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BIODIVERSITY
SPATIAL PLANNING
CLIMATE CHANGE

Preparing the scene for biodiversity responses to climate change: What can policy makers and planners do?

Eveliene Steingröver and Sabine van Rooij
Alterra Wageningen NL

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BRANCH: the challenge

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Key outputs

- Species loose ground and are less protected
- Habitat fragmentation prevents many species responding to climate change

- *BRANCH proposes:*
- Adaptation strategies, different for species with different responses

- Evaluation method for climate proof networks

- Basis for strategic planning and design method for adapting conservation networks

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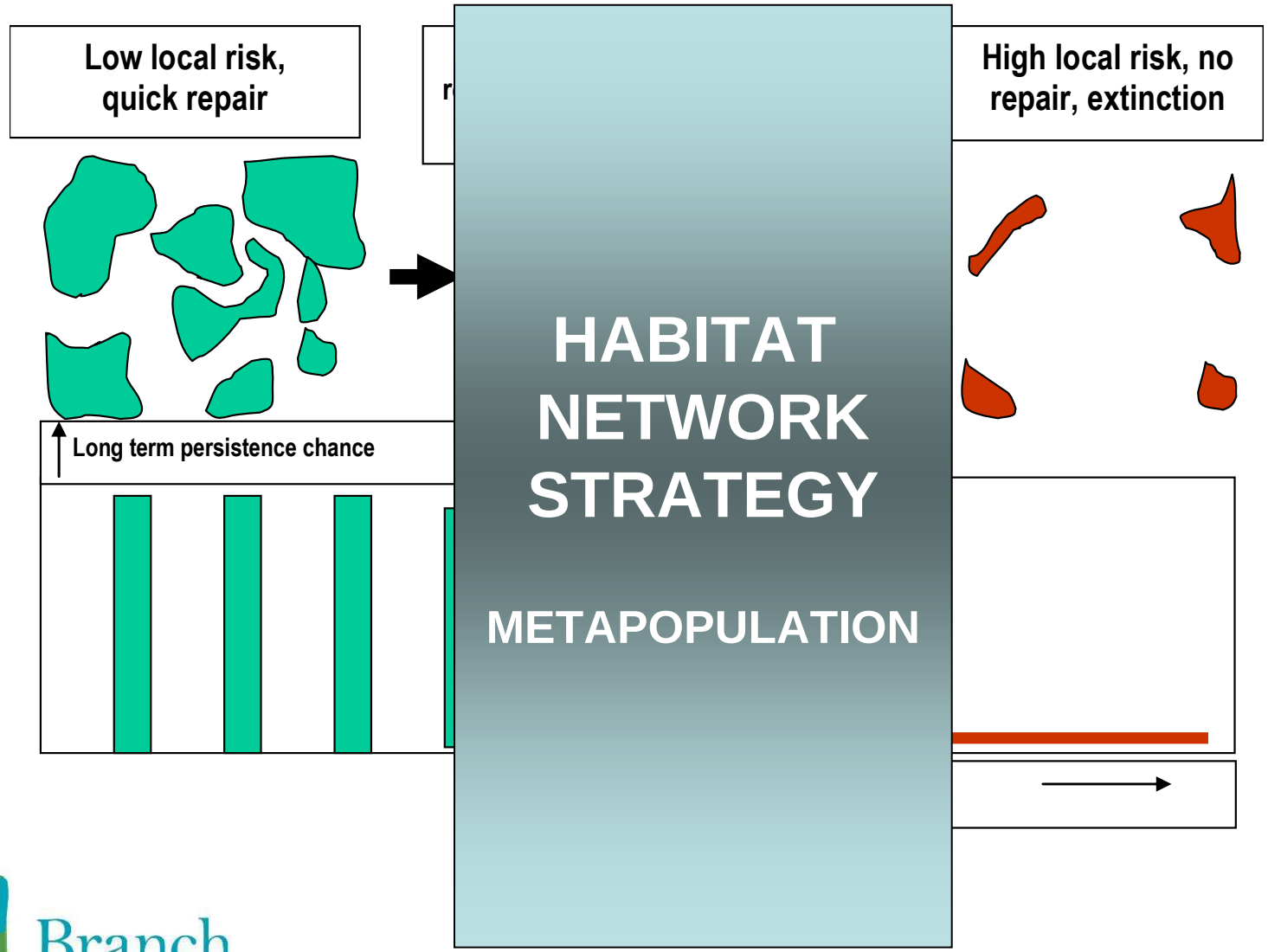
Habitat fragmentation: a conservation strategy



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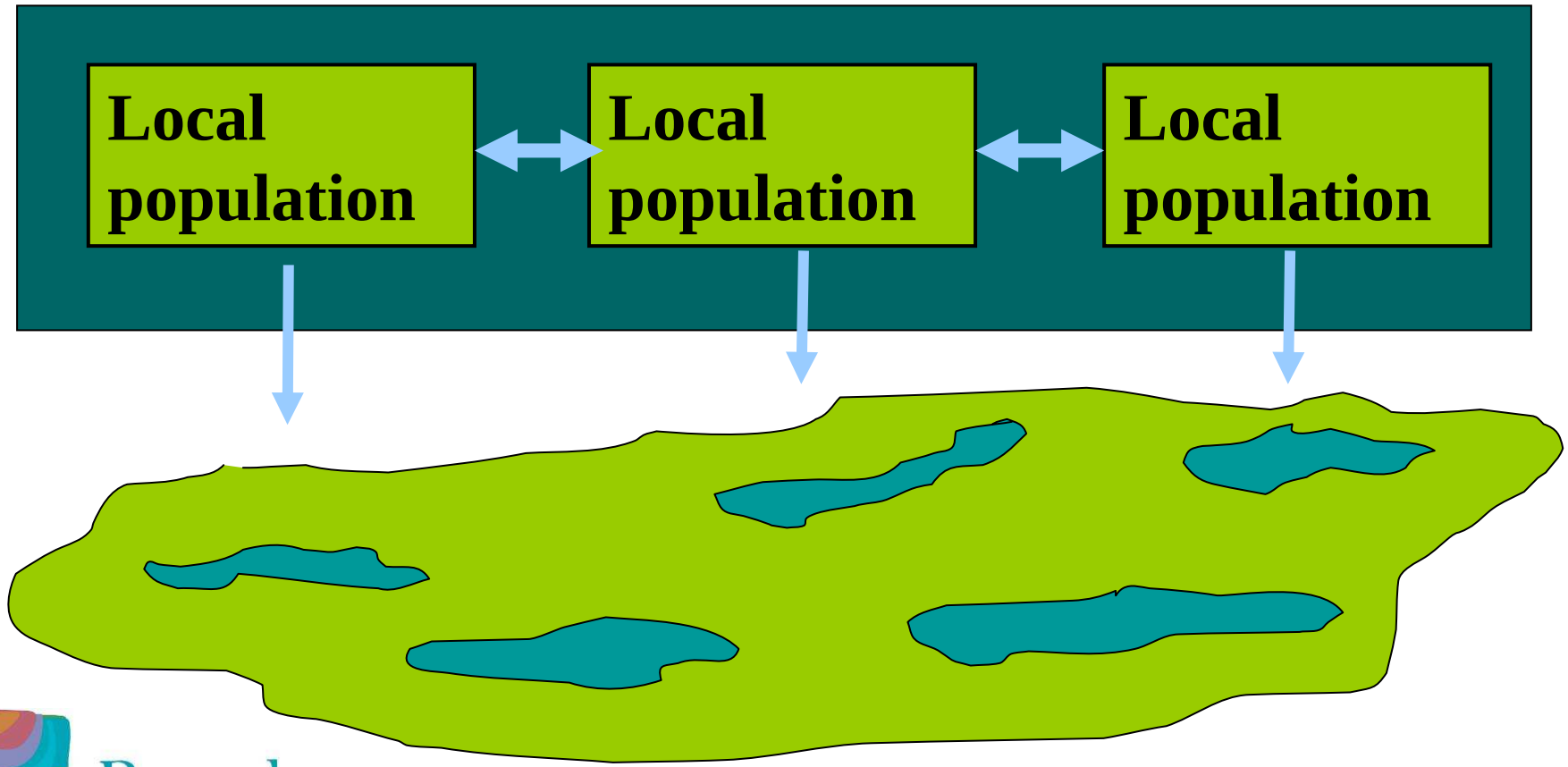
Habitat network strategy: in metapopulations the local risk is spread over the network



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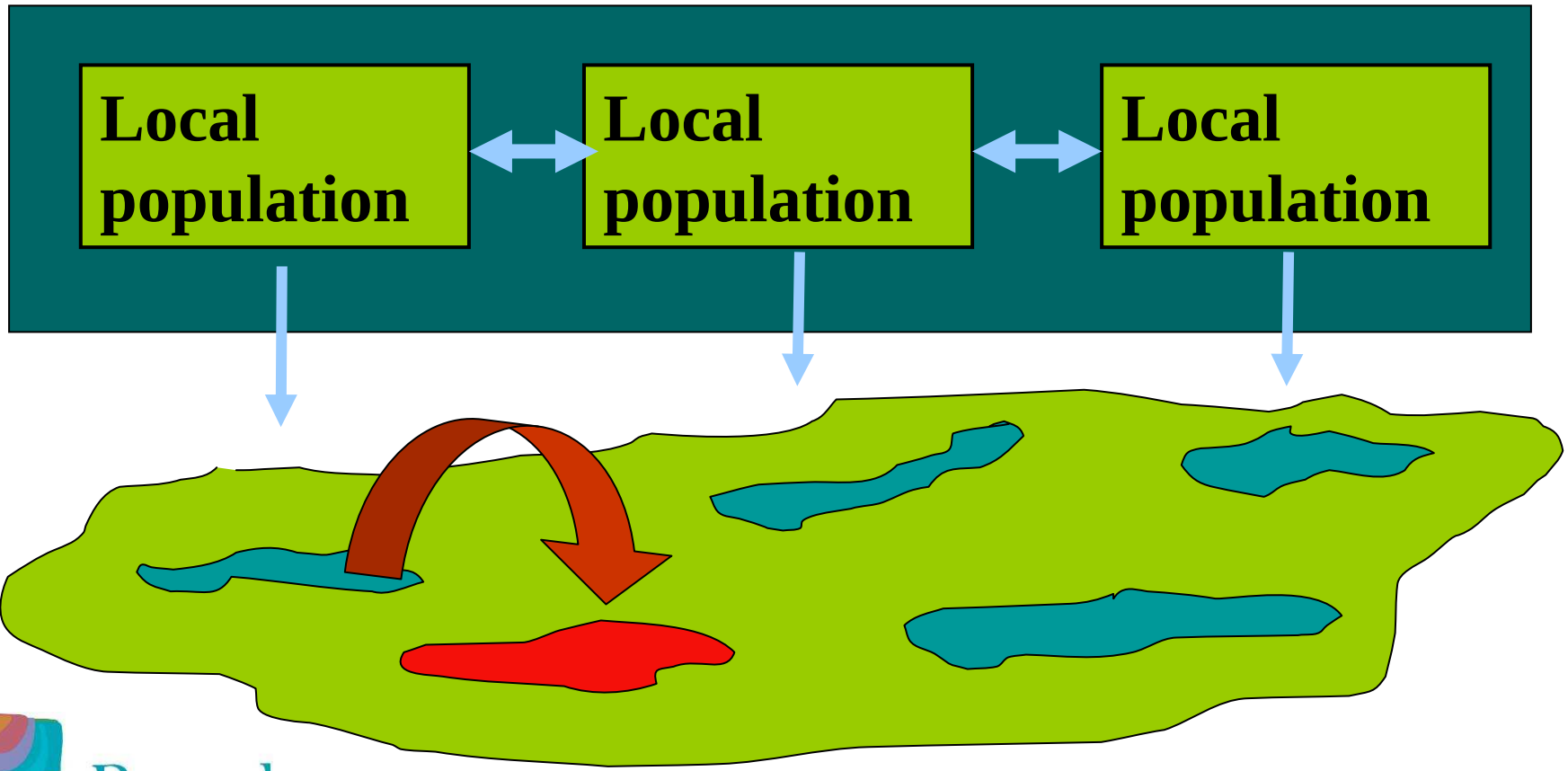
Spreading the risk:
a local mishap is repaired



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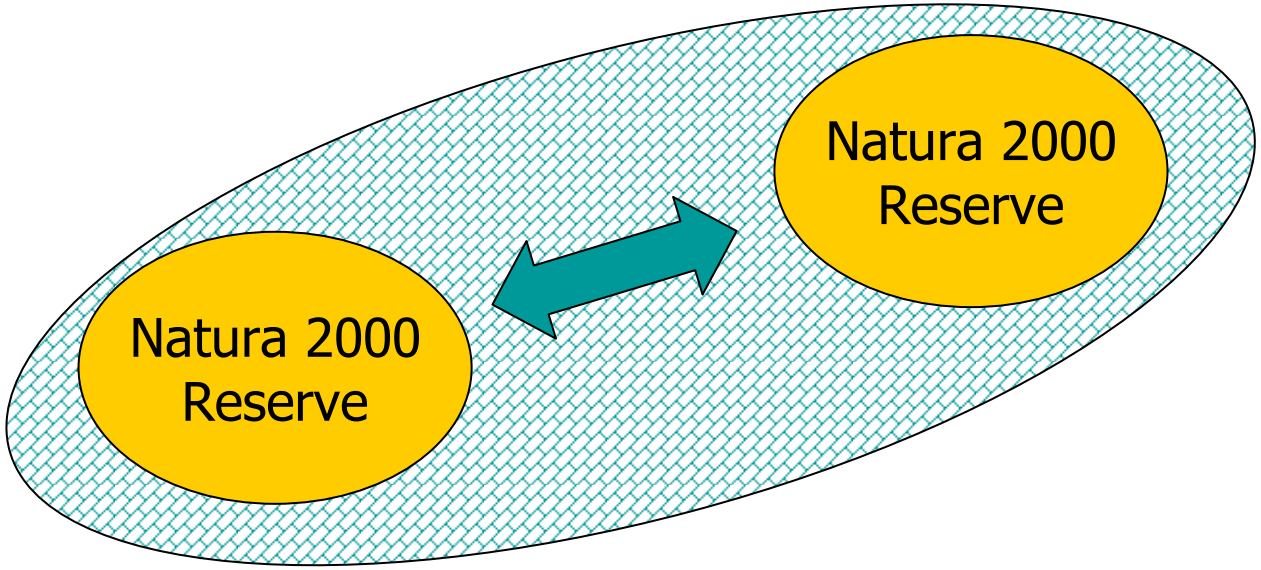
Habitat Directive is based on this theory

- Network of reserves embedded in multifunctional landscape, allowing mutual support



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However: this whole idea is based on the assumption of ***stable distributions***

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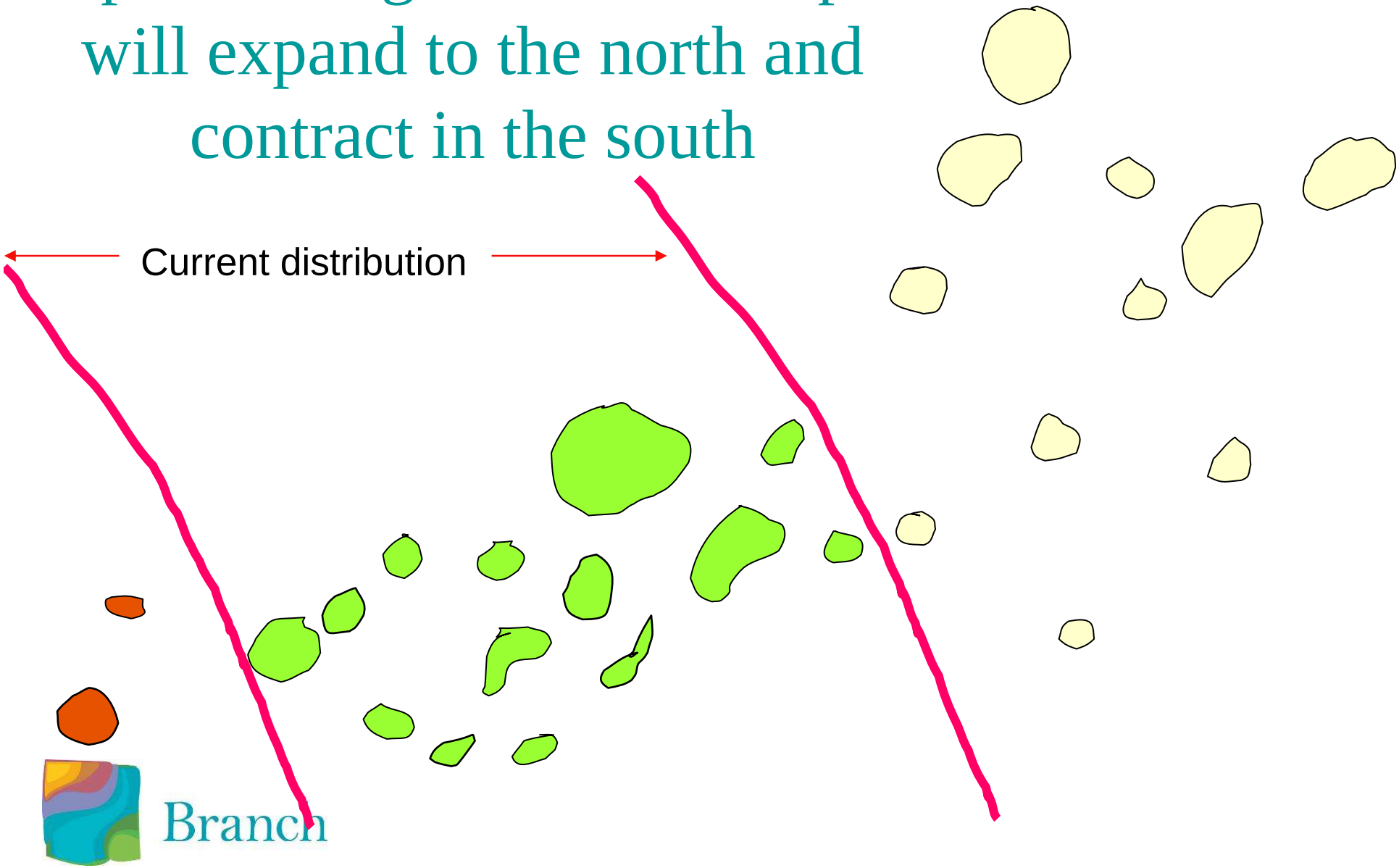
Species ranges across Europe will expand to the north and contract in the south



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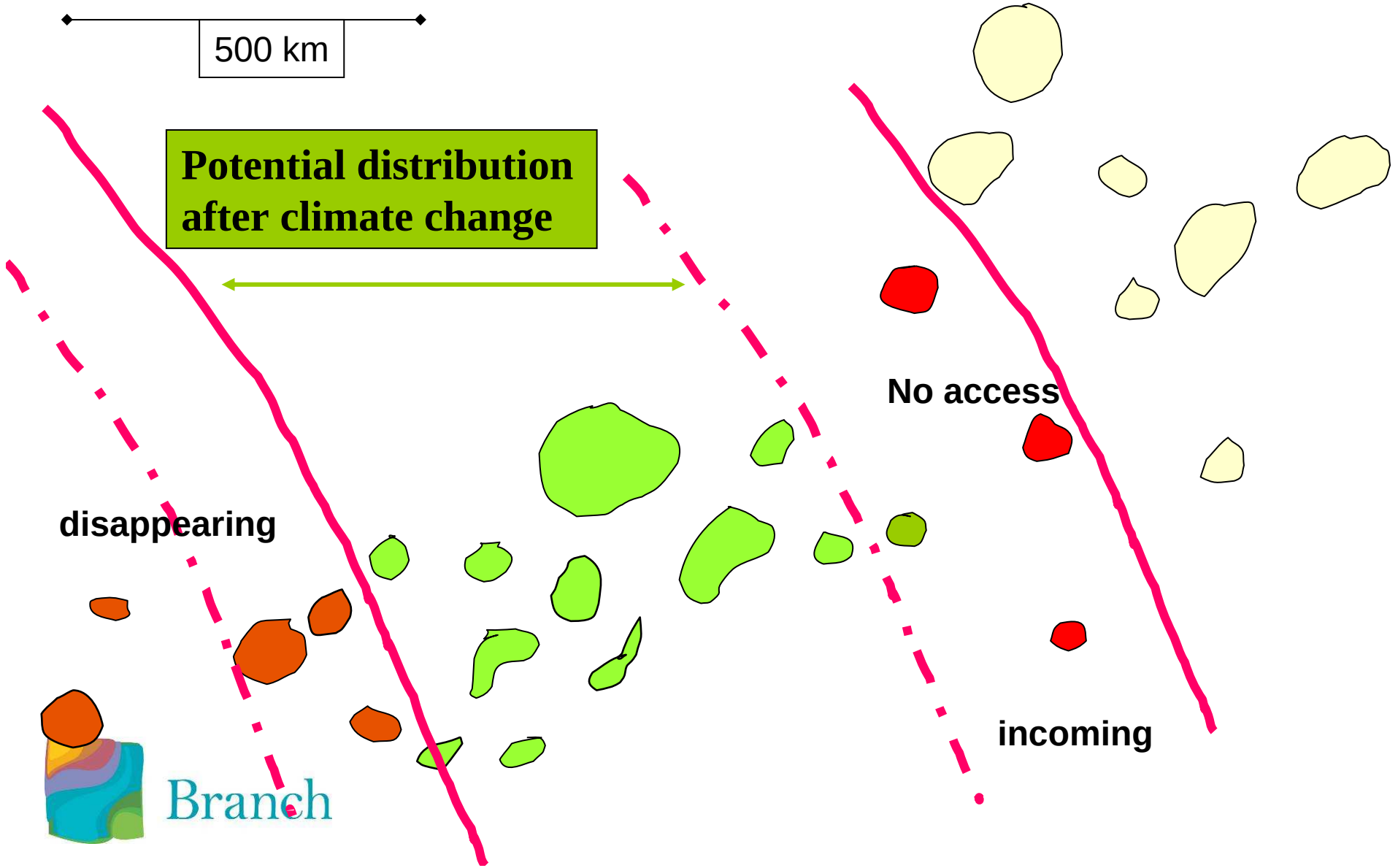
But land use patterns may block expansion



Moving targets

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BRANCH questions:

- Given the predicted change in climate space:
- Can species respond, and where does the landscape restrict options for such a response?
- How can these bottlenecks be overcome? What regional adaptation strategies might be effective?

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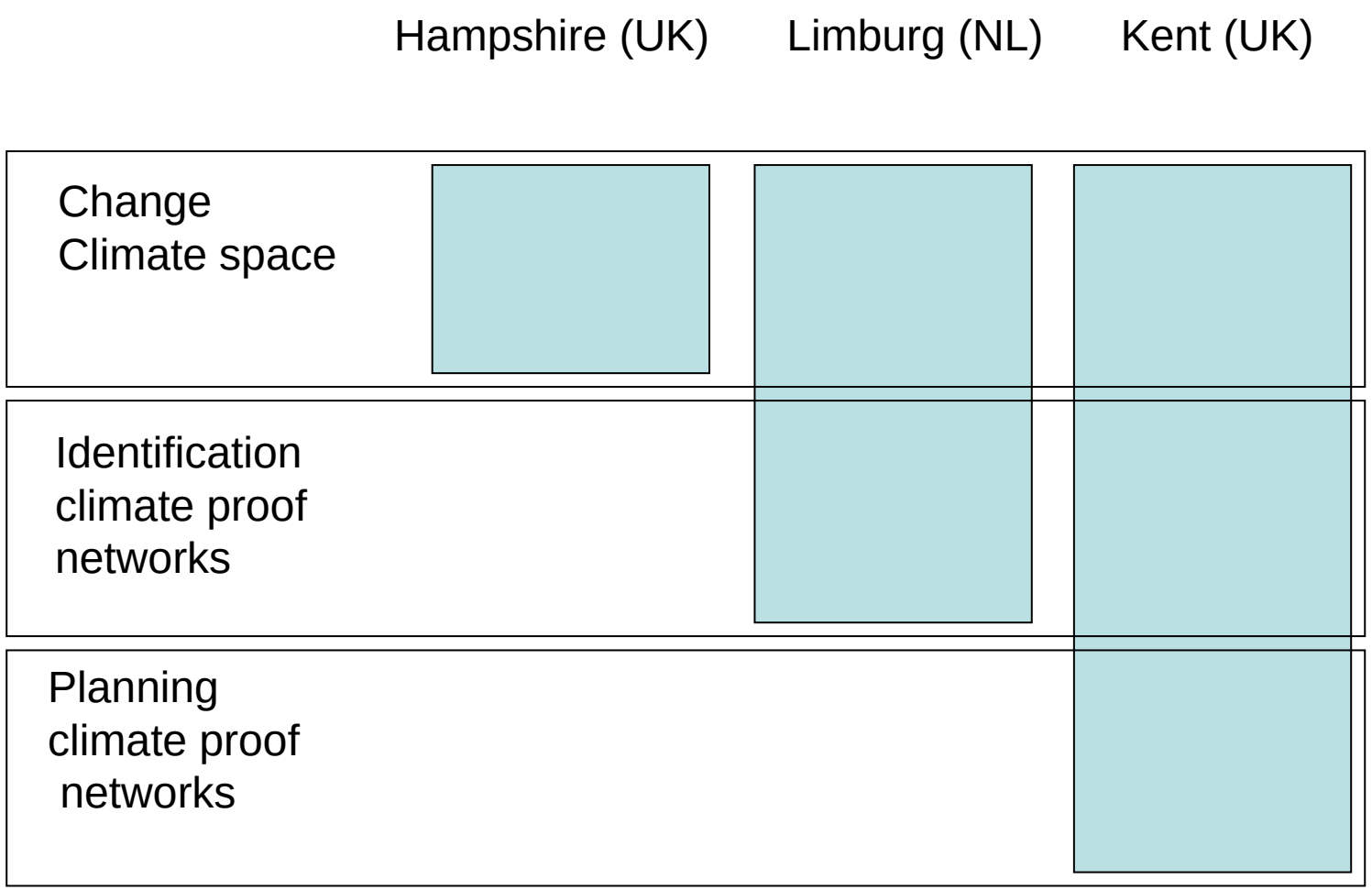
Terrestrial case studies



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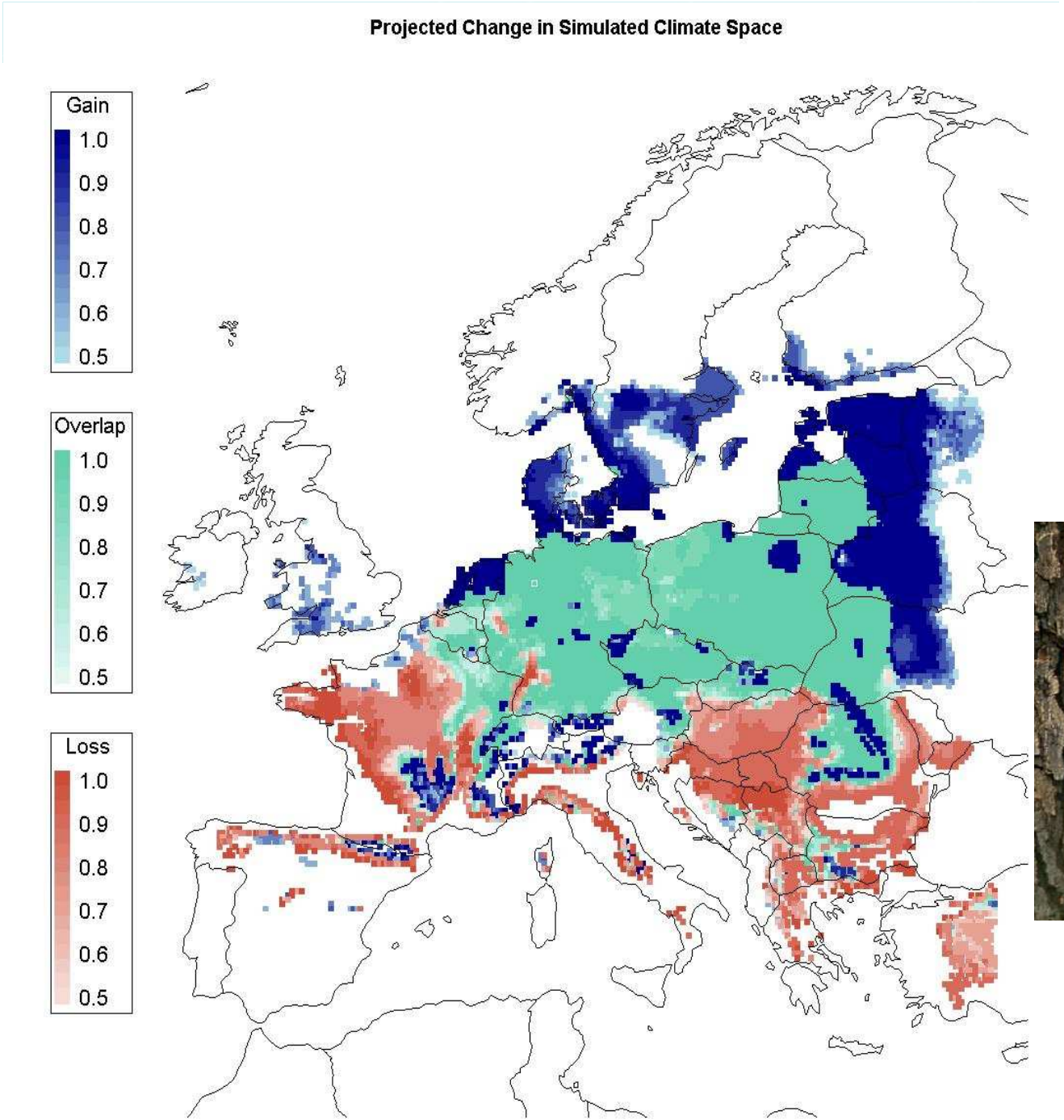

Example: Middle spotted woodpecker

Climate driven range dynamics (386 species, Europe)

Species losing 10% or more of climate space	61%
Species gaining 10% or more in climate space	37%
Species with no new climate space (northern distr.)	24%

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If climate space shifts,
will species be able to expand into the new space?

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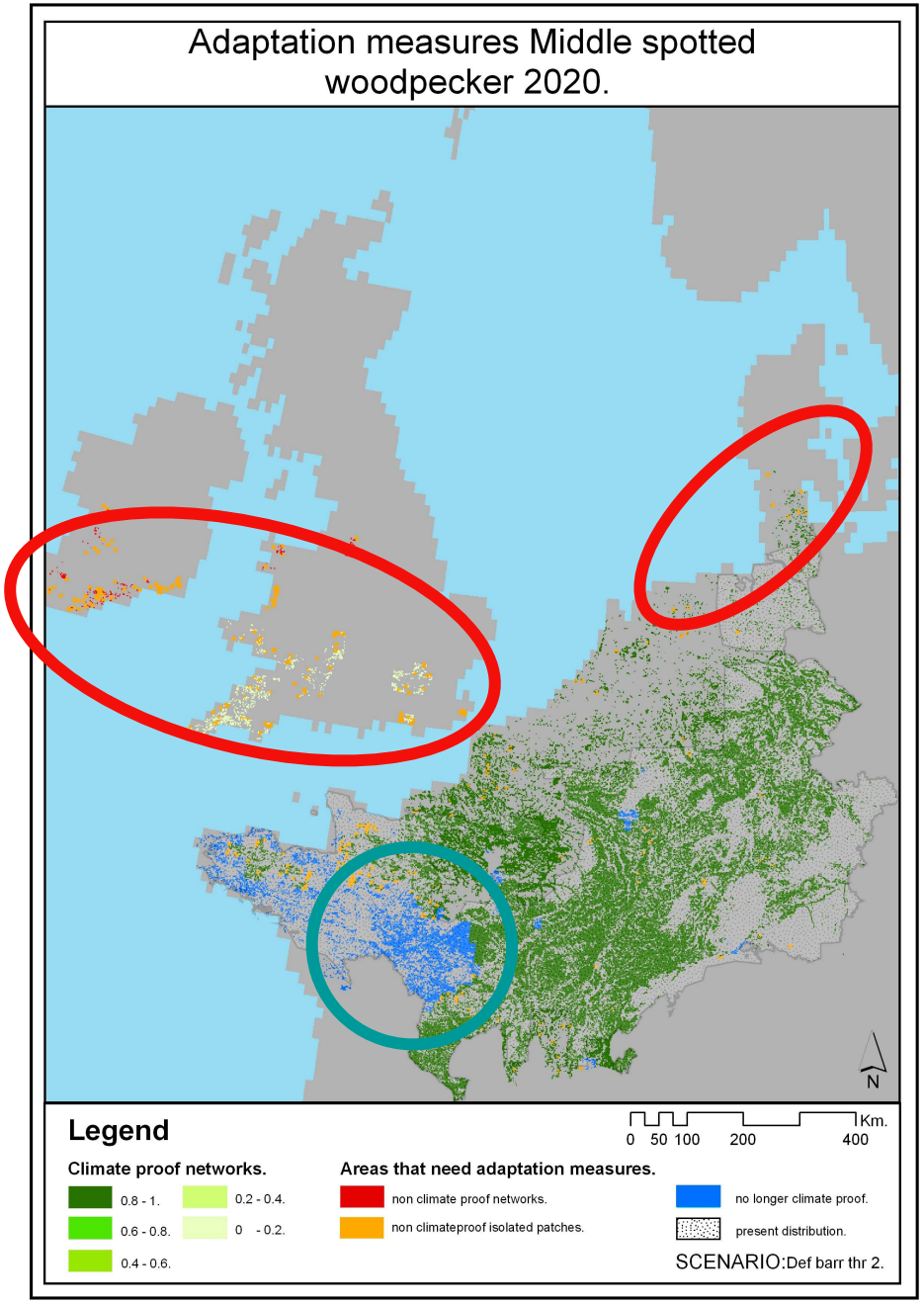

1. Climate proof networks

2. Focal areas for adaptation 2020

What are the consequences?

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Loss of area for living in NW EUR

	Loss 2020	Loss 2050
Black Woodpecker	33	***71***
Middle spotted woodp	12	***55***
Agile frog	3	11
Bittern	8	16
Meadow pipit	29	***81***
Large heath butterfly	19	33
Brown hare	15	29
Meadow pipit	38	***77***
Pool frog	17	38

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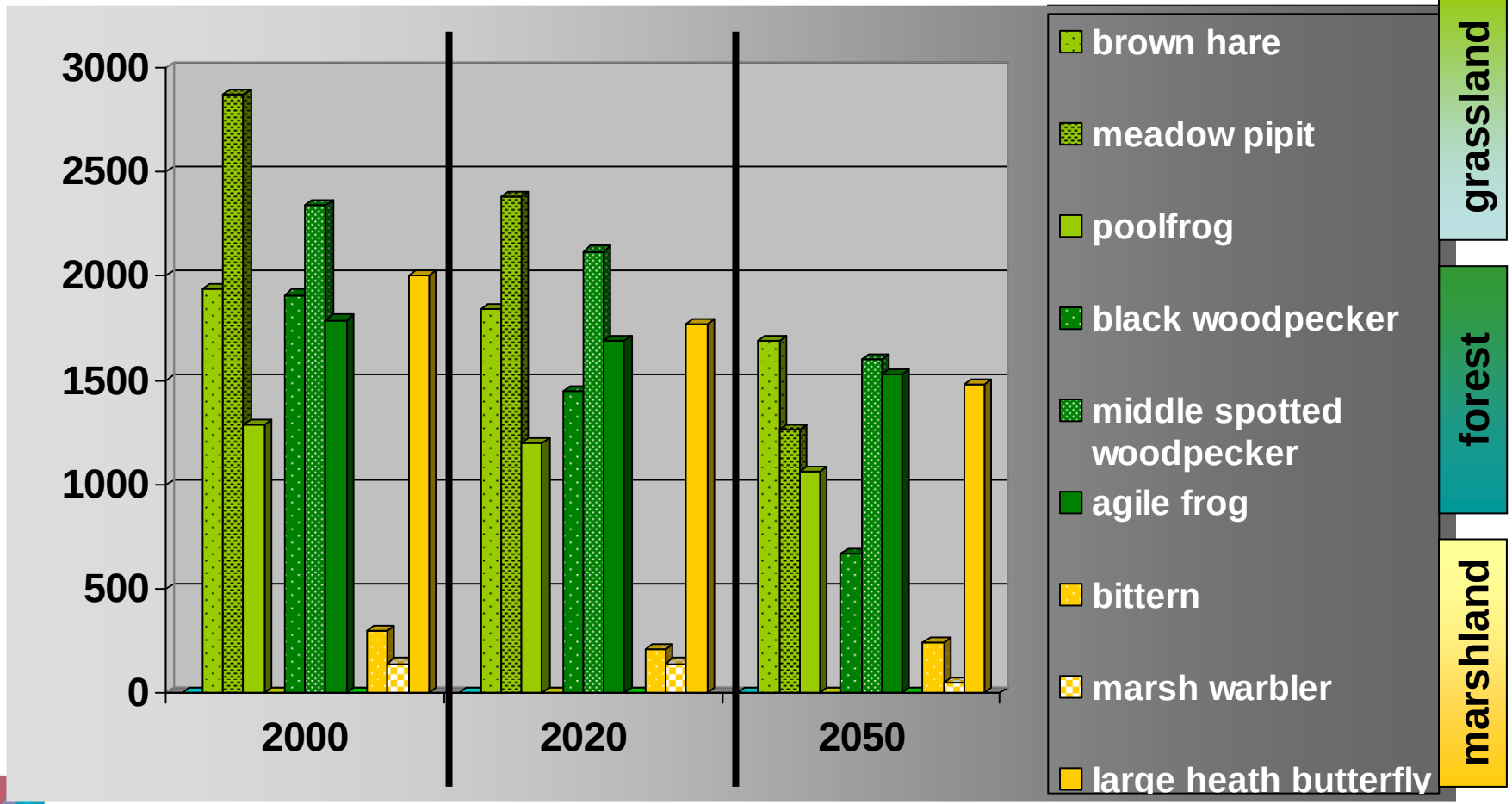
Loss of legal protection

Habitat (x1000 ha) now protected under EU-Hab. Directive in predicted climate space within NW-Europe



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Causes:

- Less habitat available to the north
- Species can’t expand into new climate space due to habitat fragmentation

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Planning adaptation measures at the local level

- Method to assess long term perspective on habitat changes;

  Hampshire UK

- Evaluation method for robust corridor;

  Limburg NL

- Design method for ecosystem network;

  Kent UK

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Example of a declining species

Green-ribbed sedge (*Carex binervis*)

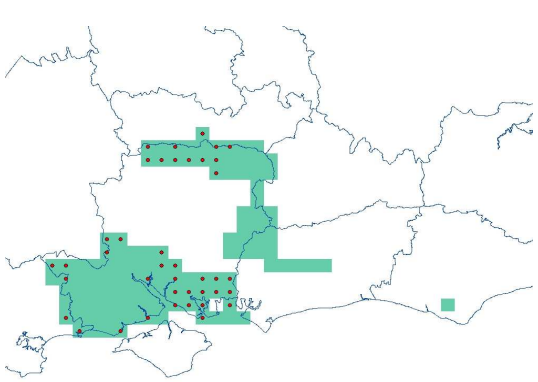
Species of Lowland Heath

Climate REMAINS suitable

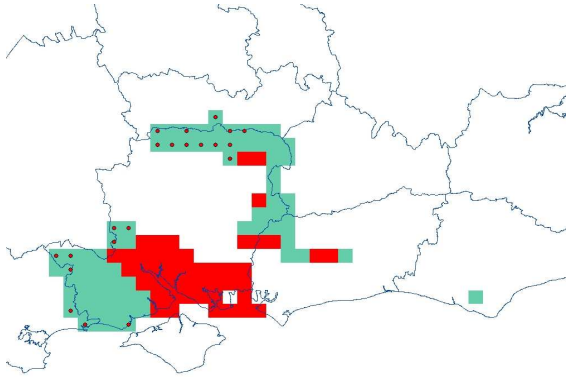
NEW suitable climate space

LOST suitable climate space.

becomes suitable if habitat is recreated.



2020 and 2050



2080, High scenario

Under the 2080: major changes in species composition/ loss of habitats

→ Expansion of habitat area and improvement of quality will help species / habitat to persist longer

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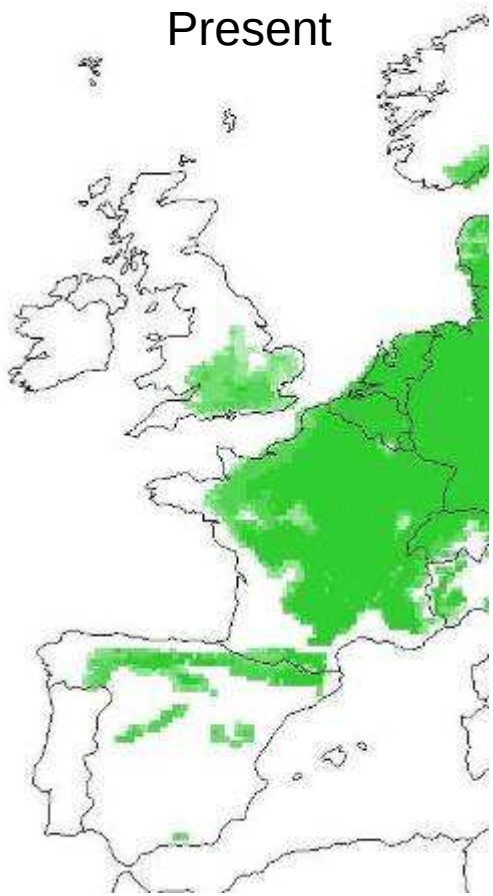
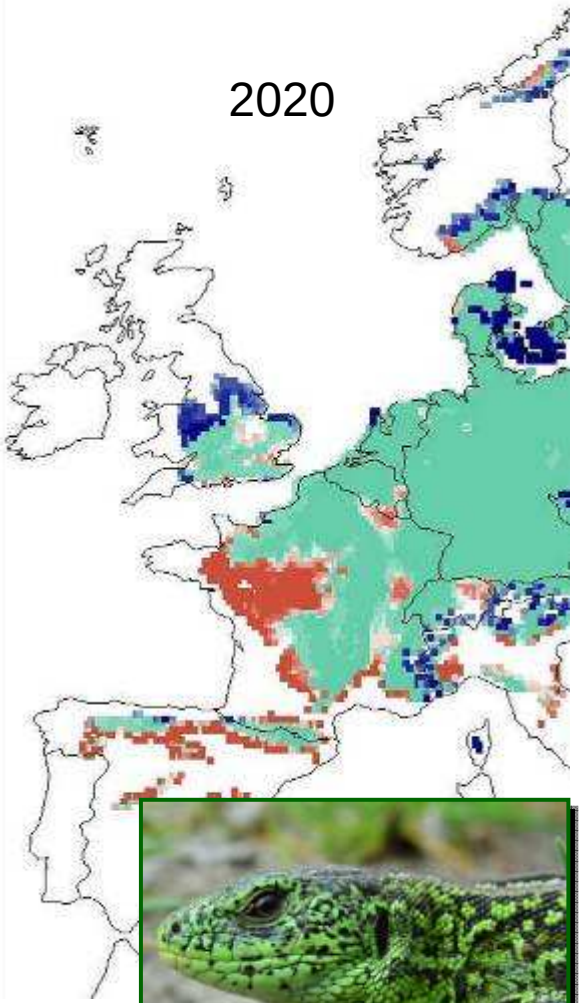
Change suitable climate space

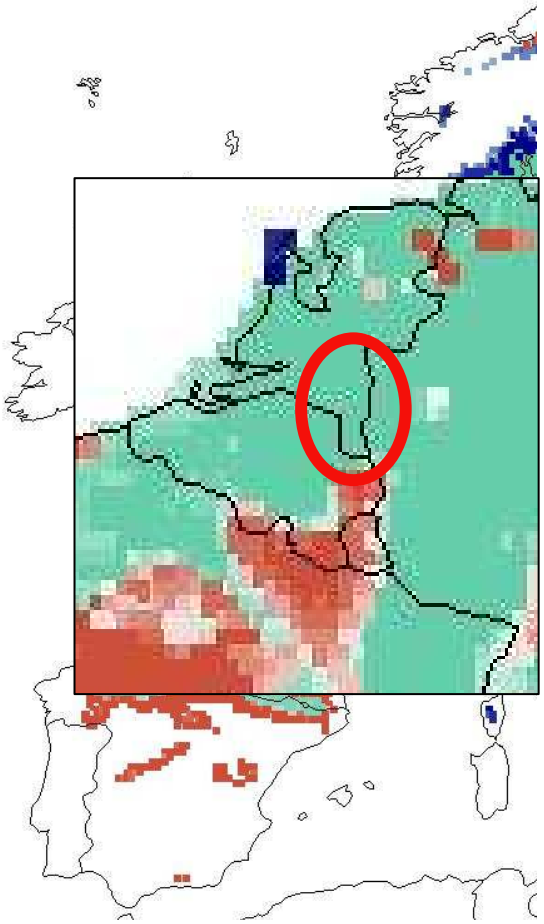
Present

2020

2050







Gain
1.0
0.9
0.8
0.7
0.6
0.5

Overlap
1.0
0.9
0.8
0.7
0.6
0.5

Loss
1.0
0.9
0.8
0.7
0.6
0.5

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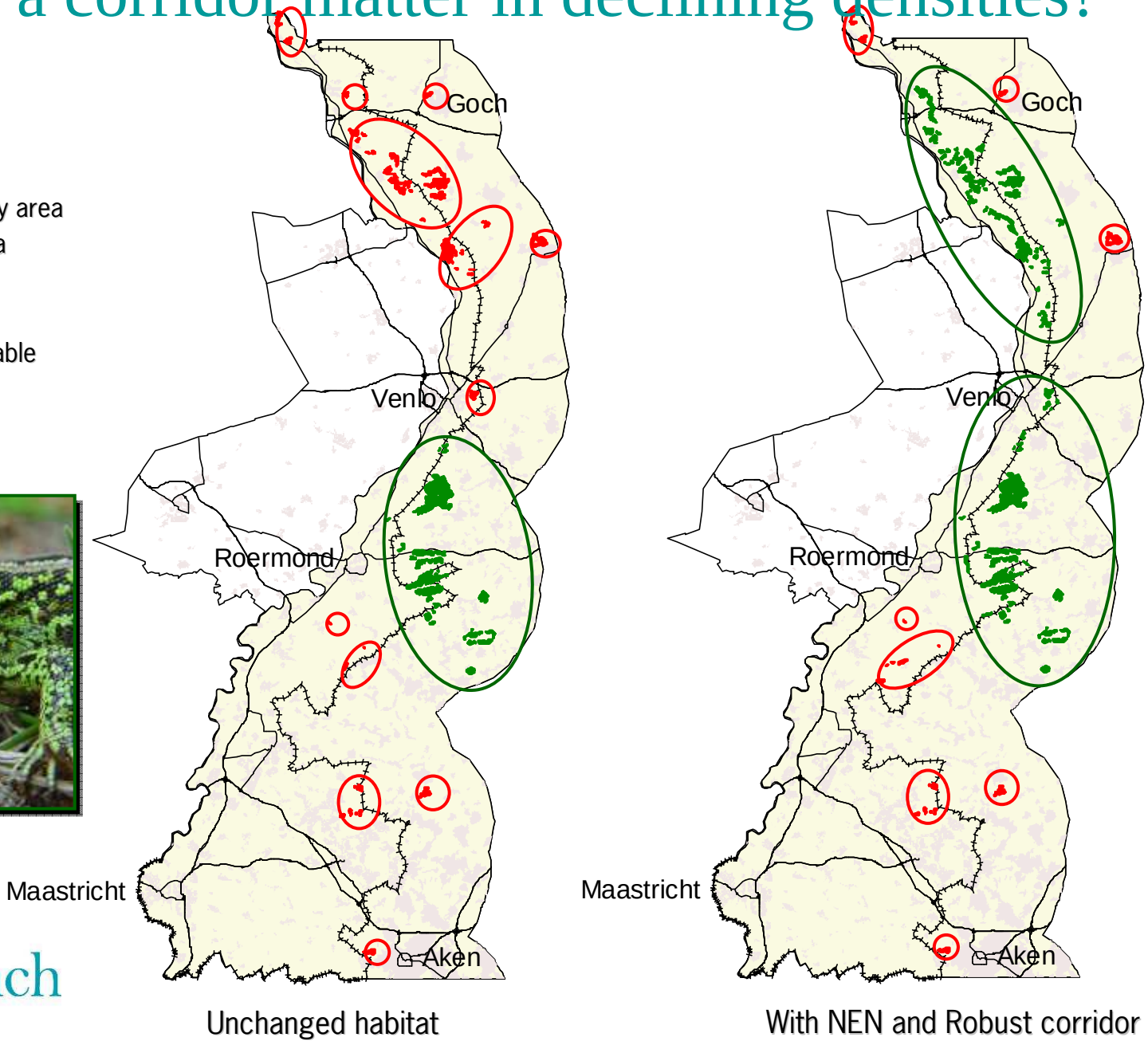
Does a corridor matter in declining densities?



Unchanged habitat

With NEN and Robust corridor

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Effectiveness of robust corridor

Species information			Without Robust Corridor		With Robust Corridor	
	Expected trend	Fragmentation prone	Occurrence pattern	Persistence chance	Occurrence pattern	Persistence chance
Incoming/ increasing species						
Dartford Warbler	↑	*Moderate*	*Increase*	*Regionally good*	*Increase*	*Regionally good*
Cetti's Warbler	↑	*Moderate*	*Increase*	*Locally good*	*Strong increase*	*Regionally good*
Present/ increasing species						
Woodlark	↑	*Moderate*	*Increase*	*Regionally good*	*Increase*	*Regionally good*
Bechstein's Bat	↑	*High*	*Local increase*	*Locally good*	*Spread throughout*	*Regionally good*
Purple Emperor	↑	*High*	*Local increase*	*Locally good*	*Spread throughout*	*Regionally good*
Declining/disappearing species						
Sand Lizard	↓	*High*	*Strong decrease*	*Risk of extinction*	*Moderate decrease*	*Regionally good*
Great Crested newt	↓	*High*	*Strong decline*	*Locally good*	*No analysis possible*	

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Kent ecosystem network design

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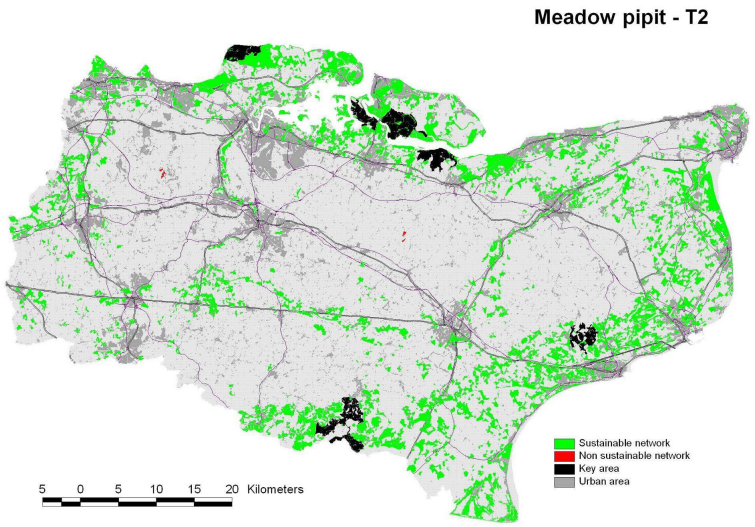
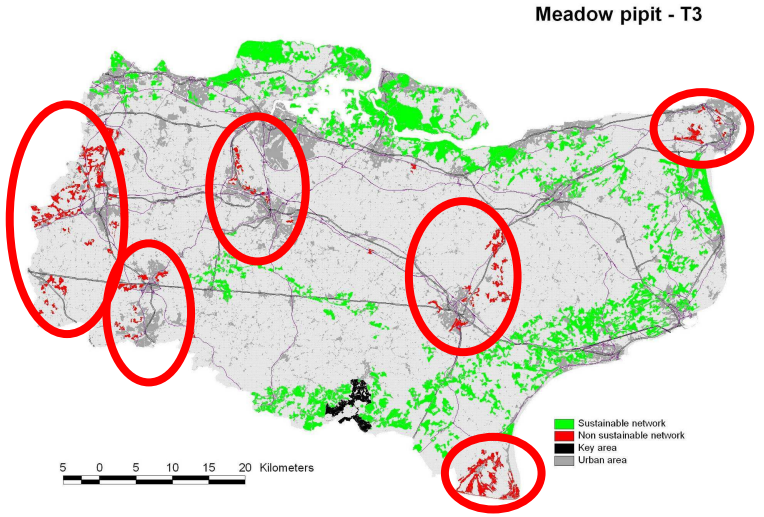
Meadow pipit – example of a declining species

Present



Future situation



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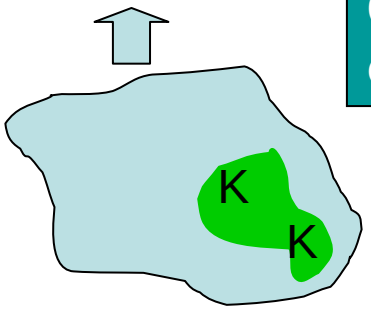
Adaptation strategies

Declining species



Carrying capacity ▲

Select robust climate proof NW + KA

Possible measures:

- add key areas
- increase network area
- connect Networks
- Improve habitat quality
- ….

Incoming/ future species

Connectivity ▲

Select preferable adaptation zone

Possible measures:

- connect Networks
- add Key areas
- robust corridor
- fine grained matrix networks
- ….

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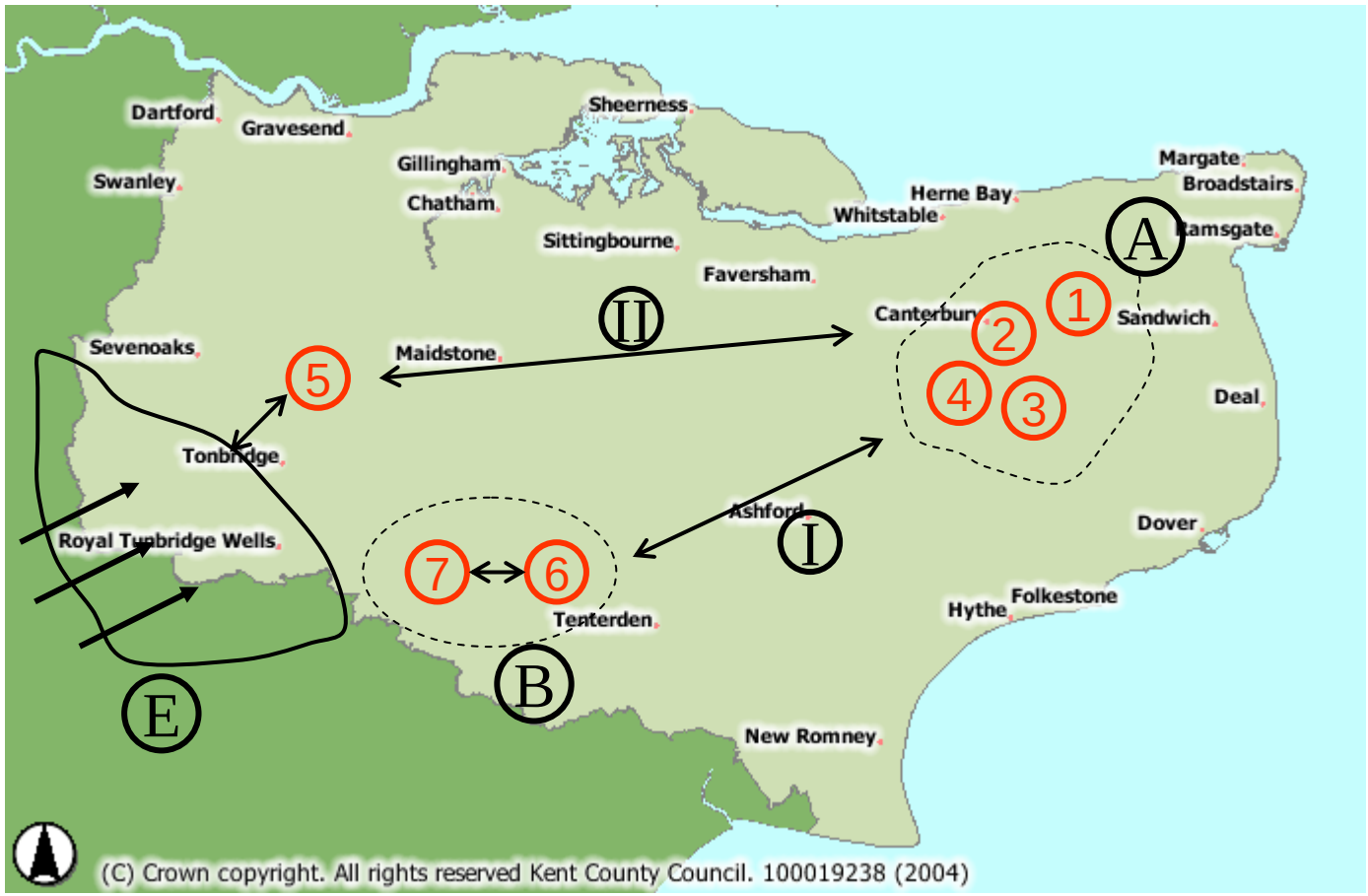
Example of adaptation strategies for woodland



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- **Claire Vos**
- **Rob Bugter**
- **Hans Baveco**

- **AND especially the many local experts**

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