THE UNIVERSITY of York

Habitat recreation strategies and connectivity

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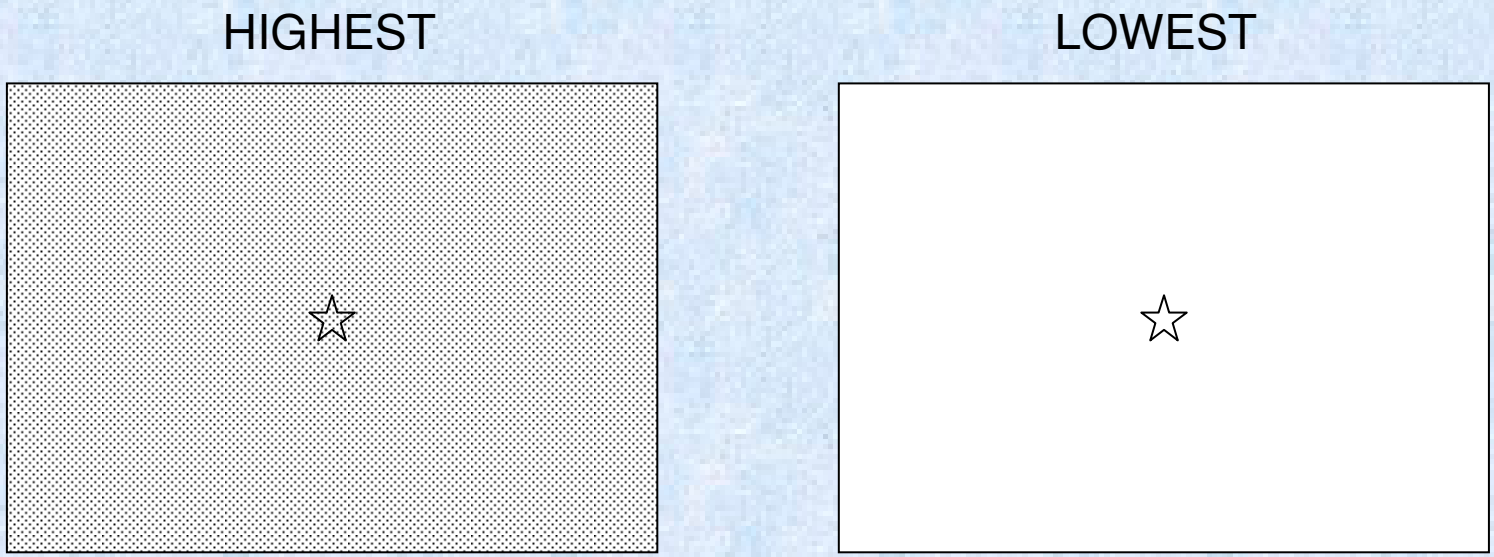
What is connectivity?

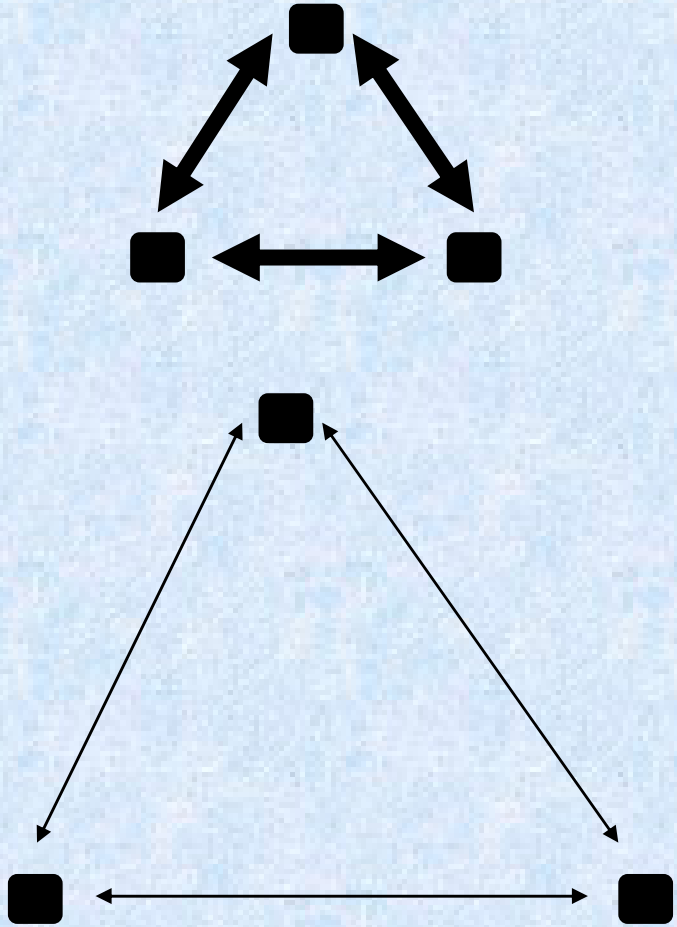
- The rate of immigration
  - actual or potential
  - to a point in space or a patch



- So depends on populations all around

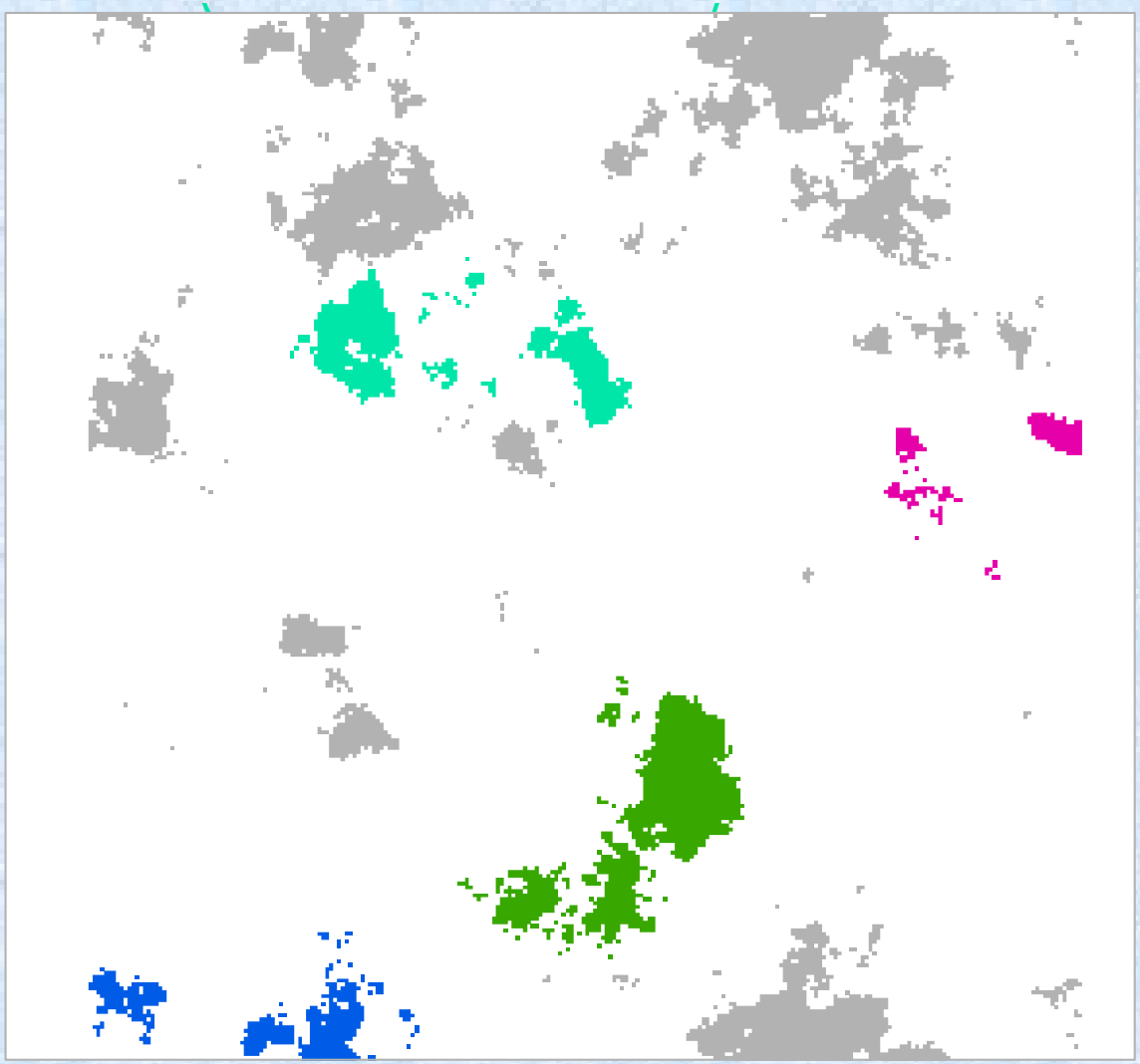
Benefits of higher connectivity

- Rescue after chance extinctions
- Less inbreeding
- Less dispersal mortality
- Less severe edge effects

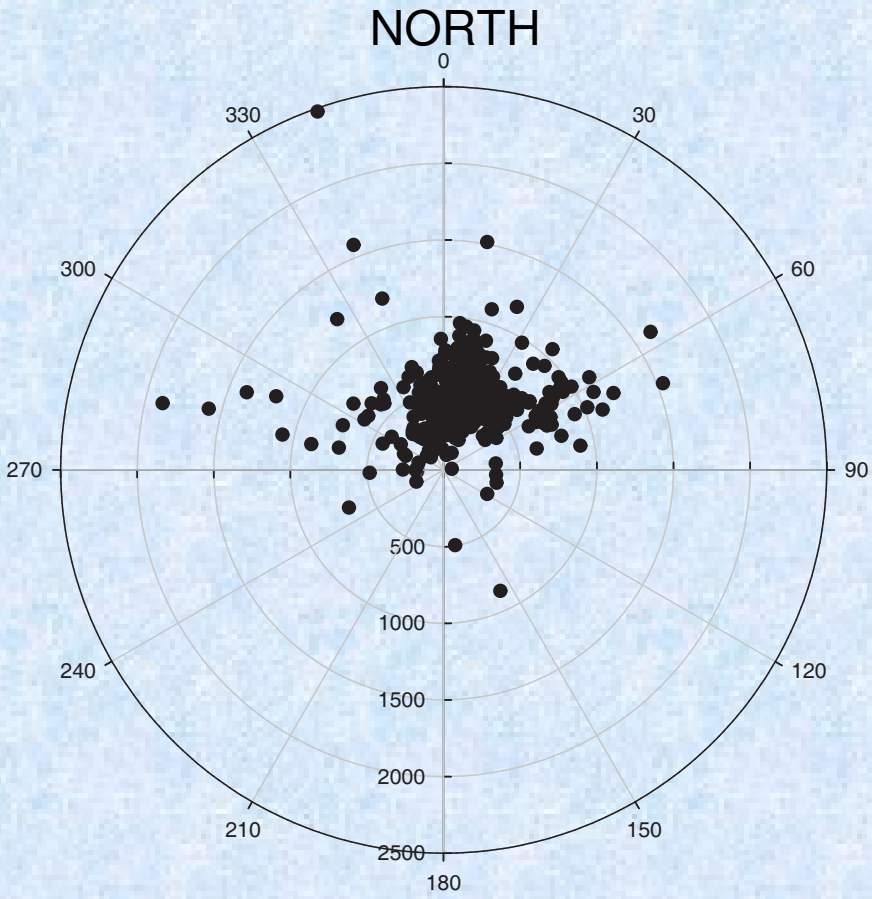


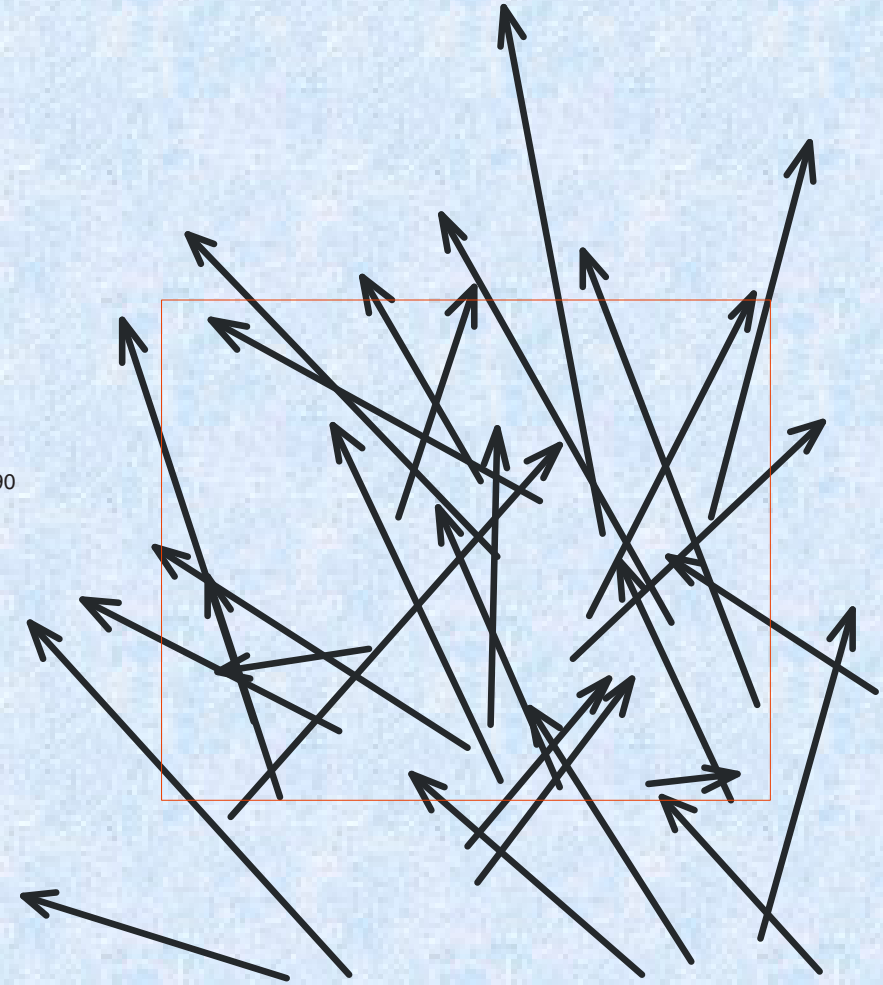
There is less natural habitat because of human activities

Conservation approaches: multiple species in fragmented landscapes



Species need to move because of climate change





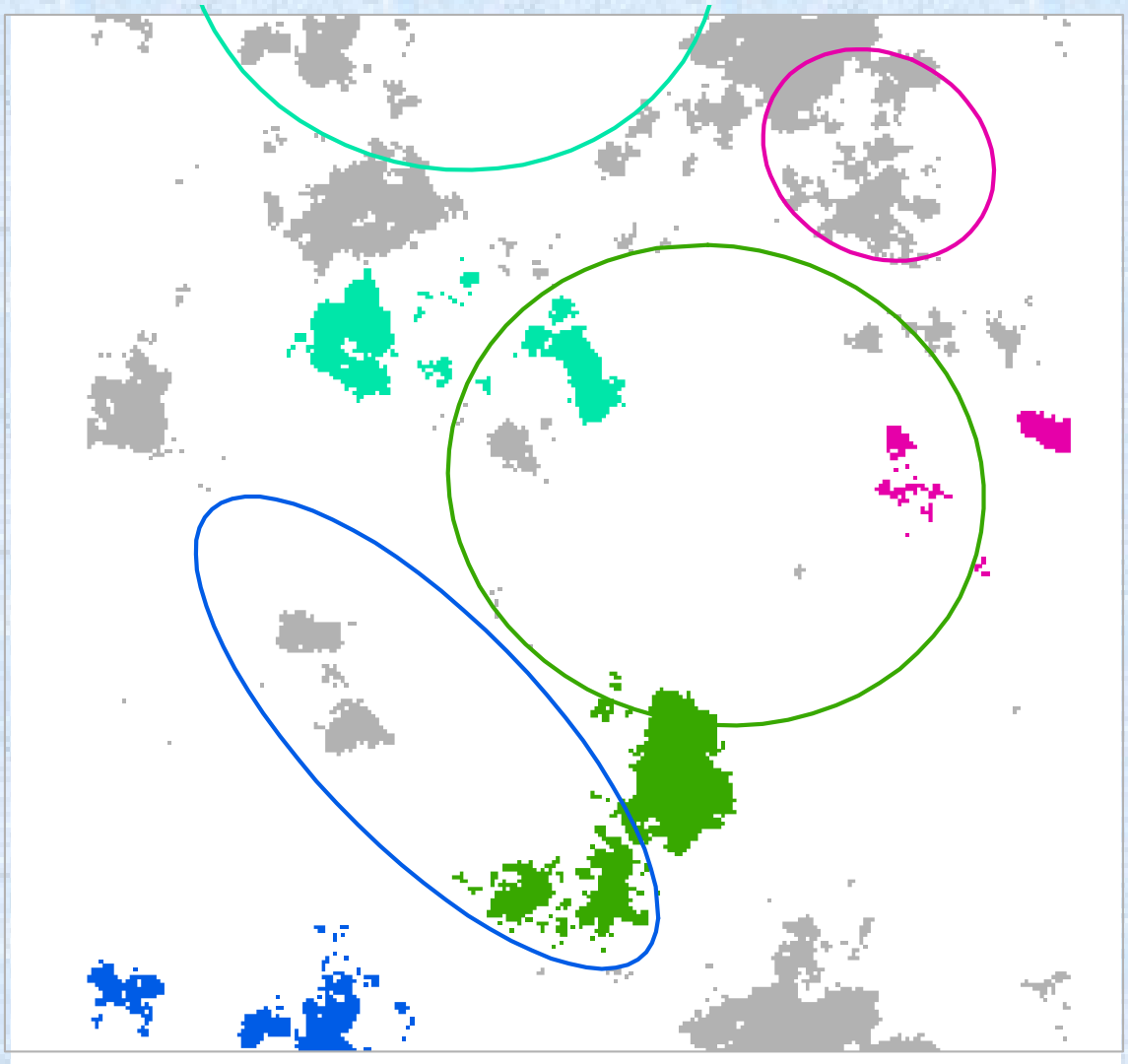
Huntley et al. (2007) *A climatic atlas of European breeding birds*

The most recommended actions for conservation under climate change

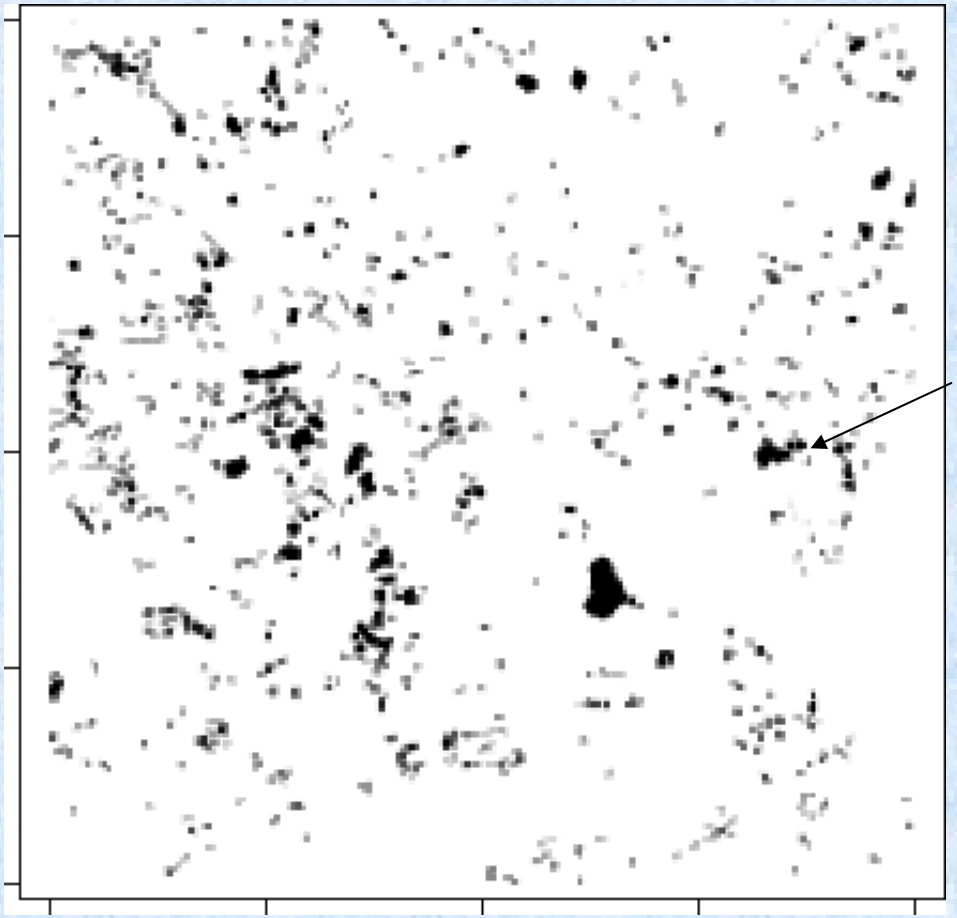
1	Increase connectivity	24
2	Integrate climate change into planning exercises	19
3	Mitigate other threats	17
4	Study response of species to climate change Practice intensive management to secure populations Translocate species	15
5	Increase number of reserves	13

Heller, NE and ES Zavaleta (2009). Biol. Conserv., **142**: 14.

Range shifts for multiple species in a fragmented landscape

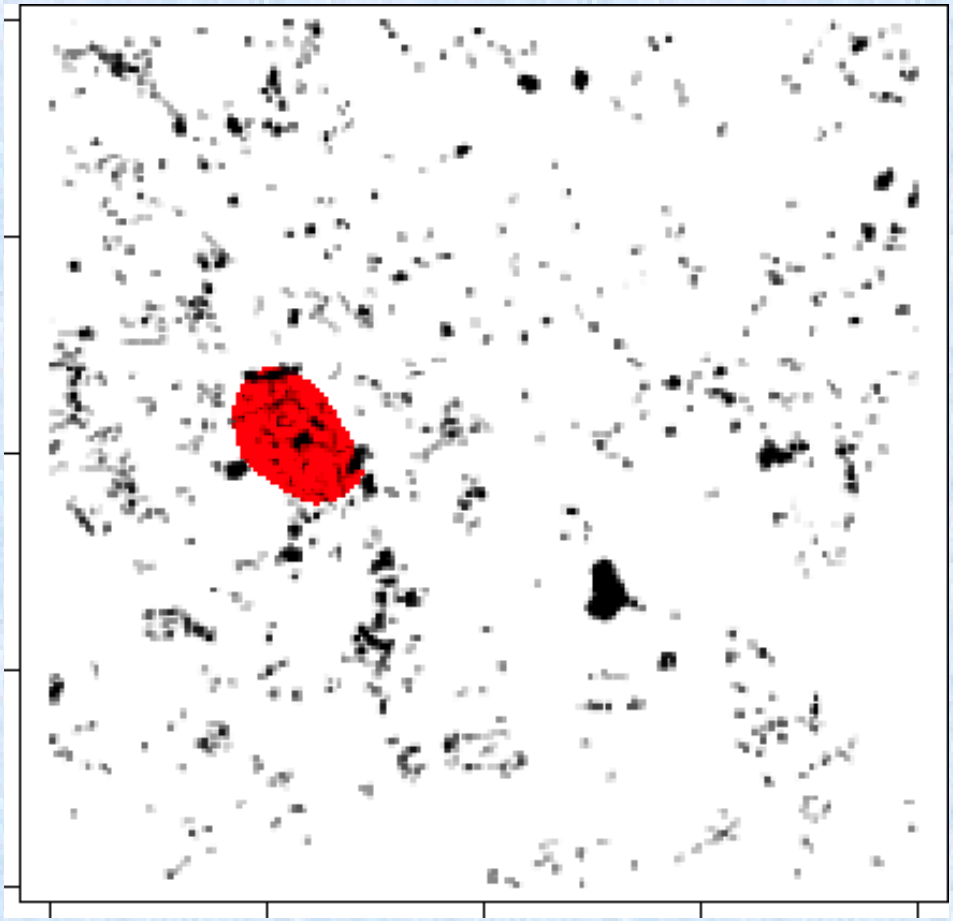


Habitat is fragmented - How could we add habitat to increase range-expansion speed?

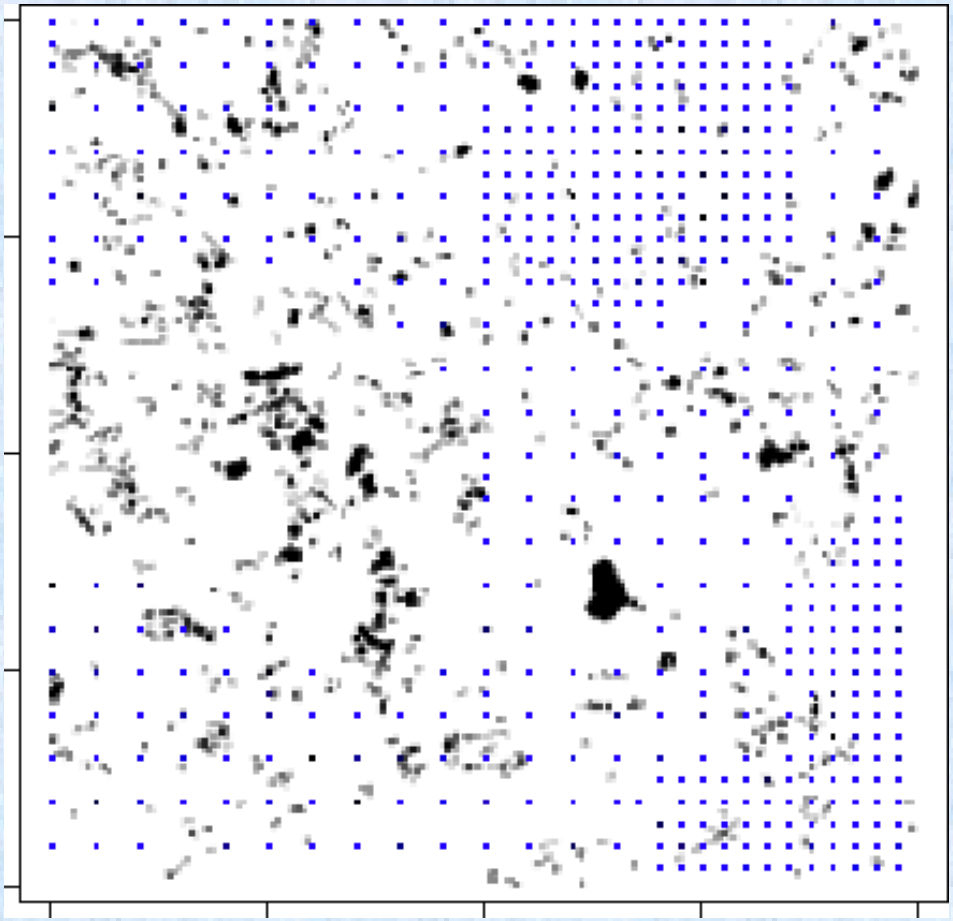


Hodgson JA *et al.* (2011) *Conservation Letters* **4:** 289–297

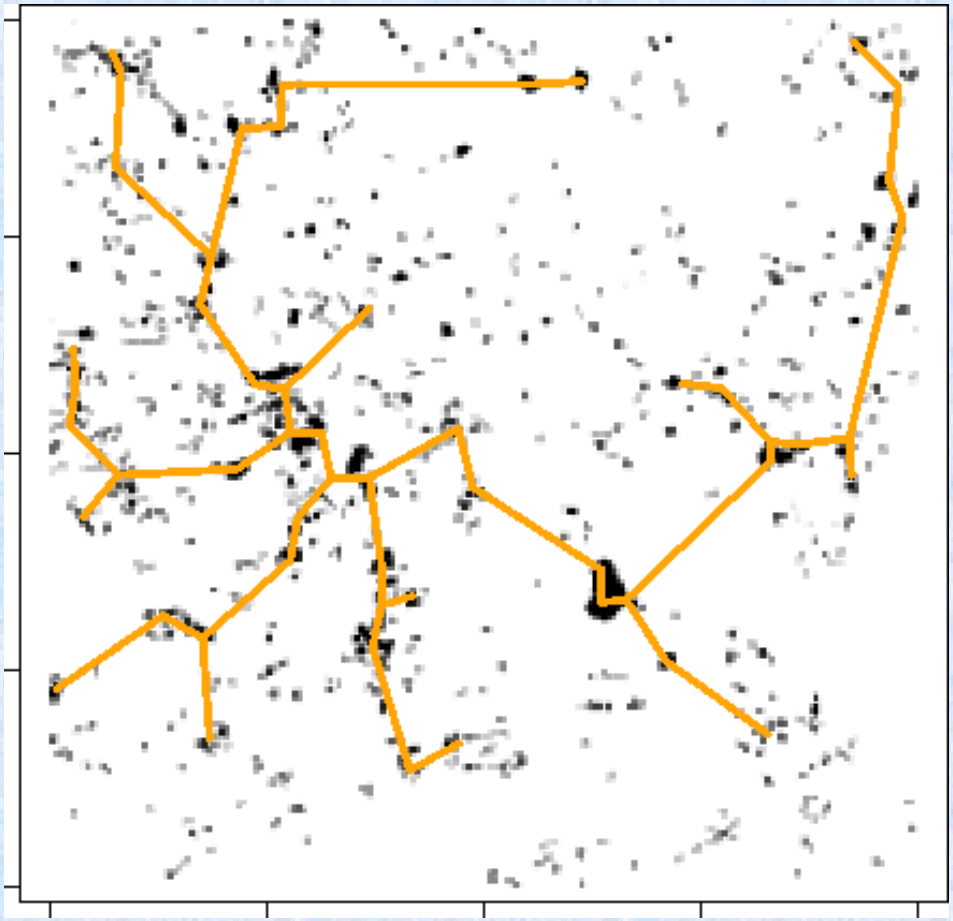
Maximum connectivity – enhance aggregation



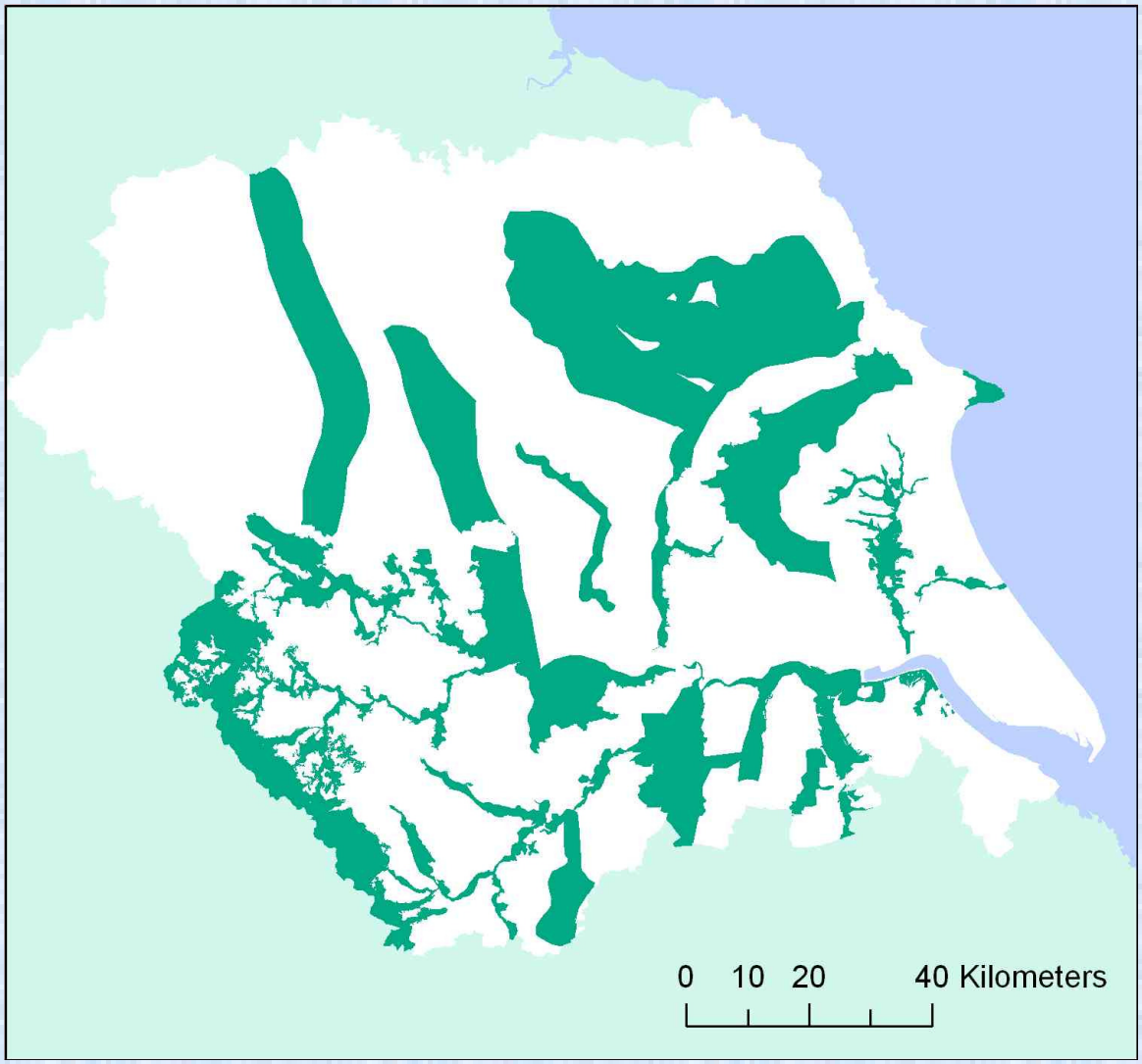
Minimum connectivity – enhance evenness



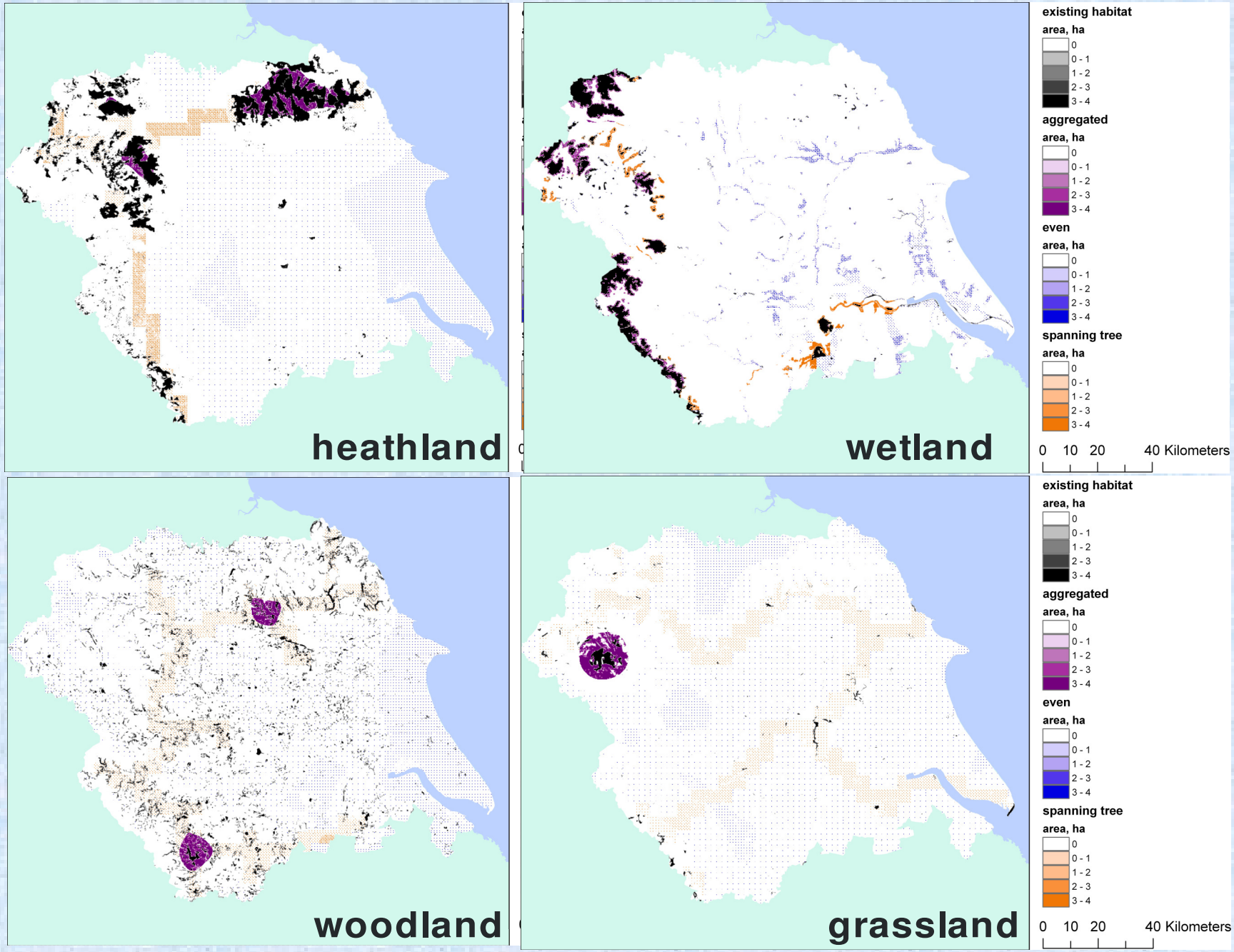
“Link” - try to find and fill important bottlenecks



Stakeholder-identified “opportunities”



Biodiversity Opportunity Landscape Scale Project Areas © Natural England/YHBF


heathland
wetland
woodland
grassland
existing habitat
area, ha
0
0 - 1
1 - 2
2 - 3
3 - 4
aggregated
area, ha
0
0 - 1
1 - 2
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even
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2 - 3
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spanning tree
area, ha
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0 10 20 40 Kilometers
existing habitat
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spanning tree
area, ha
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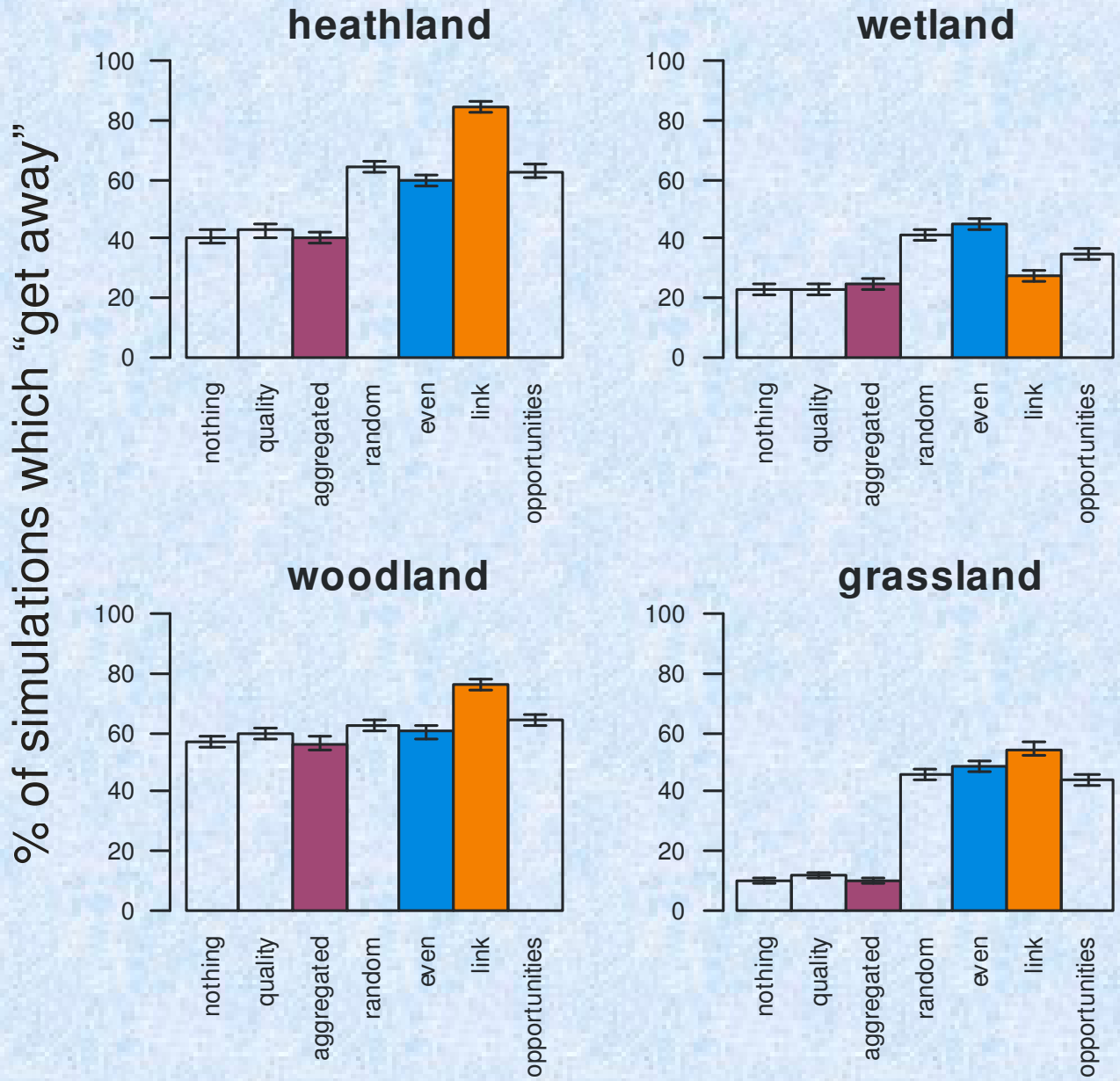
2 - 3
3 - 4
0 10 20 40 Kilometers

Modelling approach

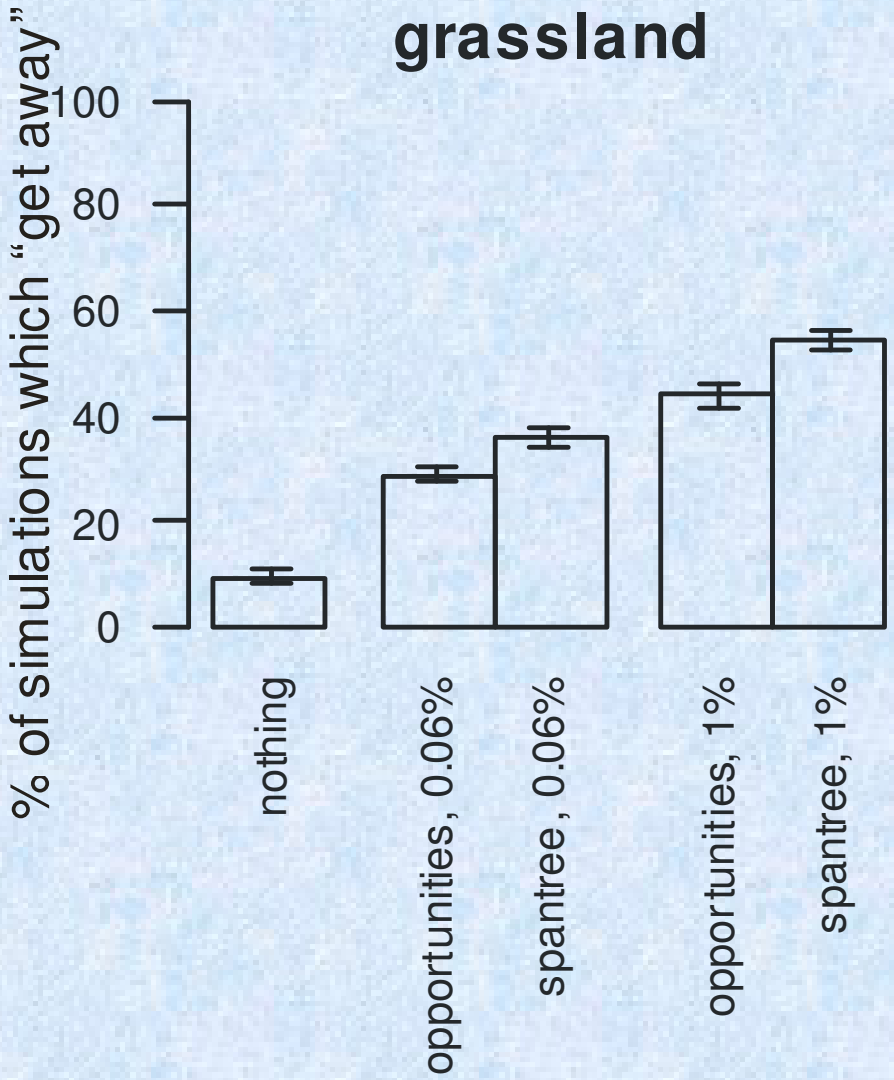
- Simulation model with 24 combinations of species traits
- Start range shift from a randomly-chosen origin
- Measure “getaways” – whether expansion starts or stalls

Results


heathland
wetland
woodland
grassland
% of simulations which "get away"
0
20
40
60
80
100
nothing
quality
aggregated
random
even
link
opportunities

Does the order of strategies depend on…

- Total amount of habitat added?
  - No, for realistic amounts we tried
- More habitat is always better!



Does the order of strategies depend on…

- Species?
  - Not much, most species' responses correlated
  - But species with lowest dispersal and lowest population density could not expand with any strategy

Conclusions

- “Connectivity” is ambiguous
- If it means putting habitat close to other habitat, this helps population persistence
- But climate change changes the rules
- Large scale links become important
- But effective links could take many forms (random sprinkles or thick ribbons)
- Less debating, more re-creating?

Acknowledgements

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