

Optimally managing threats to biodiversity across large scales

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Environment and
Climate Change Canada



Conservation is actions in places

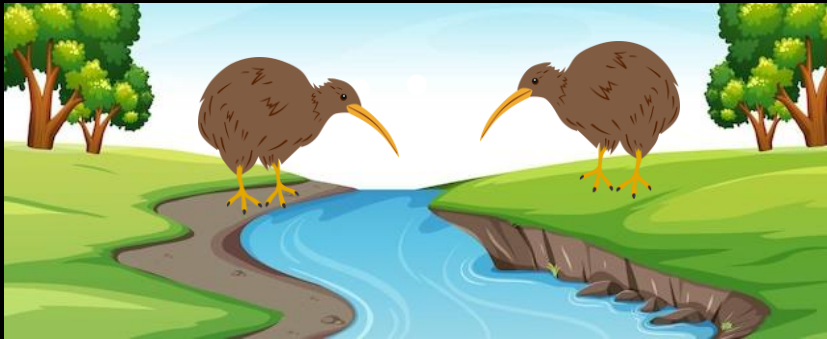
1. Area impacted by threat



2. Implement action to abate threat



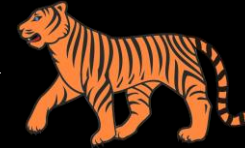
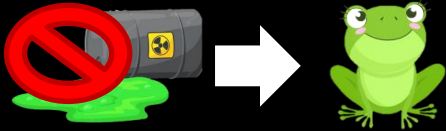
3. Positive conservation outcome



Which threats to abate?



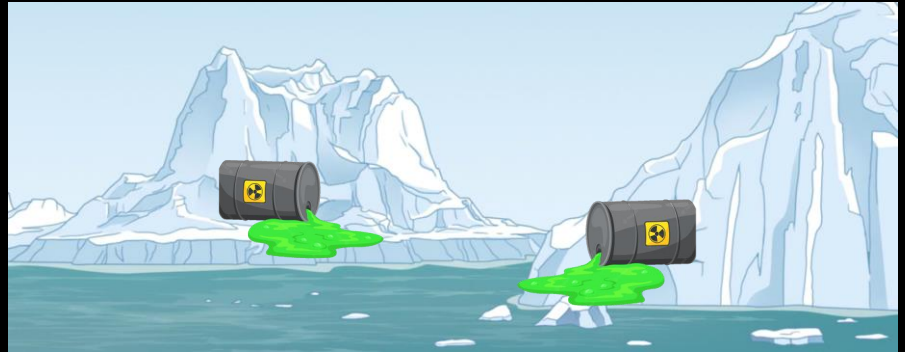
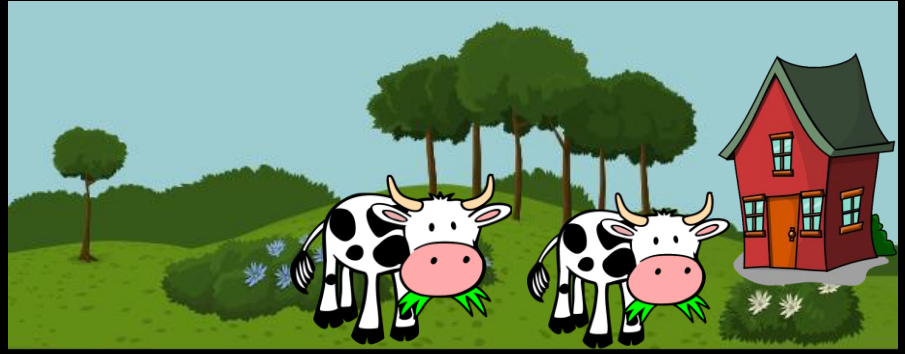
Which threats to abate?



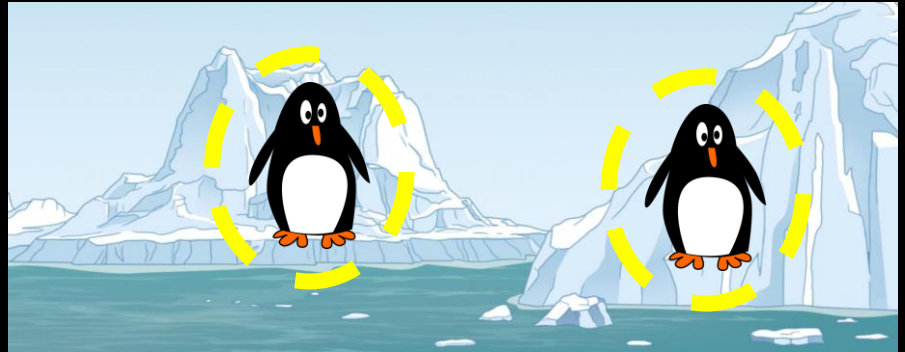
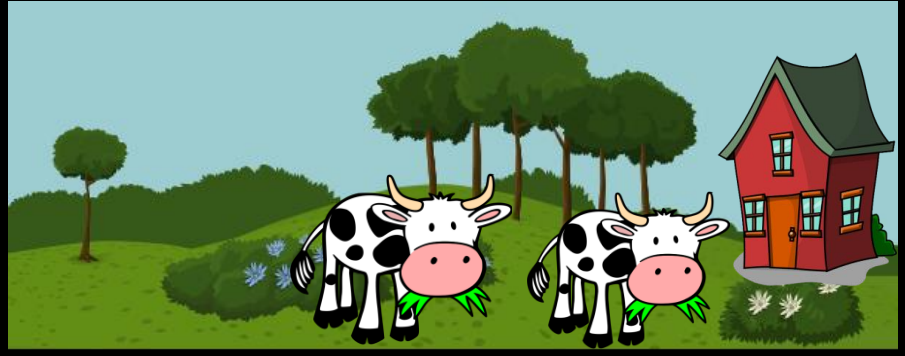
Which threats to abate?



Which places to abate which threats?



Find the cheapest set of actions needed to provide each species with adequate habitat

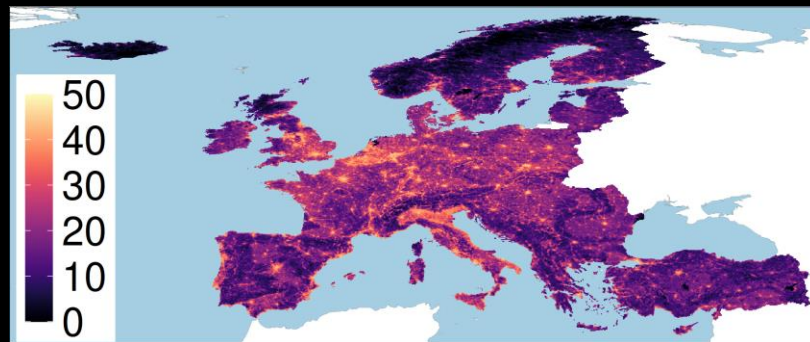


(assuming each place provides enough habitat for each species to persist)

European case study

- 415 species: 81 amphibian, 135 birds, 79 mammal, 120 reptile species
- 165,000+ planning units (grid cells)
- Natura 2000 network and nationally designed protected areas
- Conservation benefit for a species = amount of threat-free habitat in conservation areas

Human pressure

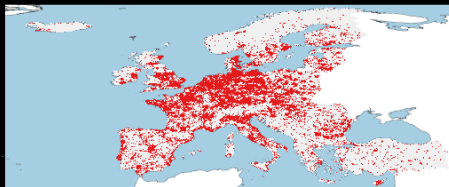


Threats to biodiversity

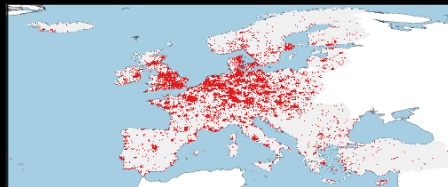
1.1: Housing & urban areas



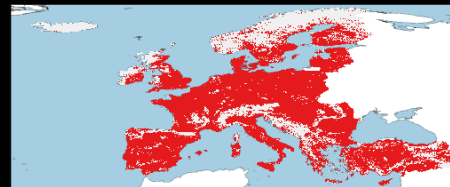
1.2: Commercial & industrial areas



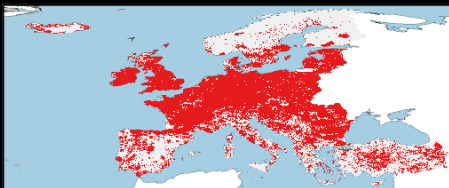
1.3: Tourism & recreation areas



2.1: Annual & perennial non-timber crops



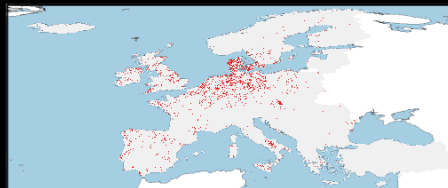
2.3: Livestock farming & ranching



3.2: Mining & quarrying



3.3: Renewable energy



4.1: Roads & railroads



5.1: Hunting & collecting terrestrial animals



5.2: Gathering terrestrial plants



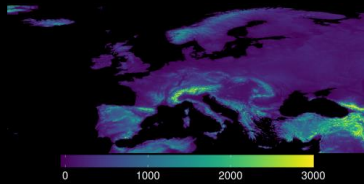
9.4: Garbage & solid waste



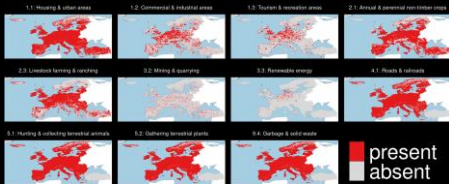
Mapping consequences

Species

Elevation



Threats



Current
land cover

Potential natural
vegetation



Horned Grebe



What if?

Protect existing habitat



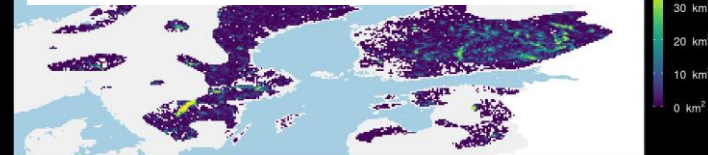
Restore urban areas



Restore croplands

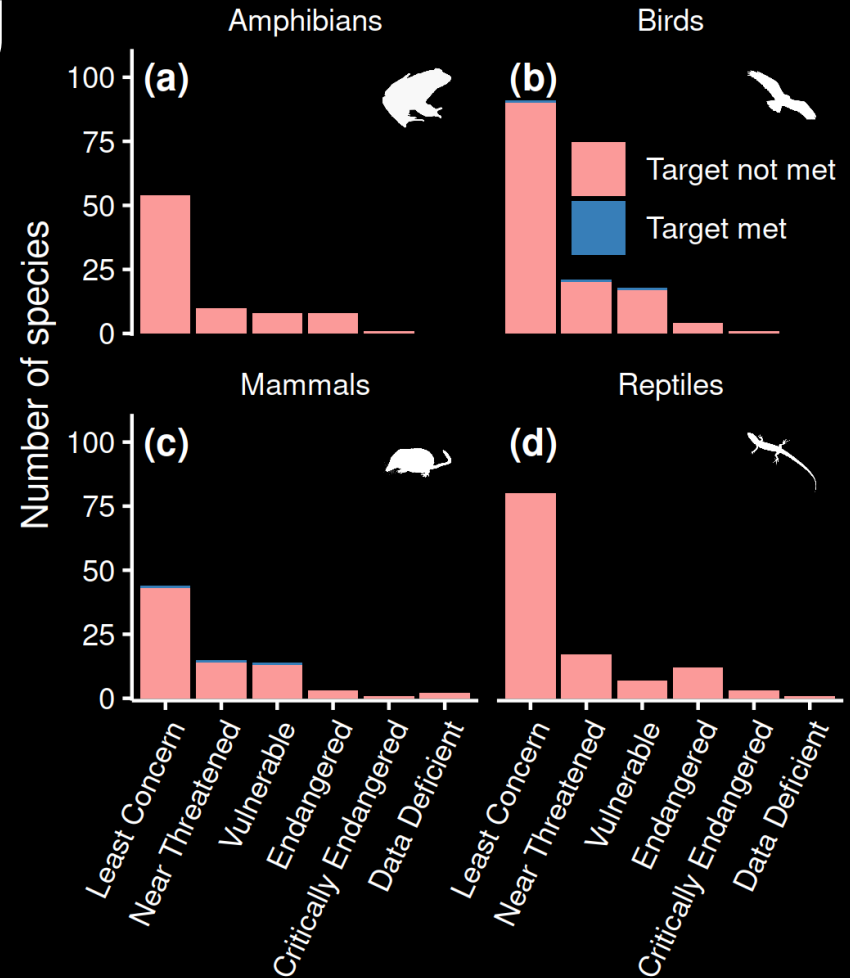


Restore urban & croplands



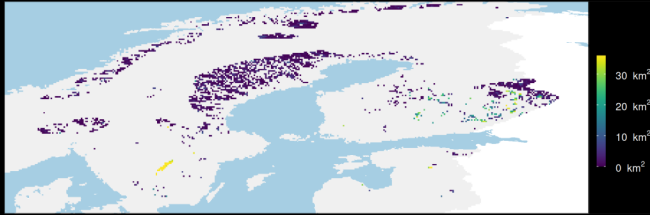
Performance of existing protected areas

- Only 6 / 415 species with adequate threat-free habitat within protected areas
- 0 amphibians and reptiles!
- Much worse than previous assessments which don't account for threats



Priority areas for establishing protected areas

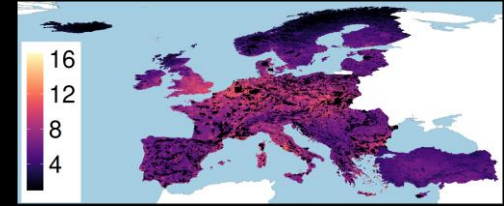
Existing threat-free
habitat for 415 species



Protected areas



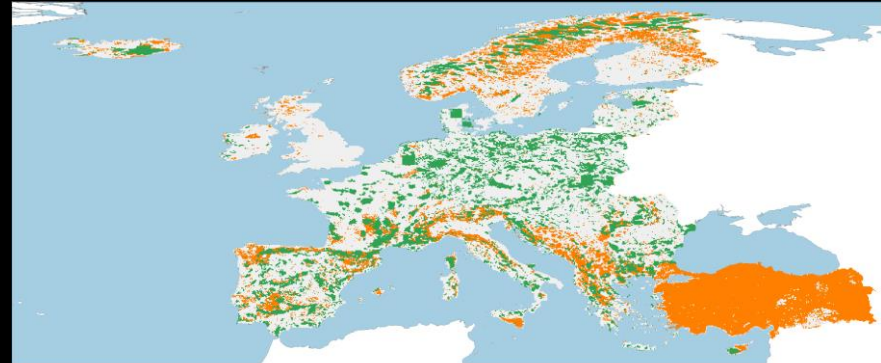
Opportunity cost



Decision support tool,
powered by optimization



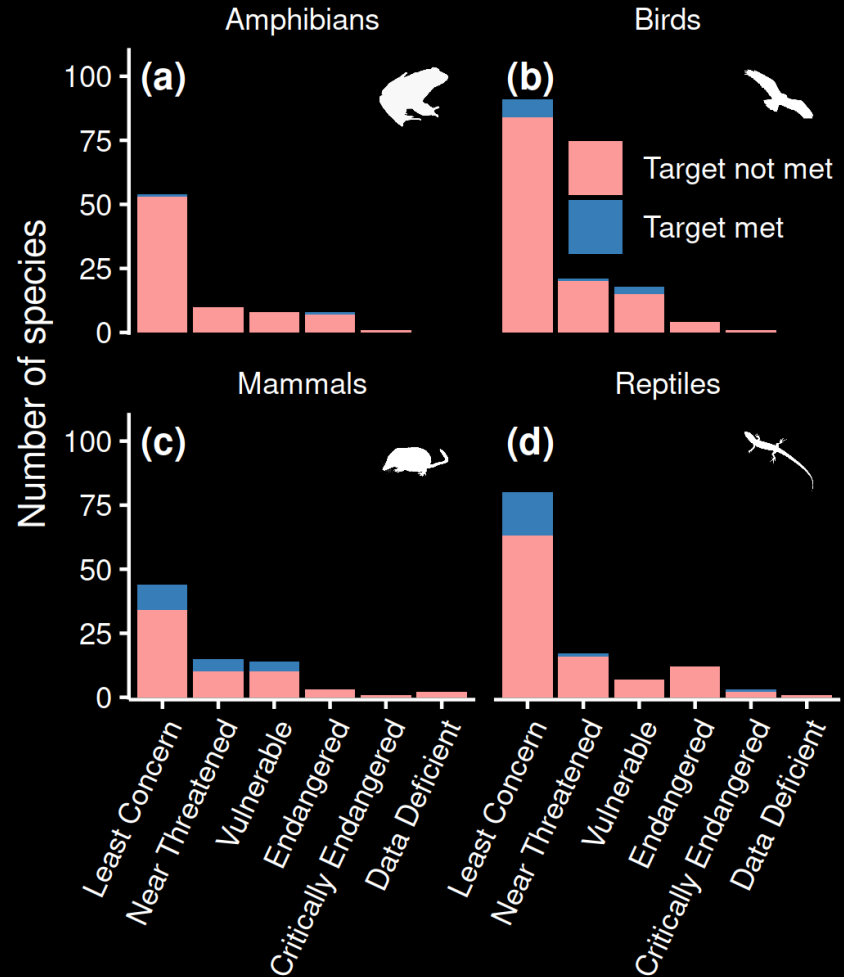
prioritizr



Priority area Existing protected area Other

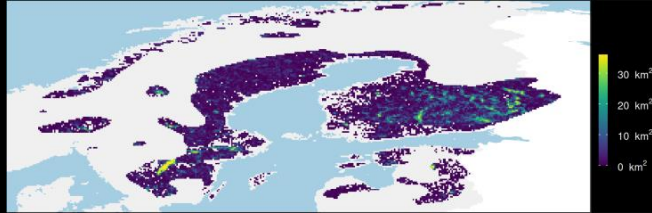
Establishing new protected areas

- Improves to 51 / 415 species with adequate threat-free habitat within protected areas
- Most species are Least Concern
- Still only 2 amphibians



Prioritizing improvement of protected areas

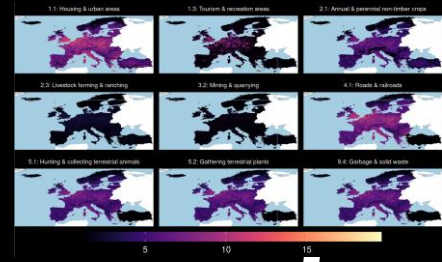
Consequence maps for 415 species
under 512 threat combinations



Protected areas



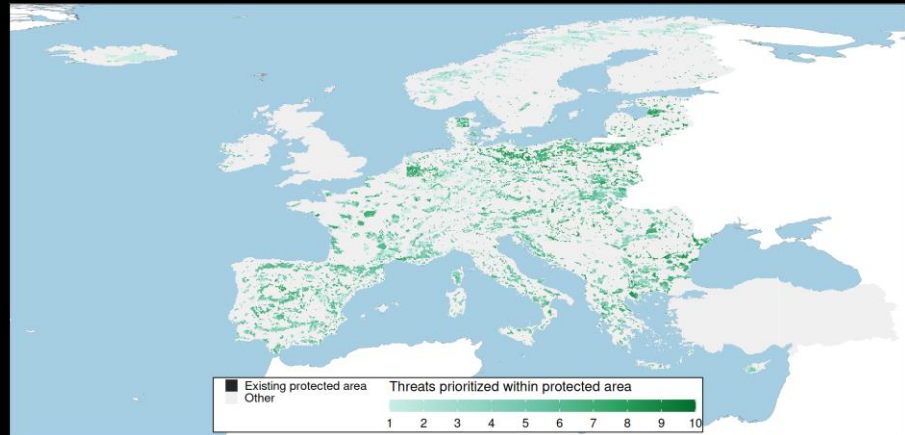
Opportunity costs
for each threat



Decision support tool,
powered by optimization

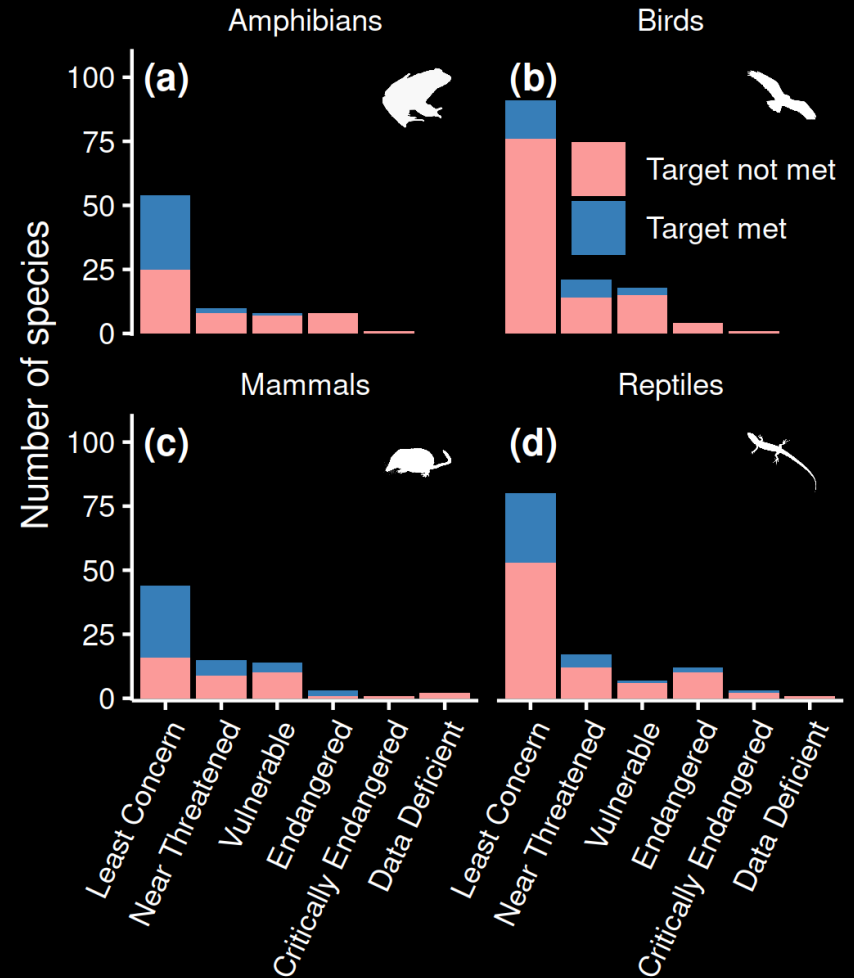


prioritizr

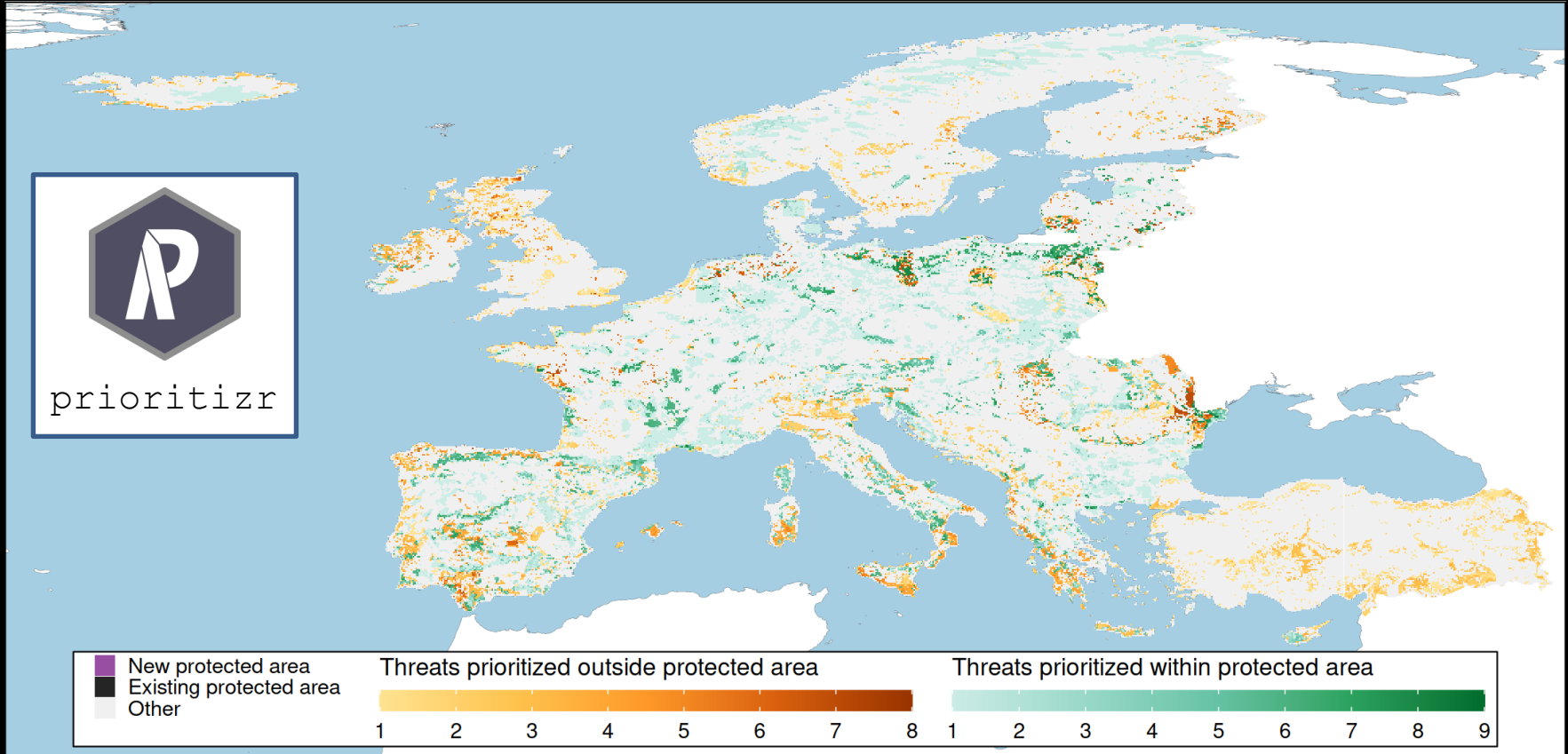


Improving existing protected areas

- Bigger improvement to 133 / 415 species with adequate threat-free habitat within protected areas
- 39% amphibian, 19% bird, 50% of mammal, and 30% of reptile species

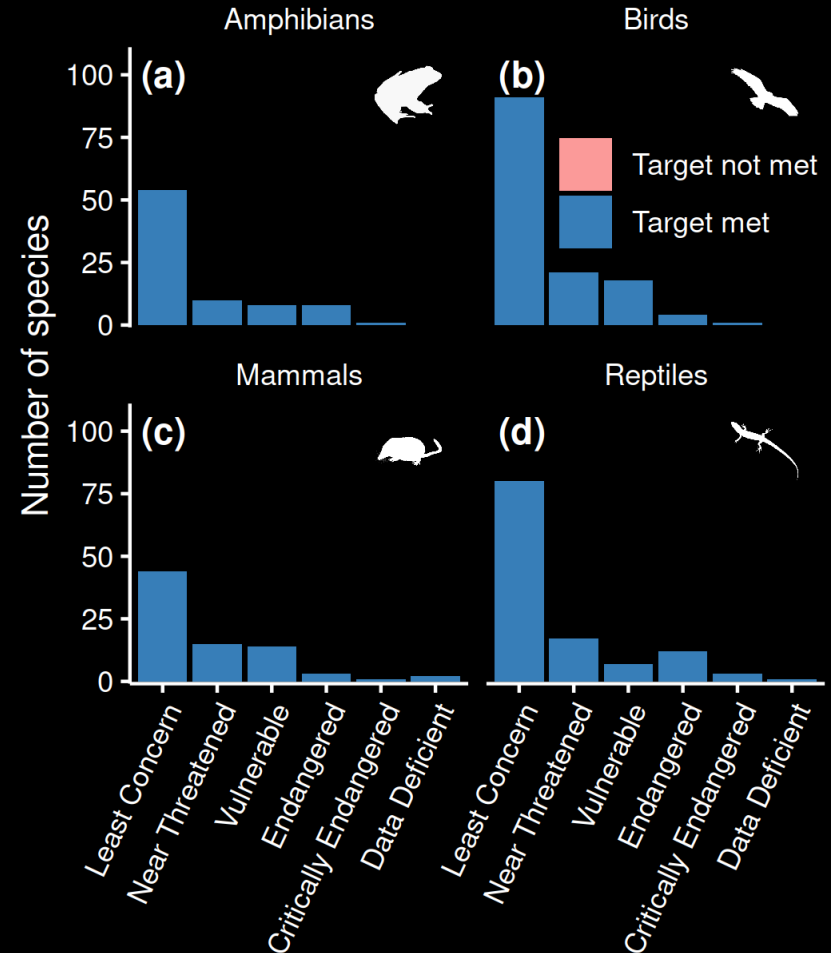


Prioritizing actions across Europe



Prioritizing actions to abate threats

- All species have adequate threat-free habitat within protected areas
- Priority areas for abating threats span 17% of Europe

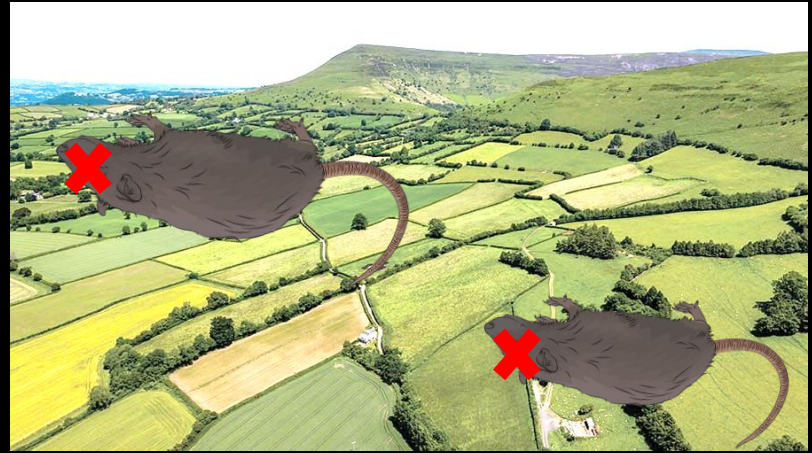
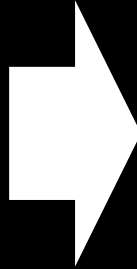


I'm a Kiwi – why should I give a shit?

What's your vision for Predator Free 2050 and beyond? Do you just want rat-free farms and urban areas? If not, maybe worth thinking about the other threats too?



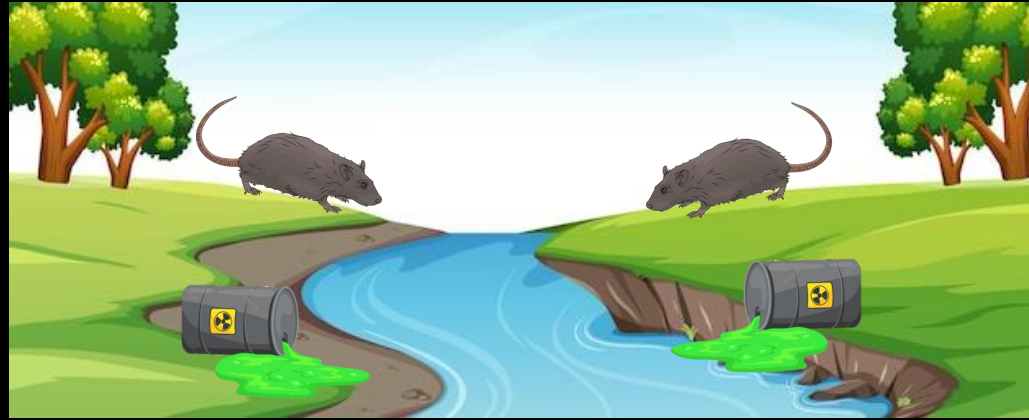
Now



Future

I'm a Kiwi – why should I give a shit?

NZ has limited funding for conservation. Maybe think about synergies between actions for invasive species management and other threats to achieve greater conservation outcomes?



I'm a Kiwi – why should I give a shit?

NZ species aren't all hyper-generalists. Maybe think about the consequences of managing invasive species in different places and how this might help different species? In other words, killing rats in grassland won't help forest species.



Take home messages

Most EU species don't have adequate habitat in protected areas that is free from threats

Improving management of existing protected areas is insufficient for many species

Strategically managing threats both within and beyond existing protected areas is needed

What you do and where you go matters!



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What's in a protected area?

Taranaki National Park, NZ



Peneda-Gerês, Portugal

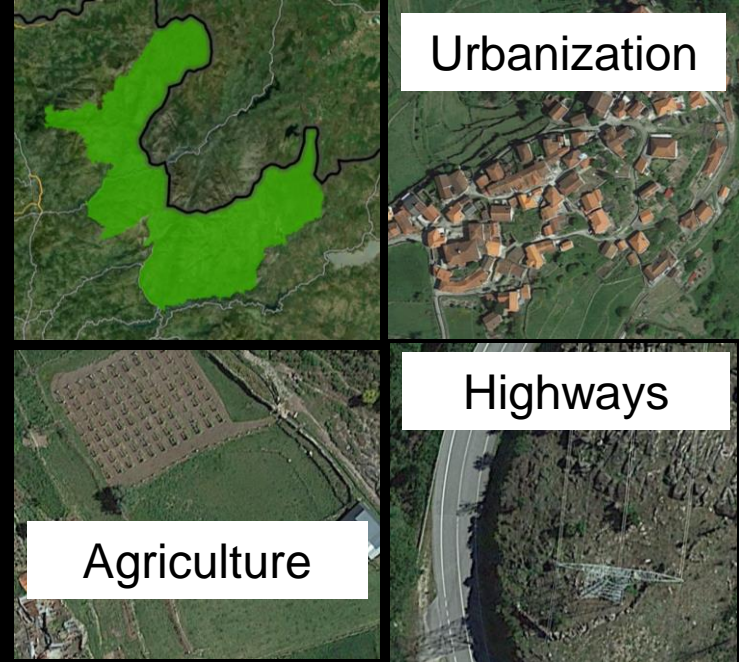


Land sparing vs. land sharing

Taranaki National Park, NZ

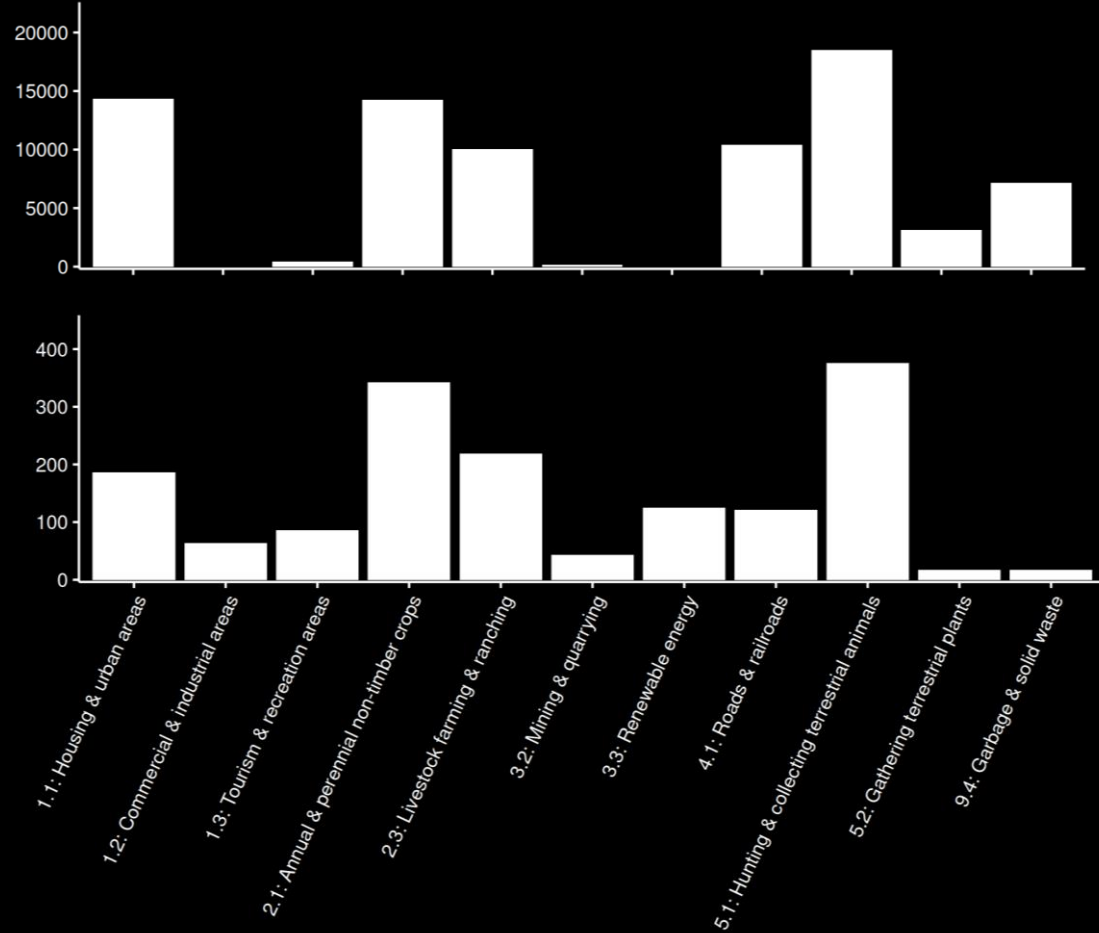


Peneda-Gerês, Portugal



It's not just as simple as focussing on threats that impact the most species

Number of planning units
Number of species impacted



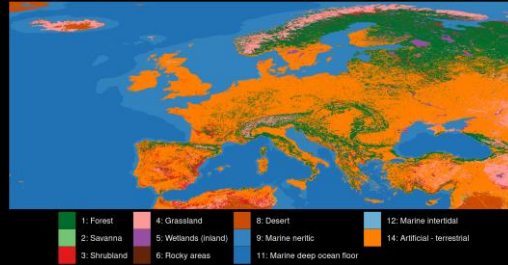
Mapping suitable habitat for species



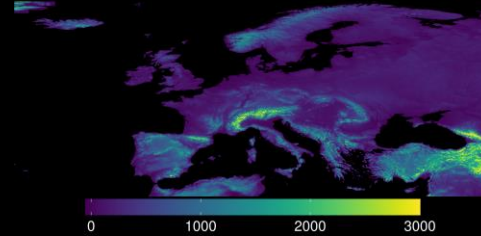
Species

- habitat types
- elevational limits
- threat impacts

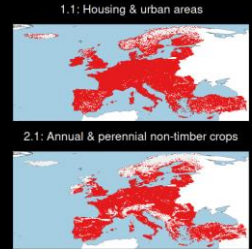
Current land cover



Elevation



Threats



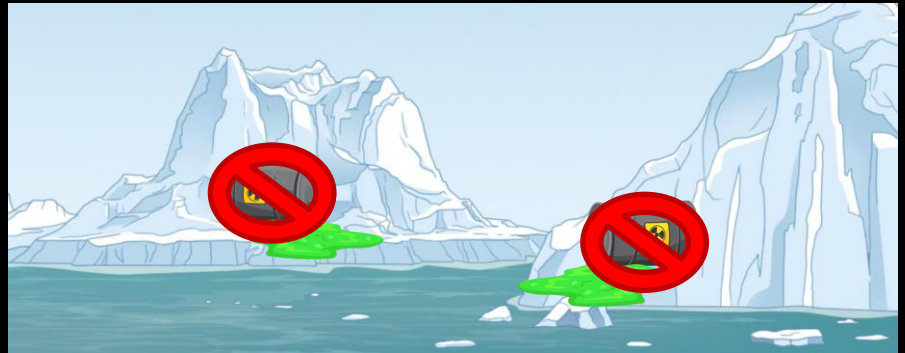
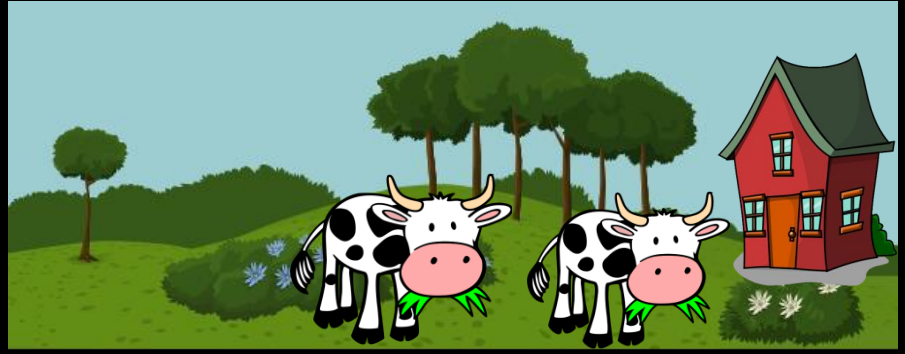
Horned Grebe



Area of threat-free habitat



Which places to abate which threats?



Which places to abate which threats?

