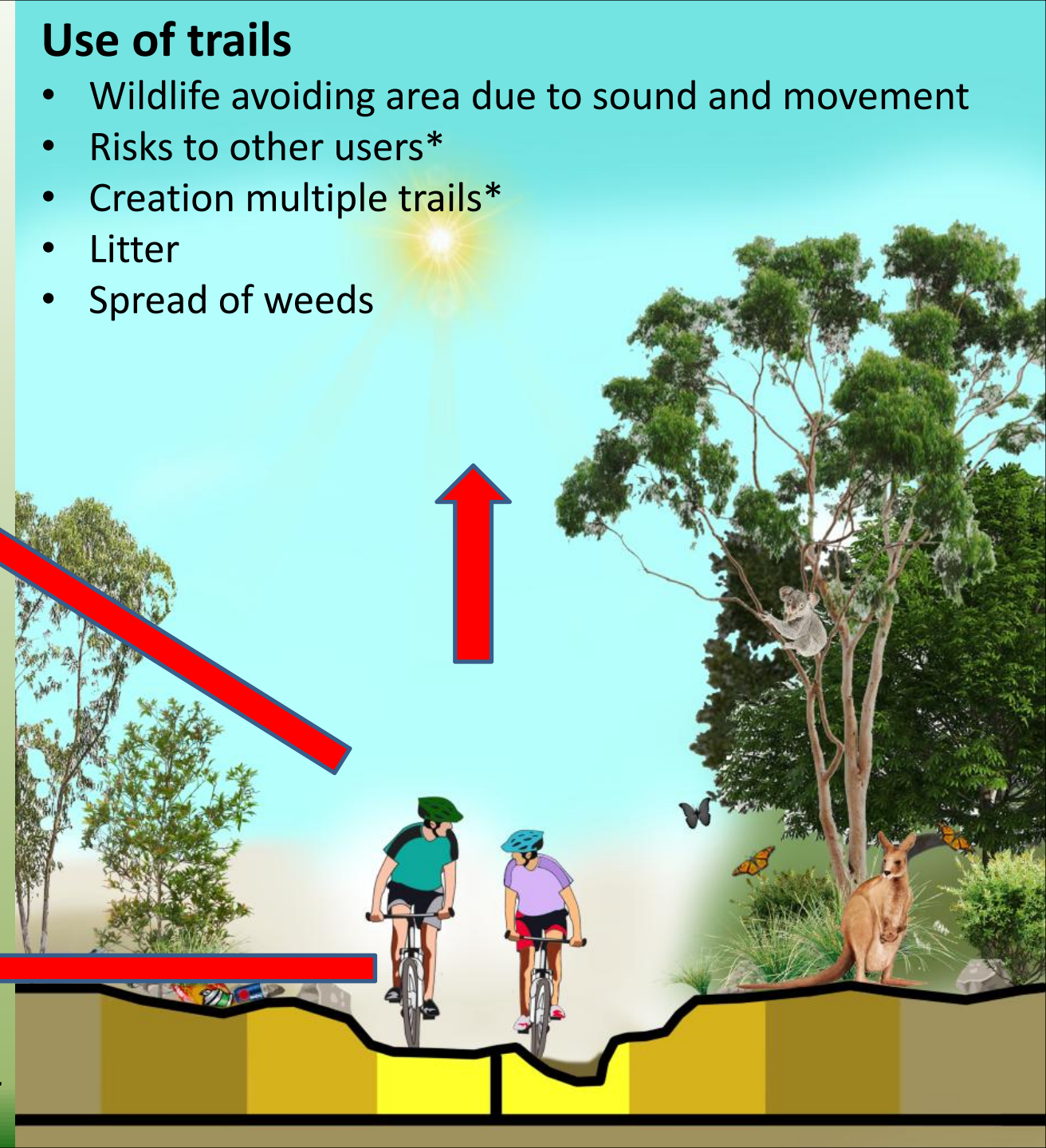
- Increase in weeds
- Loss trees, shrubs, understory and litter
- Soil compaction/creation bogs\*
- Changes in water flow and waterways\*
- Soil erosion\*
- Increased light and wind
- Changes in wildlife behaviour including avoiding area

**\* Can be reduced if well designed trails**

Pickering, C.M. (2022). Mountain bike riding and hiking can contribute to the dispersal of weed seeds. *Journal of Environmental Management*. 319, 115693. <https://doi.org/10.1016/j.jenvman.2022.115693>.

## Use of trails

- Wildlife avoiding area due to sound and movement
- Risks to other users\*
- Creation multiple trails\*
- Litter
- Spread of weeds



## Unauthorized trails and trail technical features are often poorly designed/built so:

- Often more impacts than authorised trails
- Not obtained landowners permission
- Can (unknowingly) be in high conservation value areas
- More likely subject to erosion (often steeper, no fall lines, or formal drainage)
- Often get extensive 'spaghetti' trails within small area
- Can use inappropriate materials – wood, tin, concrete, plastics etc.
- Safety issues

## Landscape level impacts

- Loss of high conservation value plant communities
- Fragmentation of forests into patches reducing habitat
- Large scale soil loss
- Changes in water flows/creeks etc from trails
- Reduce habitat for wildlife from presence and use of trails





# Relative impacts of mountain biking vs hiking



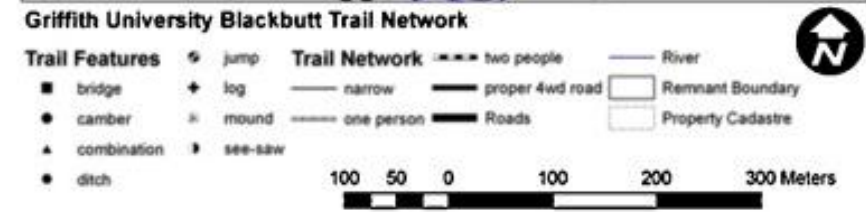
- Riding of trails: similar impacts per pass in terms of loss vegetation, soil compaction, increase in litter
- Riding on and off trails: different combination of weed seeds dispersed, but not necessarily greater numbers in total for mountain biking vs hiking
- But mountain bikers travel further so issue that more damage overall/more area impacted
- Creation of informal trails and trail technical features is a major issue with mountain biking

**Pickering, C.M.** (2022). Mountain bike riding and hiking can contribute to the dispersal of weed seeds. *Journal of Environmental Management*. 319, 115693. <https://doi.org/10.1016/j.jenvman.2022.115693>.

**Pickering, C.M., Hill, W., Newsome, D. and Leung, Y.-L.** (2010). Comparing hiking, mountain biking and horse riding impacts on vegetation and soils in Australian and the United States of America. *Journal of Environmental Management*. 91: 551-562. 10.1016/j.jenvman.2009.09.025

# Example at Griffith University, Gold Coast

In 29 ha endangered Blackbutt (*Eucalyptus pilularis*) forest - 116 trail technical features + 8.6 km of trails. This included jumps, ditches and mounds, which collectively resulted in an area of

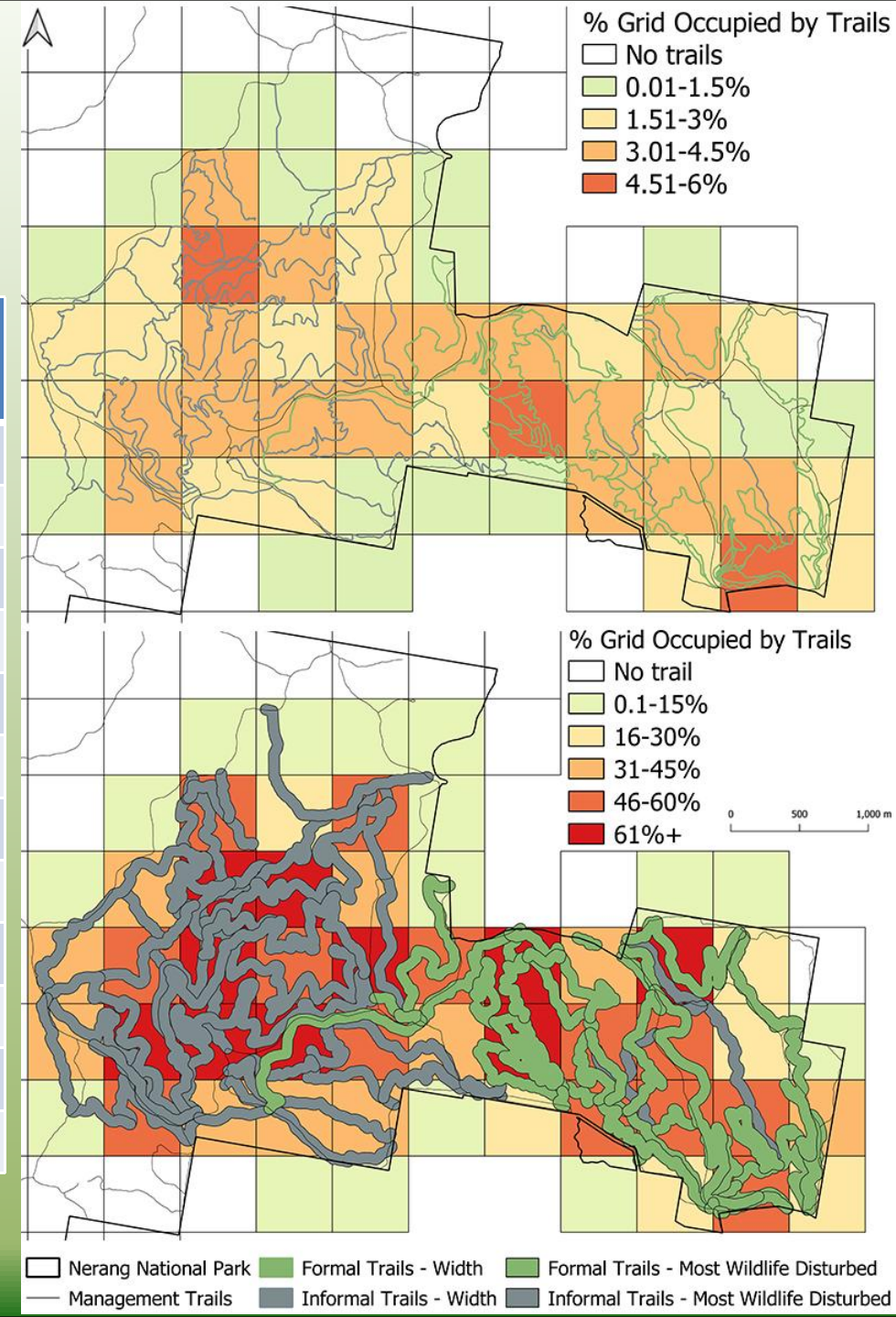


Environmental issues	Social and safety issues		Management issues
	Positive	Negative	
Loss of native vegetation either through direct clearing or via trampling	Attachment to site	Social conflict with other users	Reduced safety due to structures, their use, and risk of accidents/collisions
Soil movement and compaction, soil erosion	Recreation facilities	Reduced naturalness of site	Increased costs with maintenance, removal and rehabilitation, increased management (signs, etc.)
Pollution—noise, litter, waterways from soil etc	Local community development	Reduced safety and personal injury	Liability issues
Also informal trail networks	Fitness and experiencing nature	Deterioration of trail technical features	Manage social and environmental impacts
Spread of weeds and pathogens via bicycles, riders and construction materials		Lack of appropriate planning	Communicate with stakeholders to achieve acceptable outcomes
Wildlife disturbance		Location of features on multi-use tracks	

# Nerang National Park

Table 1: Characteristics of trails in Nerang National Park, Gold Coast, Australia based on data from Trailforks, QPWS and the Queensland Government.

Characteristics	All trails	Formal	Informal
Number	71	27	44
Total length (km)	77.10	31.91	45.19
Average length per trail (km)	1.09	1.18	1.03
Maximum length (km)	4.03	3.32	4.03
Minimum length (km)	0.03	0.04	0.03
Mean average slope (degrees)	11.4	9.6	12.6
Maximum average slope (degrees)	31.4	19.8	31.4
Popularity (number routes trail)			
Total number of trail routes	9,720	8,498	1,222
Average routes per trail	211	370	53
Maximum routes on single trail	921	921	210
Minimum routes on single trail	0	26	0



Wildlife (birds) likely affected across 22% of the park by trails

# More eMT bikes

Kuwaczka, L.F., Mitterwallner, V, Audorff, V and Steinbauer, M. J. (2023). Ecological impacts of (electrically assisted) mountain bikes. *Global Ecology and Conservation*. 44: e02475.

## Impacts in general

- Impacts occur directly & indirectly during: Construction of trails, use of (in)formal trails, moving off-trail
- More area than the trail itself is affected
- First disturbances often have the highest impact
- Impact dependent on user behaviour
- MTBing causes informal trail creation
- Severity of damage is dependent on the conservation value of a site



- Different preferences & riding behaviour (e.g. riding longer distances and more vertical climbs fastly)
- Leading to a hardening, widening or increase of trails

## Impacts on soil

- Altered local soil properties also affect vegetation
- Off-trail trampling: soil compaction & soil exposure
- On-trail biking (unhardened trails): soil erosion, especially on steep slopes, during wet conditions & skidding; soil compaction



- More impact per time due to covering of longer distances
- More impacts on soil due to creation of informal trails
- Higher soil erosion due to preference for climbing slopes

## Impacts on vegetation

- Trails alter local conditions and affect trailside vegetation
- Off-trail trampling (especially on slopes): reduction of vegetation cover, height, species richness and change of species & functional composition
- Seed attachment to bikes, therefore high dispersal potential



- More trampling damage because of new informal trail creation and steeper climbs
- Longer distance seed dispersal
- Increase of trails, therefore more damage associated with them

## Impacts on wildlife

- Immediate responses of wildlife to MTBing: alert, flight, increased traveling, decreased resting
- Avoidance of suitable habitat (habitat compression)
- Larger territory size due to lower food abundance
- Lower reproductive success
- Change of diurnal activity patterns & behaviour
- Impacts are highly species specific



- Stronger immediate wildlife responses on slopes due to faster uphill riding
- Intensification of recreational use, use of so far seldom frequented areas or times of the day: more immediate wildlife responses (also of less tolerant individuals), spatial or temporal habitat avoidance
- More often stronger wildlife responses due to off-trail riding

