Optimally managing threats to biodiversity across large scales

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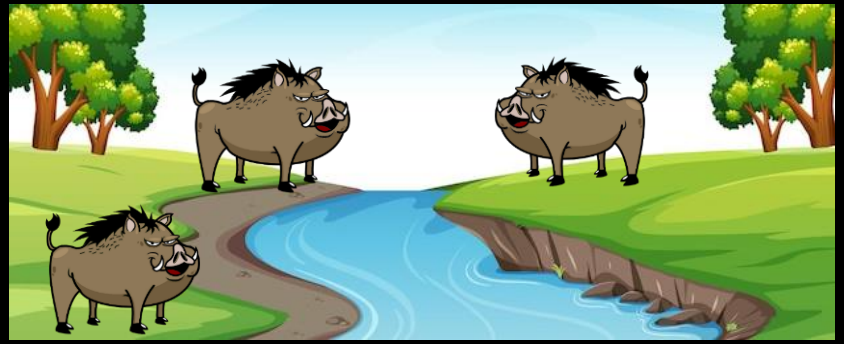
NSERC CRSNG

NATURE CONSERVANCY CANADA

Conservation is actions in places

1. Area impacted by threat

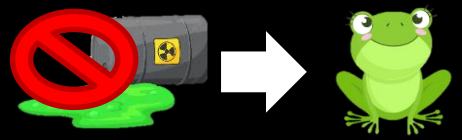


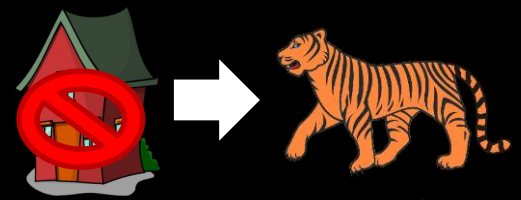
2. Implement action to abate threat

3. Positive conservation outcome

Which threats to abate?

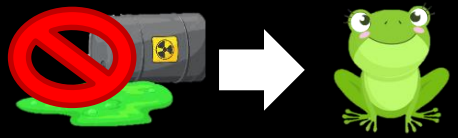
Which threats to abate?





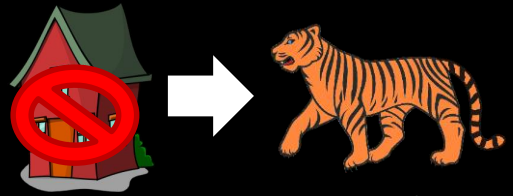
Which threats to abate?

$1M



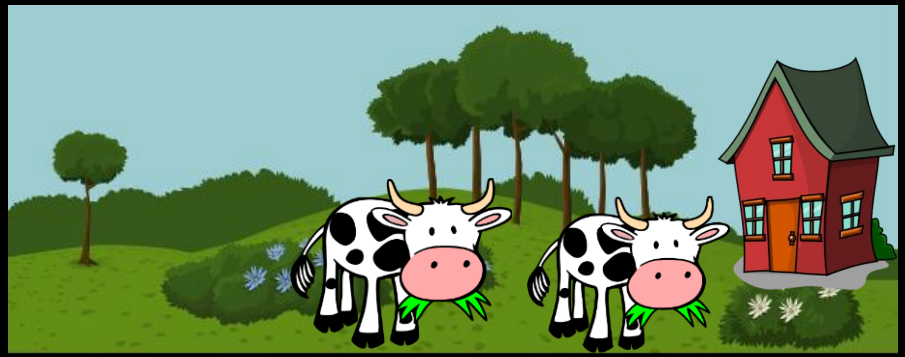
$2M

$4M

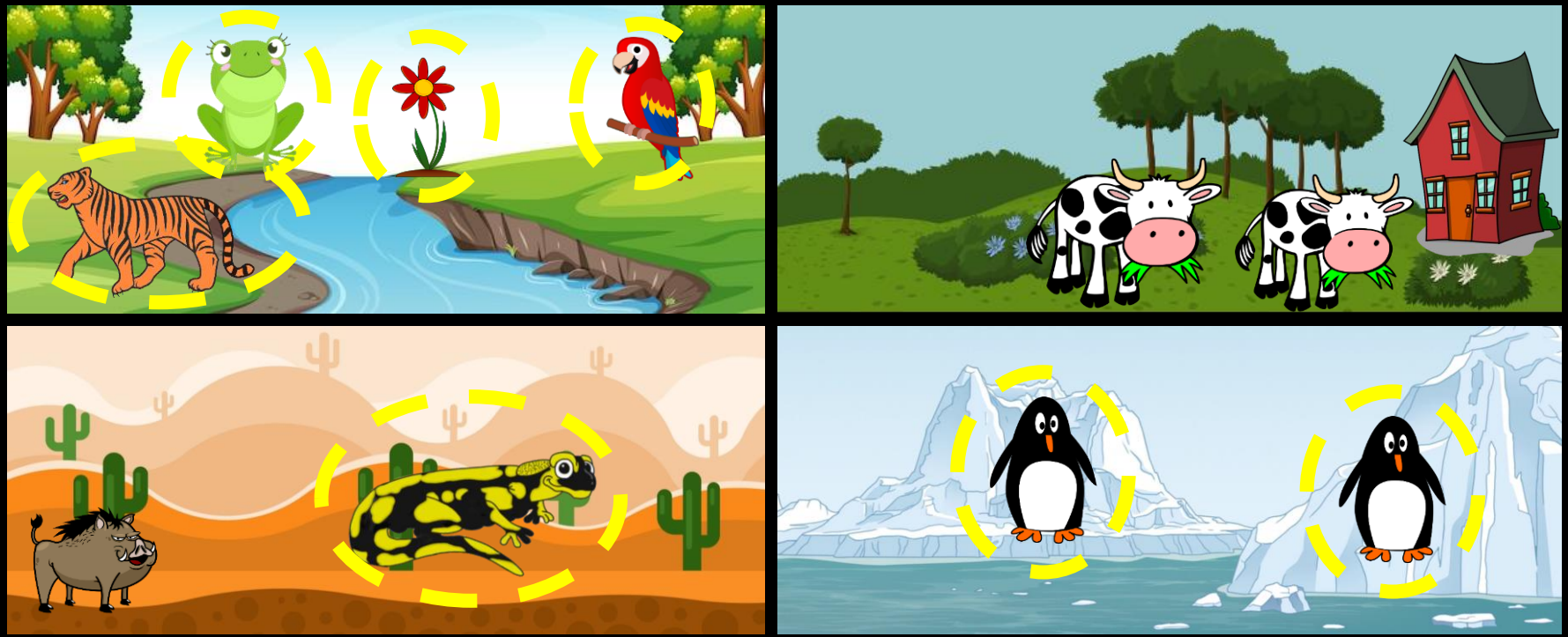


$5M

Which places to abate which threats?



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

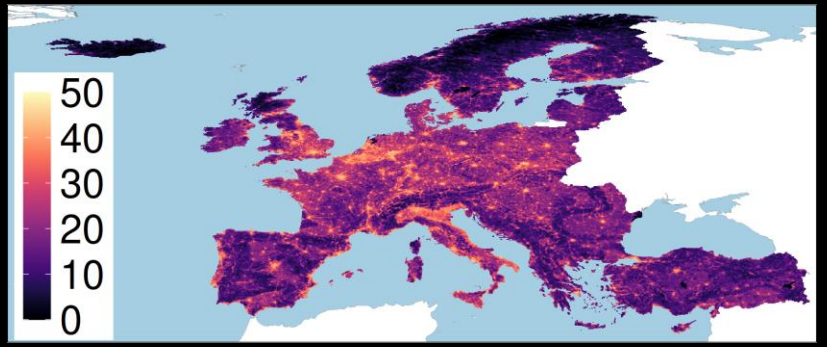


(assuming each place provides enough habitat for each species to persist)

European case study

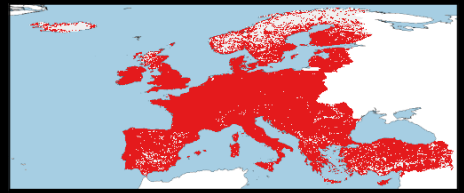
- 415 species: 81 amphibian, 135 birds, 79 mammal, 120 reptile species
- 165,000+ planning units (grid cells)
- Natura 2000 network and nationally designed protected areas
- Conservation benefit for a species = amount of threat-free habitat in conservation areas

Human pressure

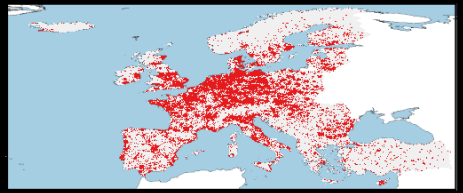


Threats to biodiversity

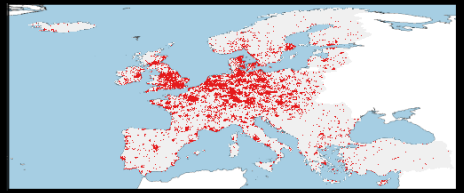
1.1: Housing & urban areas



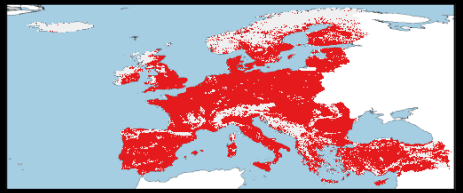
1.2: Commercial & industrial areas



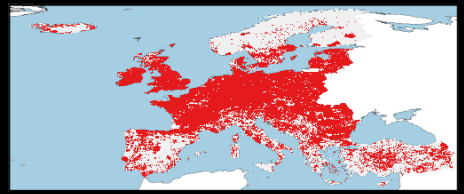
1.3: Tourism & recreation areas



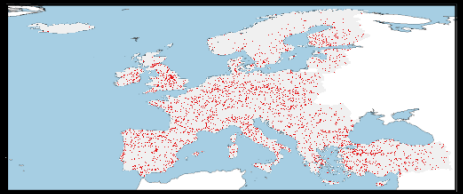
2.1: Annual & perennial non-timber crops



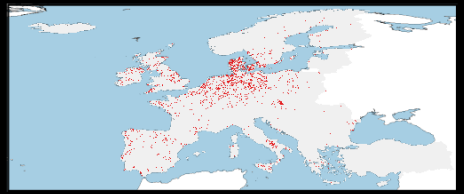
2.3: Livestock farming & ranching



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

present

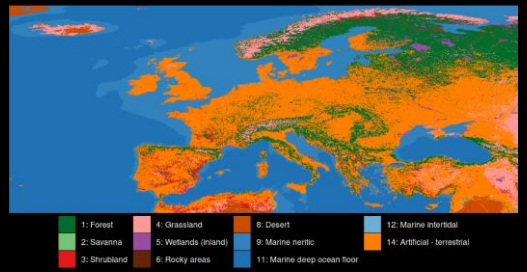
absent

Mapping suitable habitat for species

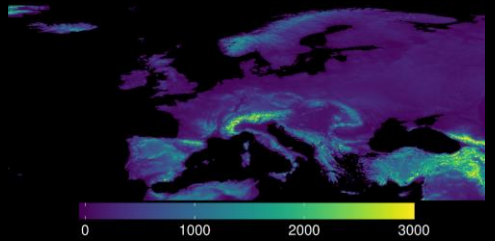
Species

- habitat types
- elevational limits
- threat impacts

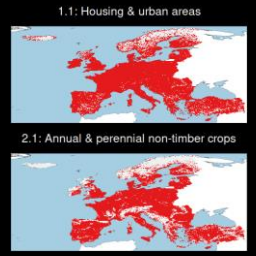
Current land cover



Elevation



Threats

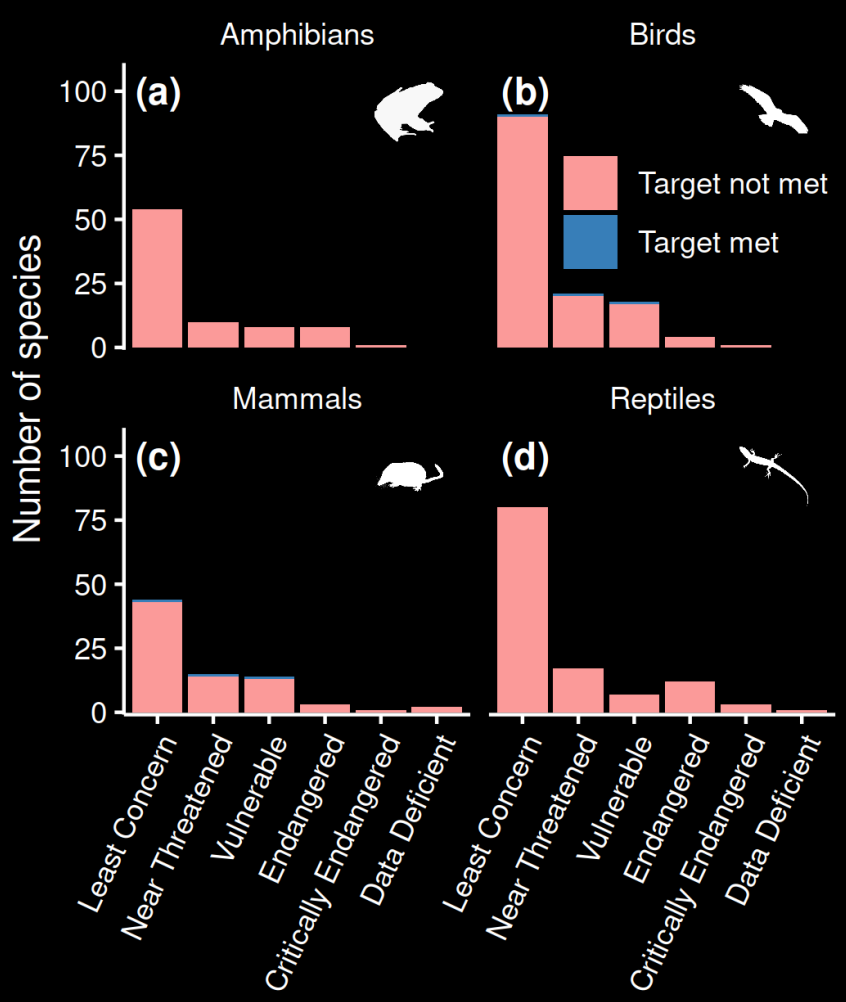


Horned Grebe

Area of threat-free habitat

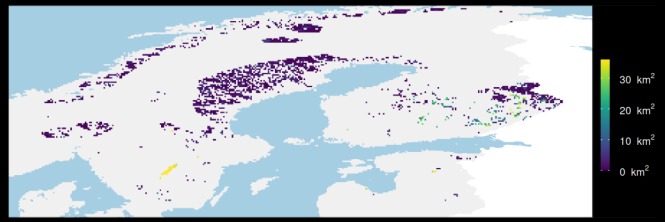
Performance of existing protected areas

- 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



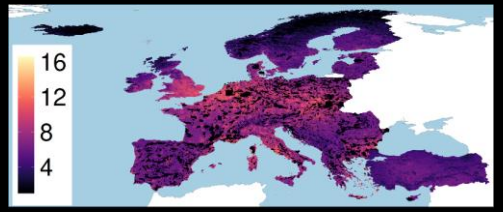
Priority areas for establishing protected areas

Existing threat-free habitat for 415 species



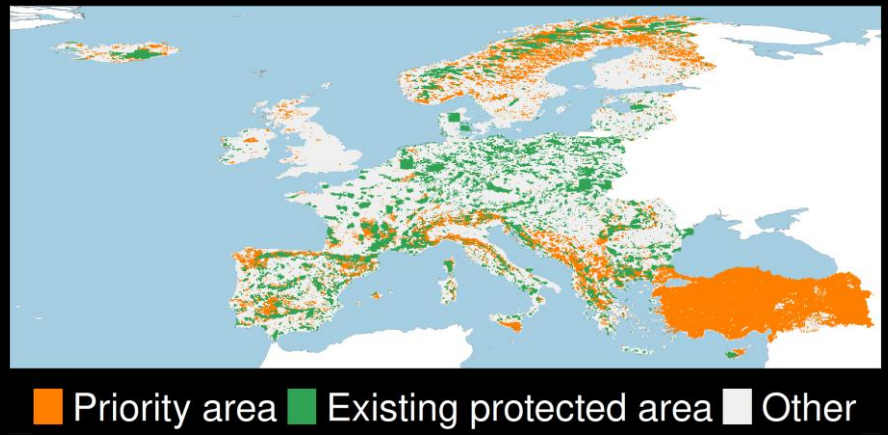
Protected areas

Opportunity cost



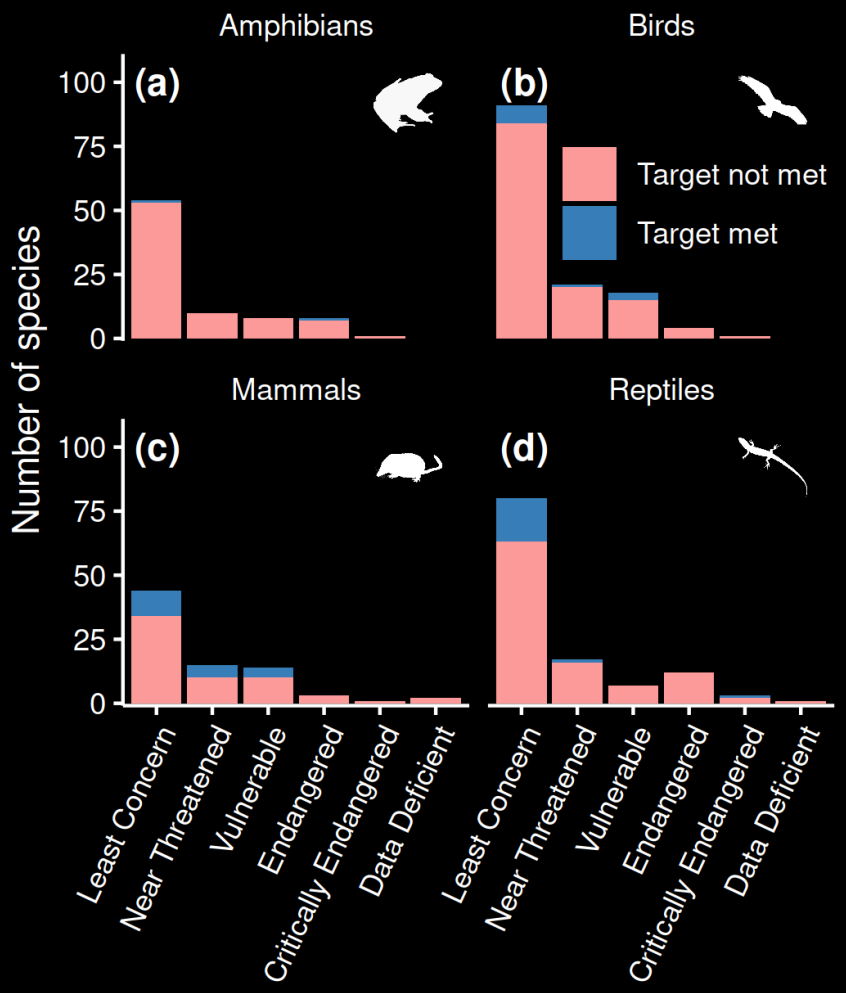
Optimization

prioritizr



Establishing new protected areas

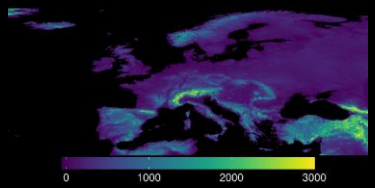
- Improves to 51 / 415 species with adequate threat-free habitat within protected areas
- Most species are Least Concern
- Still only 2 amphibians



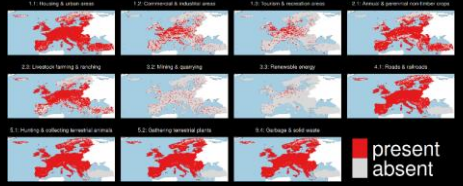
Mapping consequences of abating threats

Species

Elevation



Threats



Current land cover

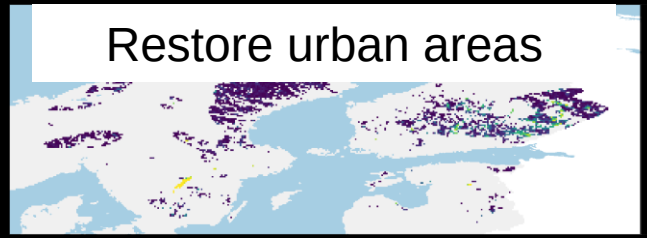
Potential natural vegetation

Horned Grebe

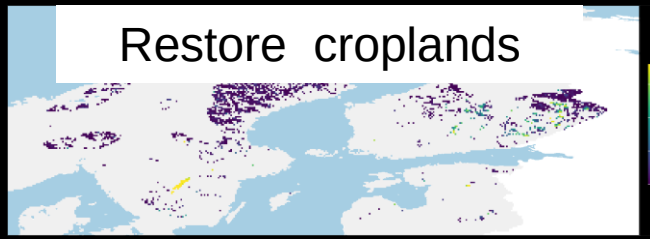
What if?

Protect existing habitat

Restore urban areas



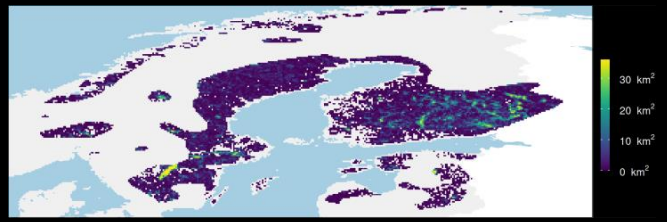
Restore croplands



Restore urban & croplands

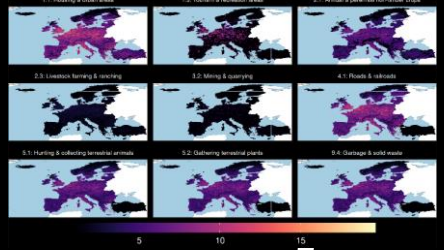
Prioritizing improvement of protected areas

Consequence maps for 415 species under 512 threat combinations



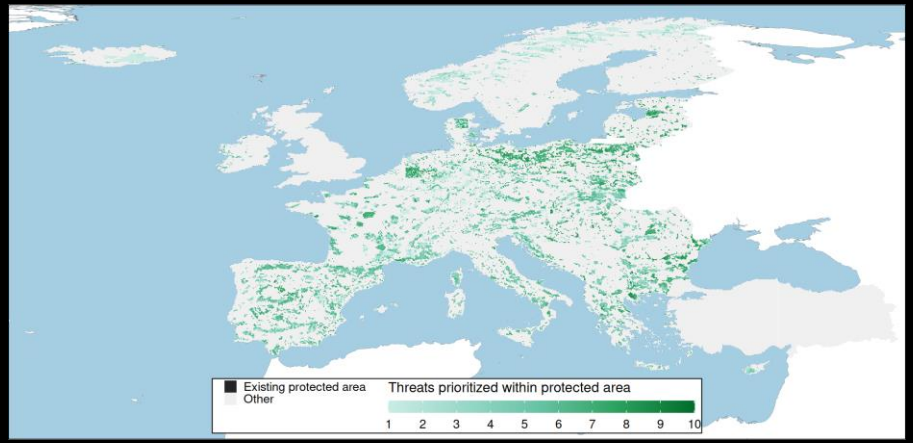
Protected areas

Opportunity costs for each threat



Optimization

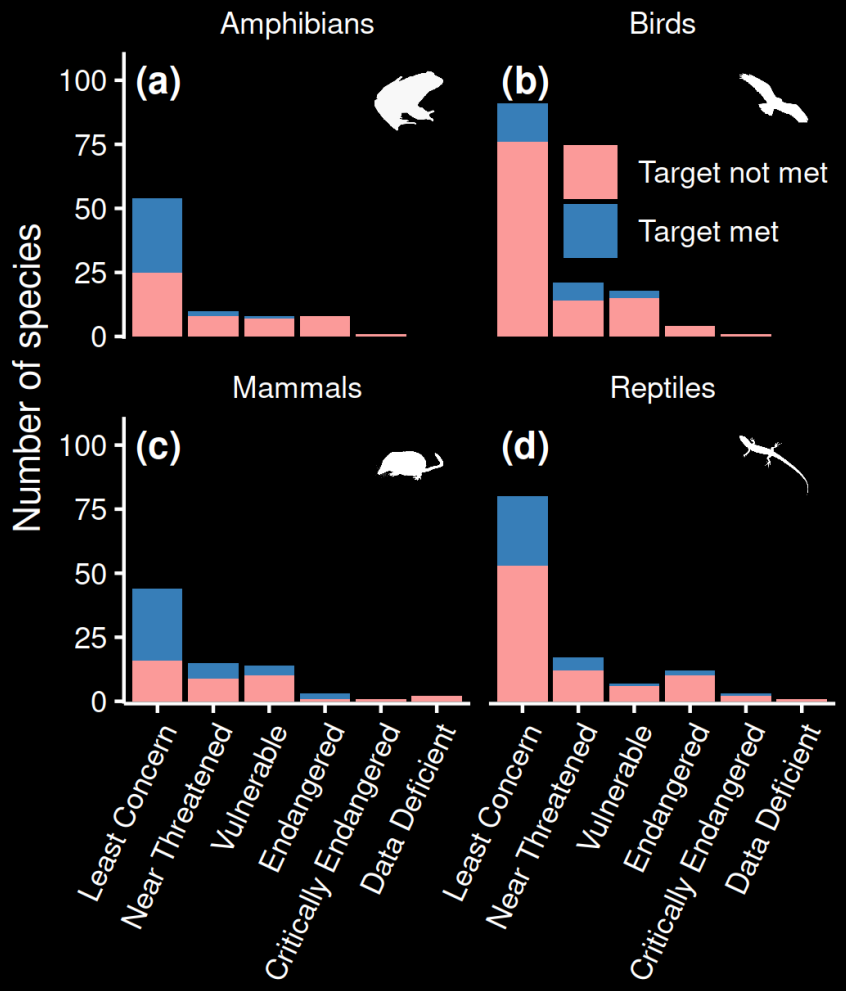
prioritizr



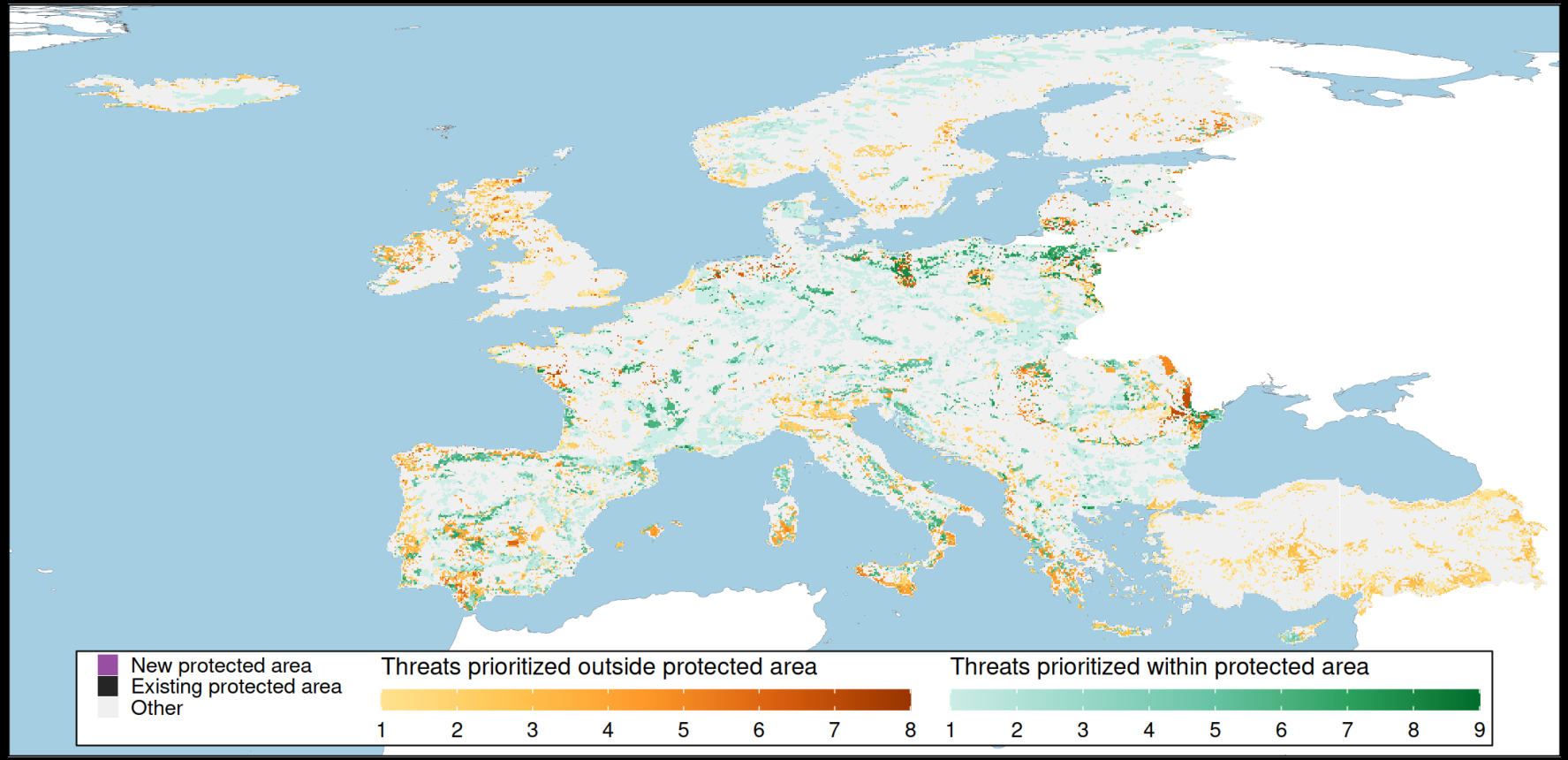
Improving existing protected areas

- 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

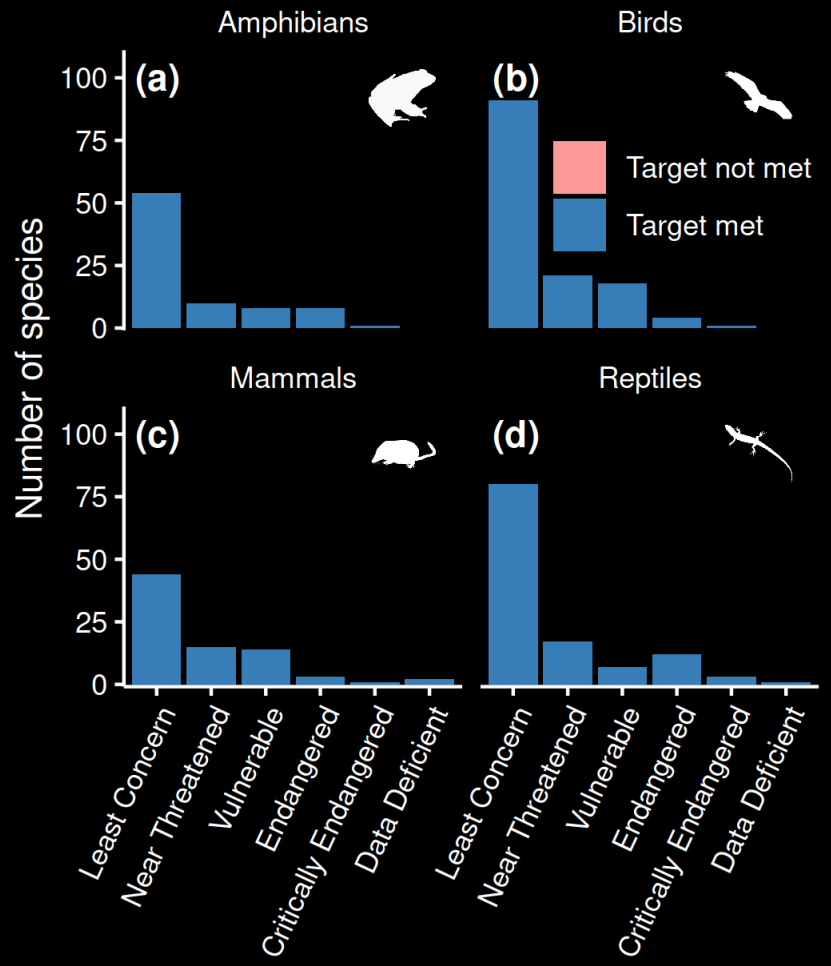


Prioritizing actions across Europe

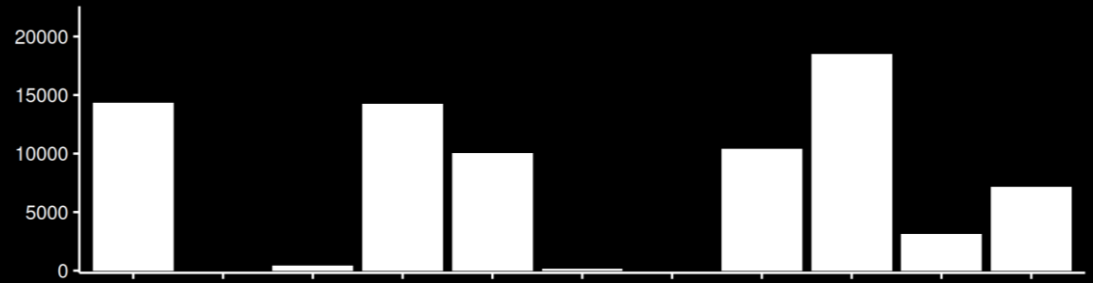


Prioritizing actions to abate threats

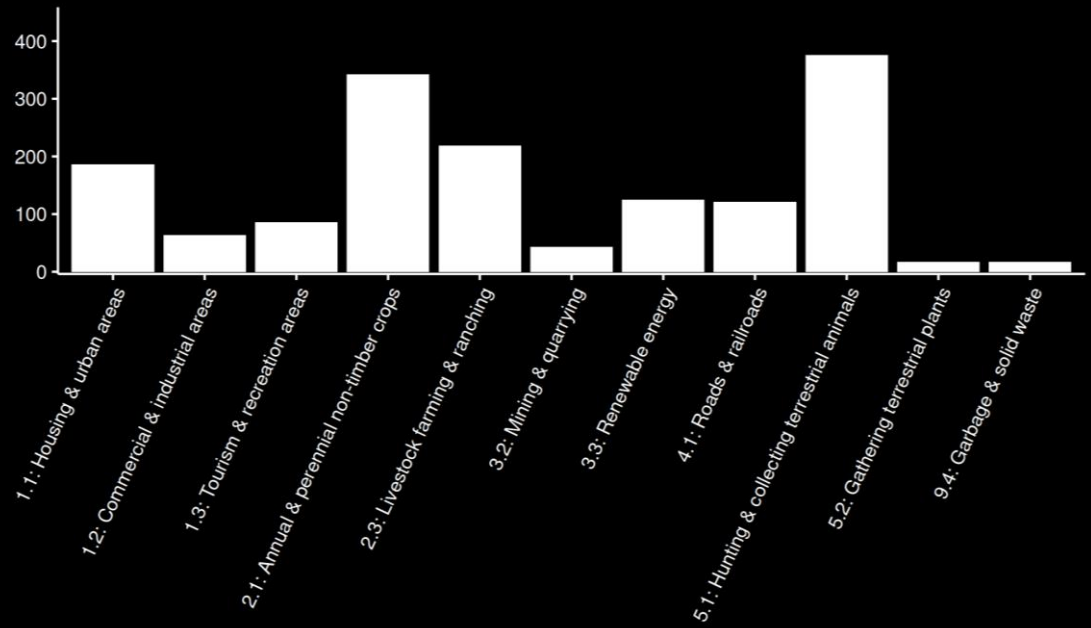
- All species have adequate threat-free habitat within protected areas
- Priority areas for abating threats span 17% of Europe



Number of planning units in prioritization



Number of species impacted



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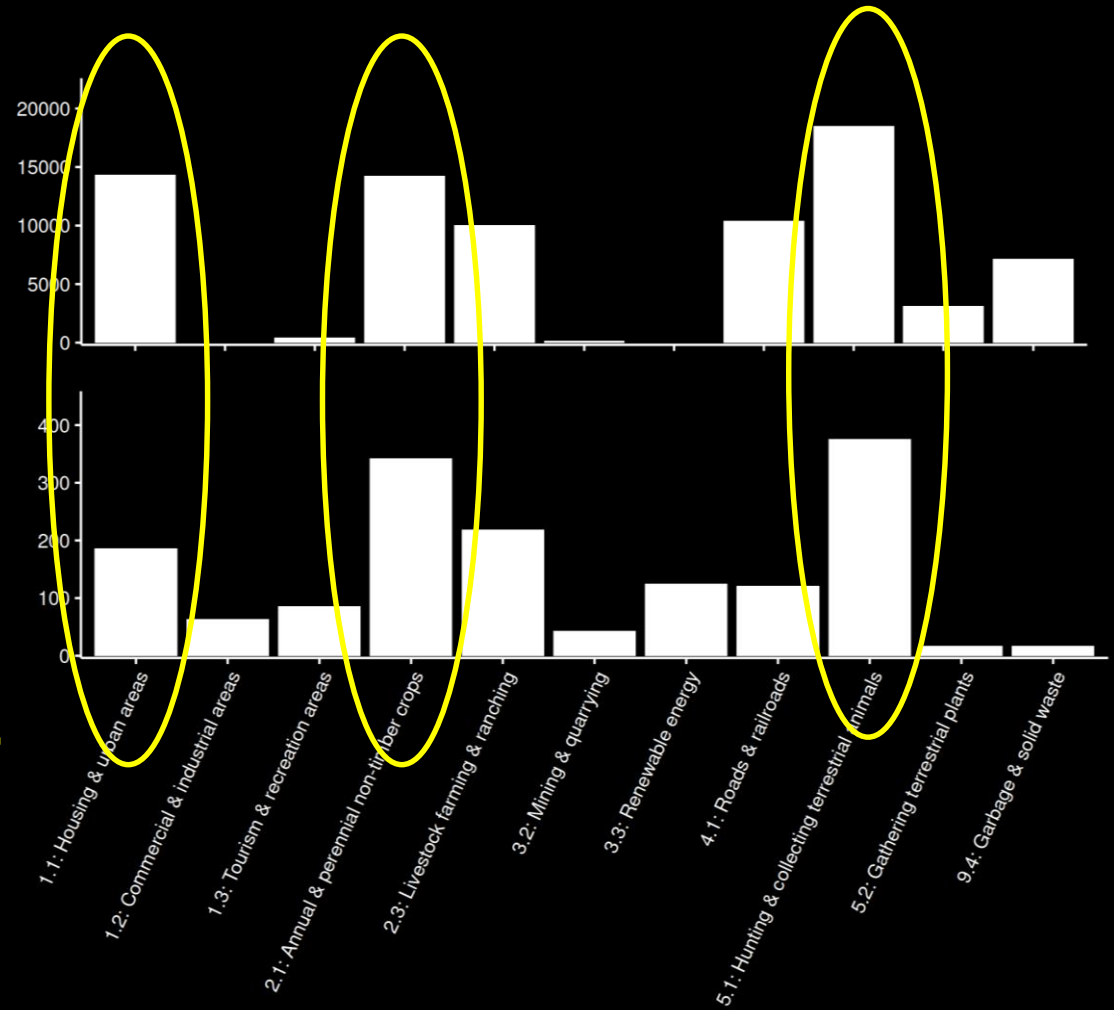
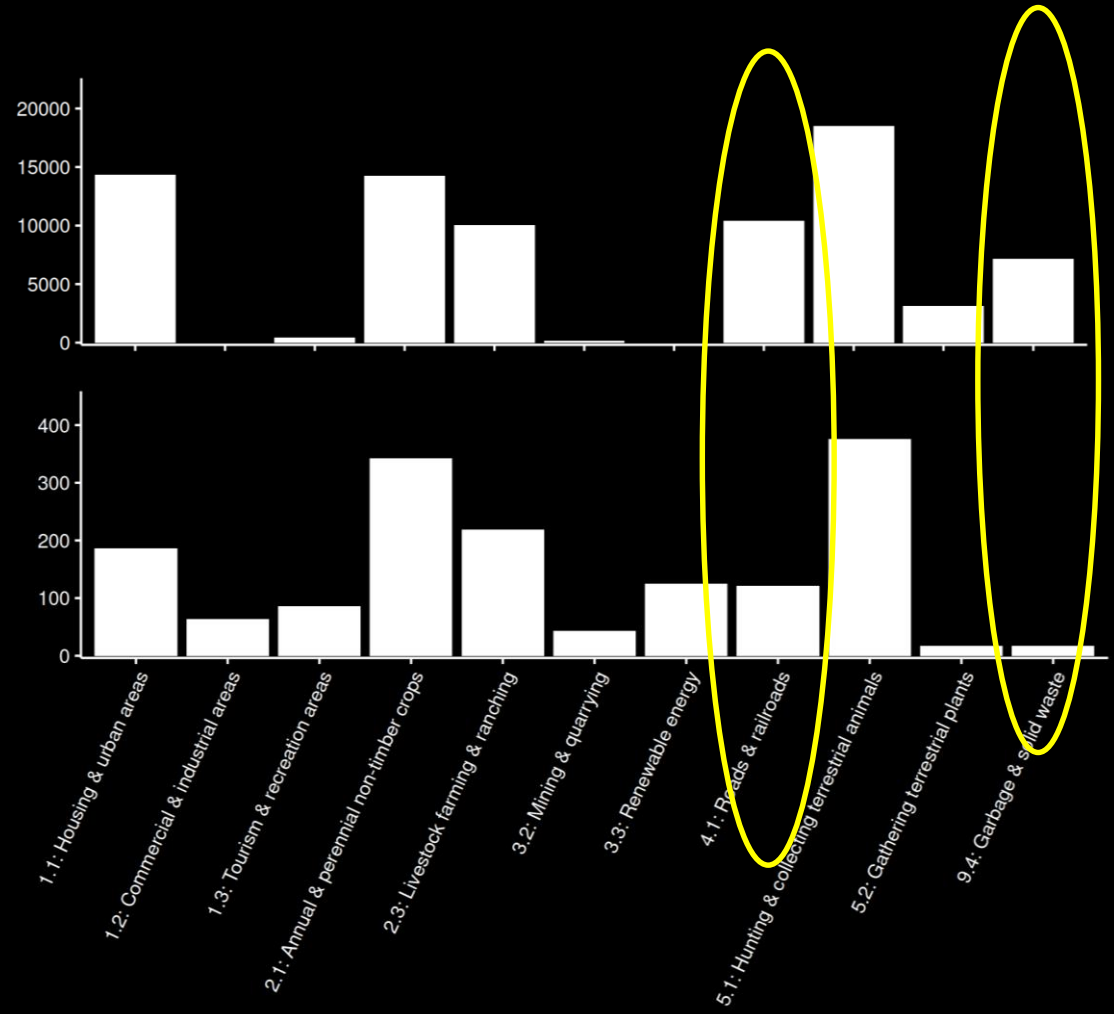


Focussing on threats that impact the most species isn’t a bad start

Number of planning units in prioritization

Number of species impacted



But that's not the whole story, other threats may be important too

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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