

How to make the European landscape climate-change proof for biodiversity?



Prof. Paul Opdam



Notions



- Habitat fragmentation and land use prevent species to respond to climate change
- Adaptation of the landscape by improving cohesion based on the Natura 2000 network is the strategic answer
- Regional landscape planning is the arena

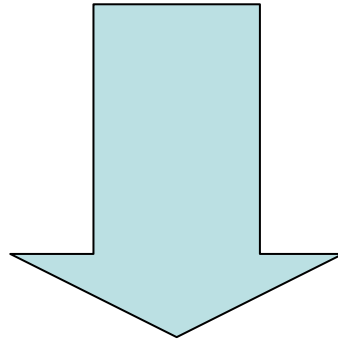


Key concepts

- **Landscape**=physical template for biodiversity.
- **Spatial cohesion**: an ecologically scaled landscape measure related to the persistence of metapopulations
- **Ecological network**: a functionally coherent pattern of ecosystems or nature areas, at a defined spatial scale

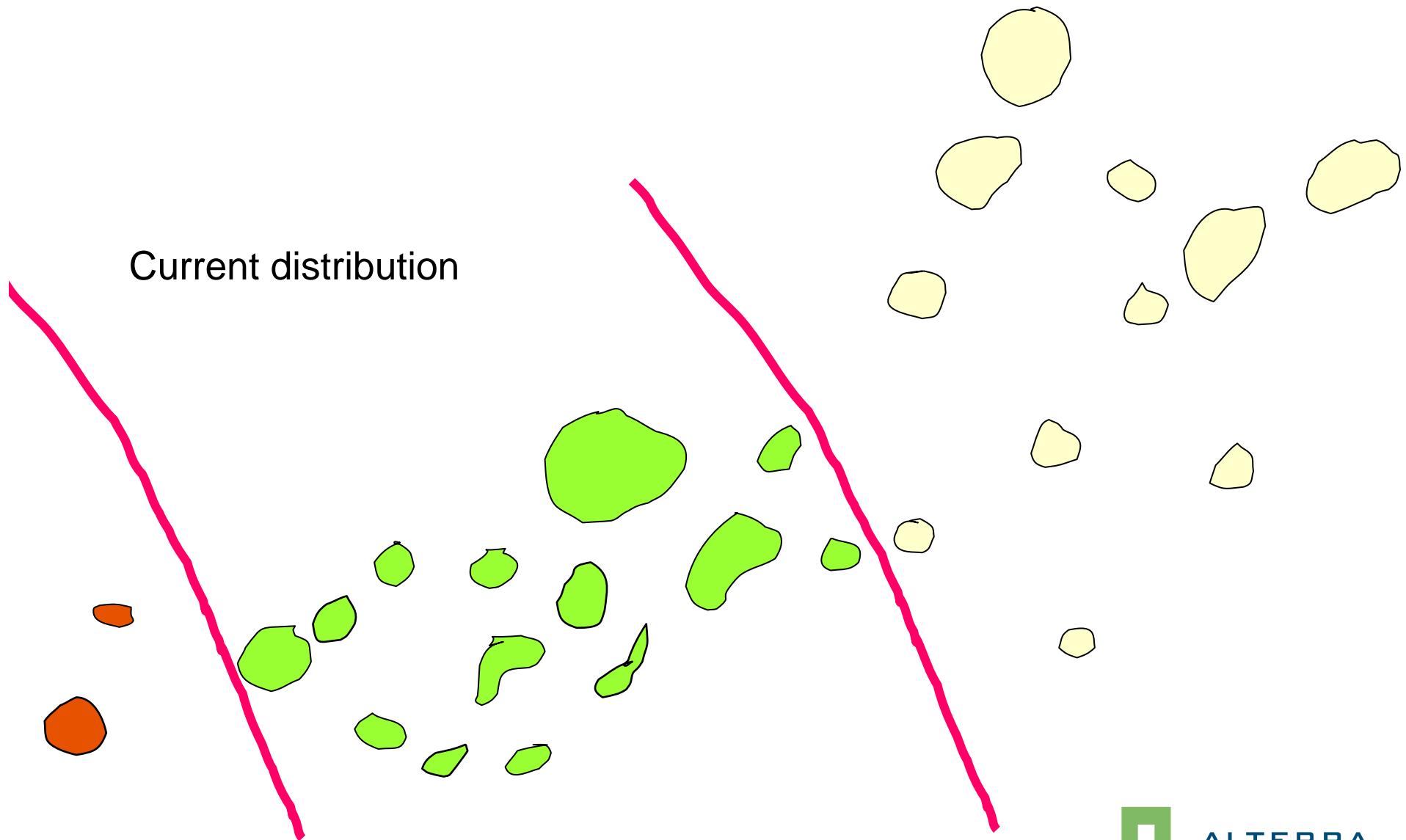
Five research topics

1. If temperature zones shift

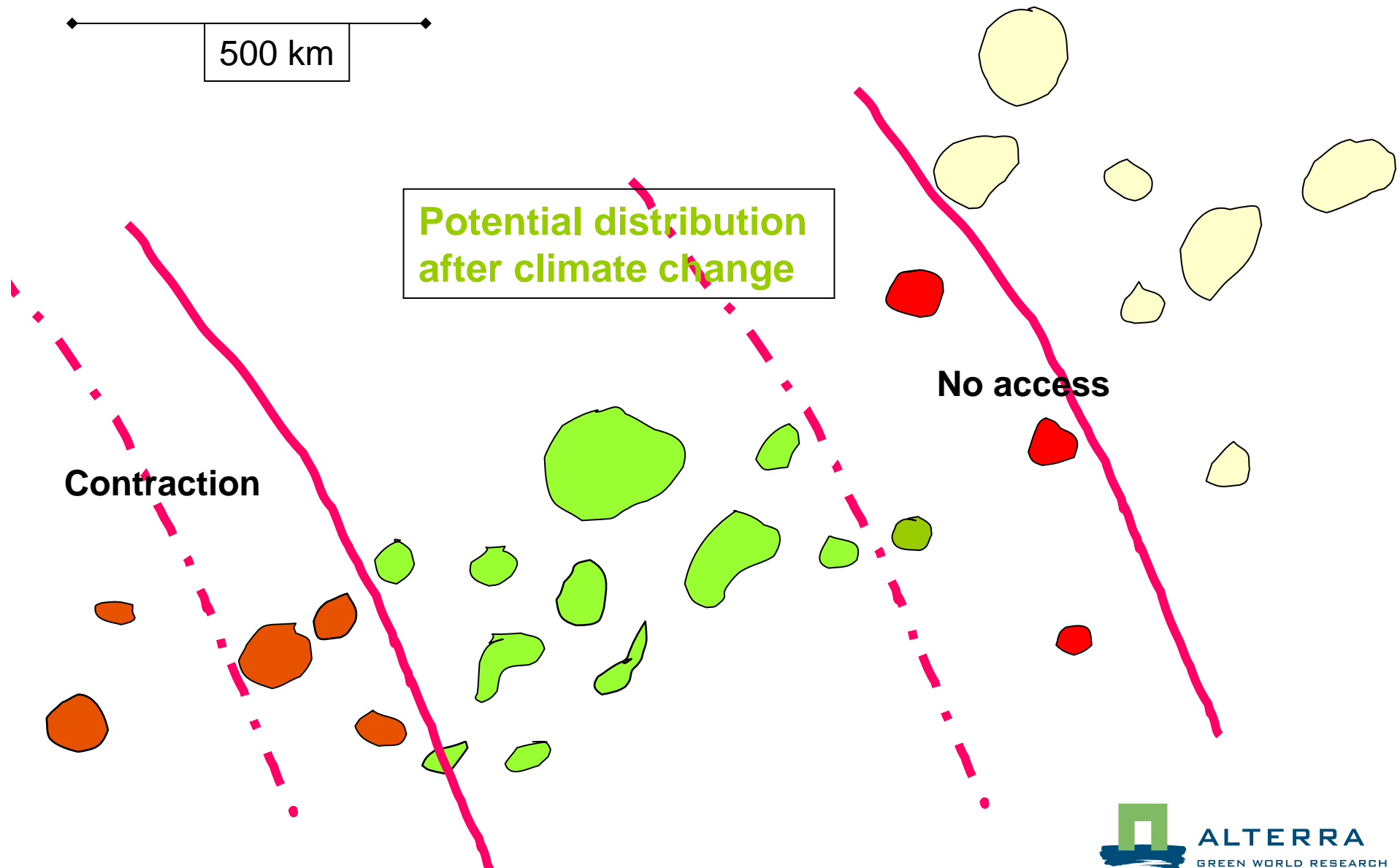


Can species distributions follow?

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



But habitat patterns may block expansion

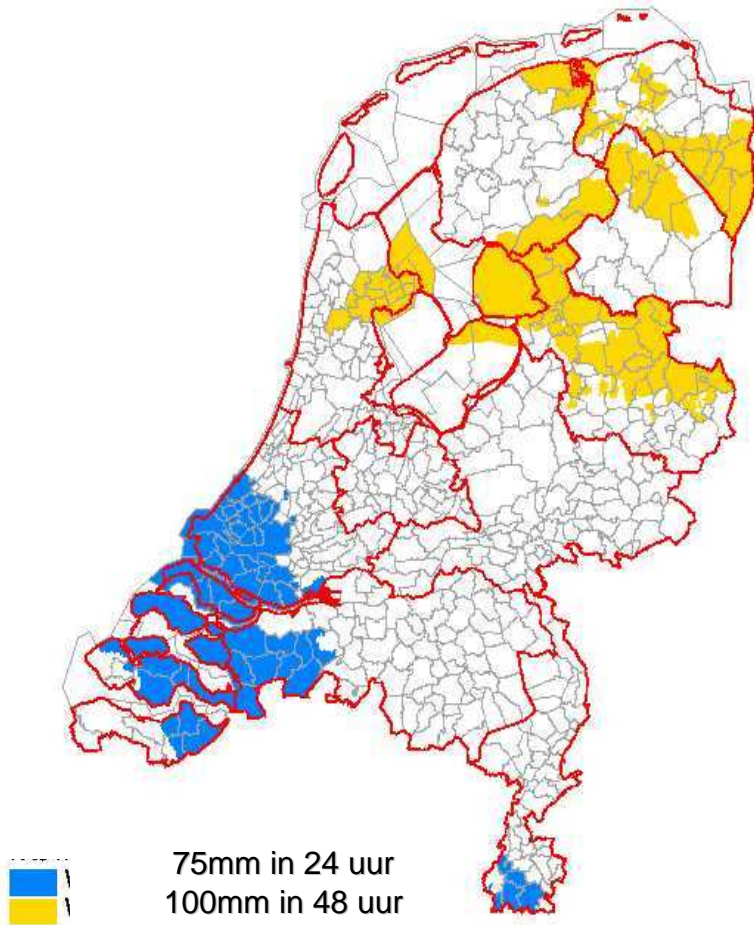


1. Region-Specific effects on (protected and unprotected) species (which, where)?

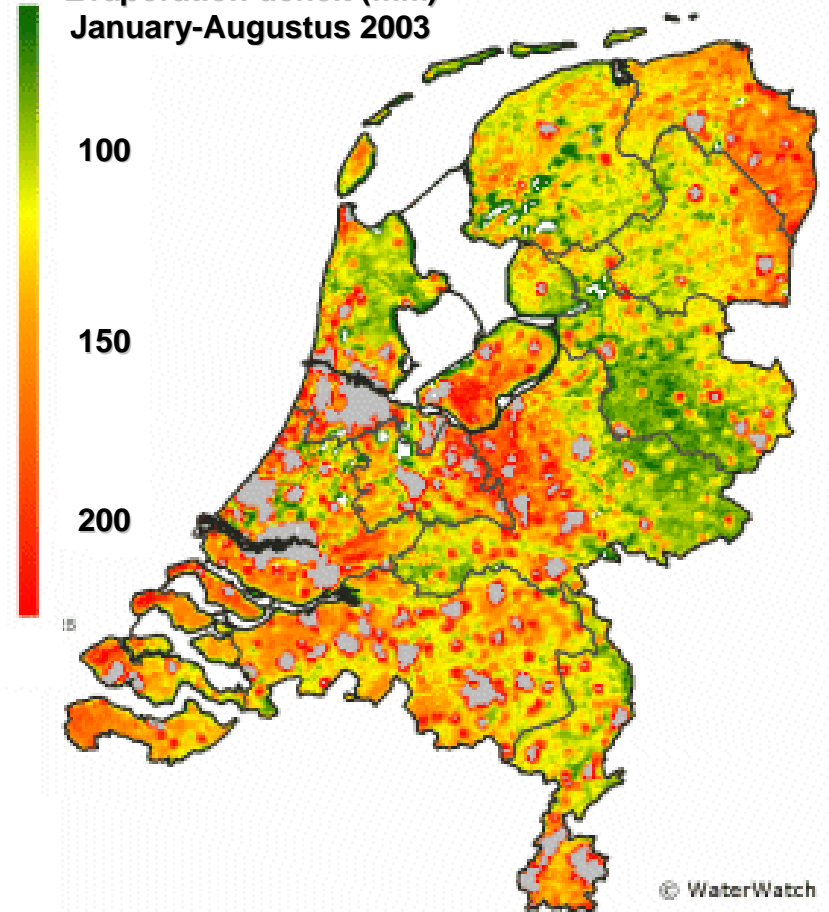
- How and where does interaction between climate change and the cohesion of habitat patterns lead to deviations from European nature policy targets?
- Which are critical levels of spatial cohesion in ecological networks? Where are the weak parts?
- If specialists are more affected than generalists, which effects on ecosystem resilience and services?

2. Weather extremes: what are the risks of increased regional dynamics?

Extreme rains in 1998



Evaporation deficit (mm)
January-Augustus 2003



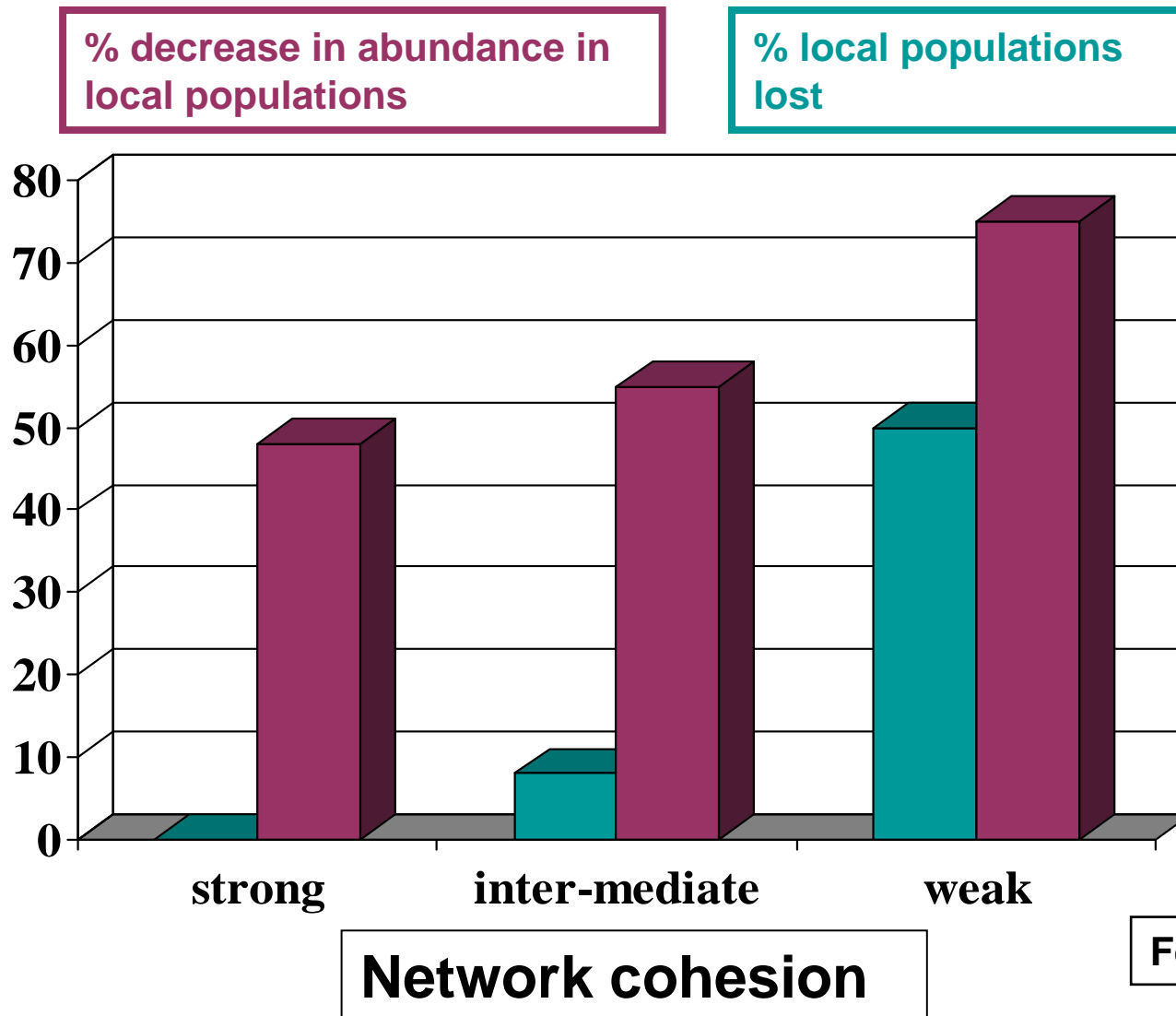
Weather extremes have
stronger impacts in more
fragmented regions



Acrocephalus schoenobaenus
Sedge warbler

Sedge warbler crash during Sahel drought

less severe in stronger habitat networks



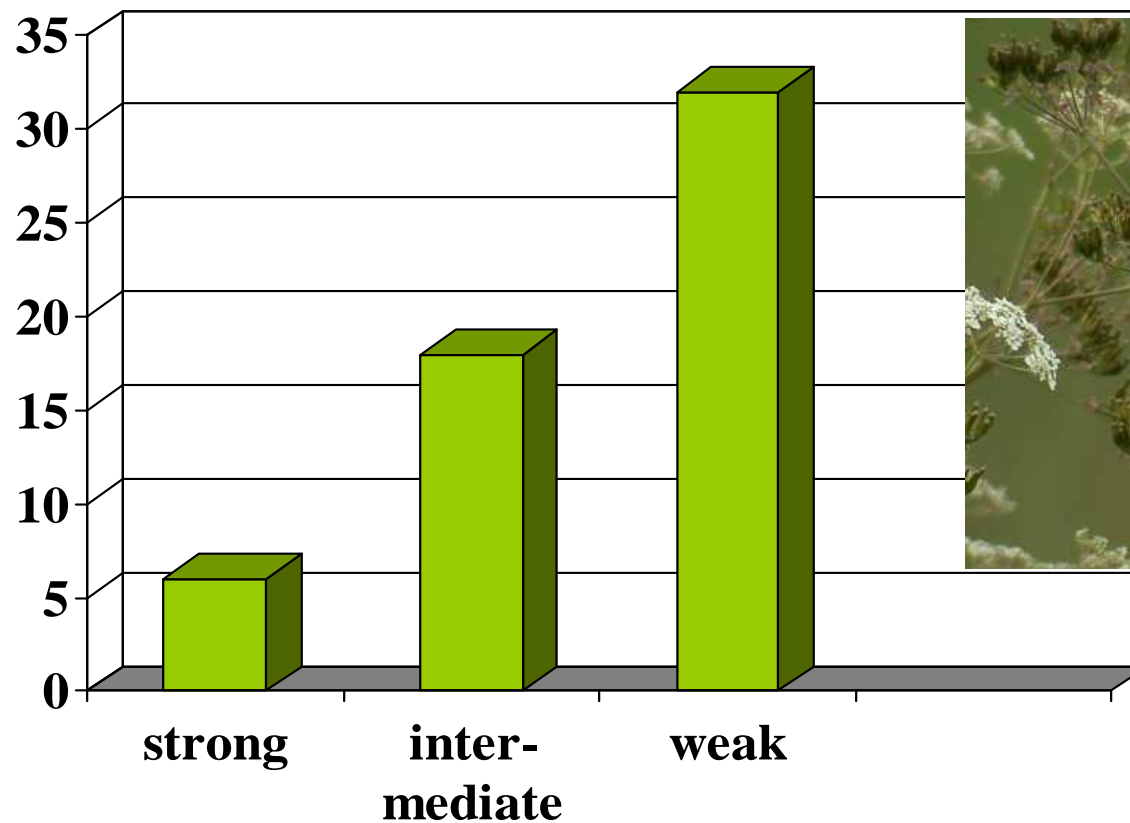
Foppen et al. 1999



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Predicted sedge warbler recovery time: shorter in more cohesive networks

Years until recovery



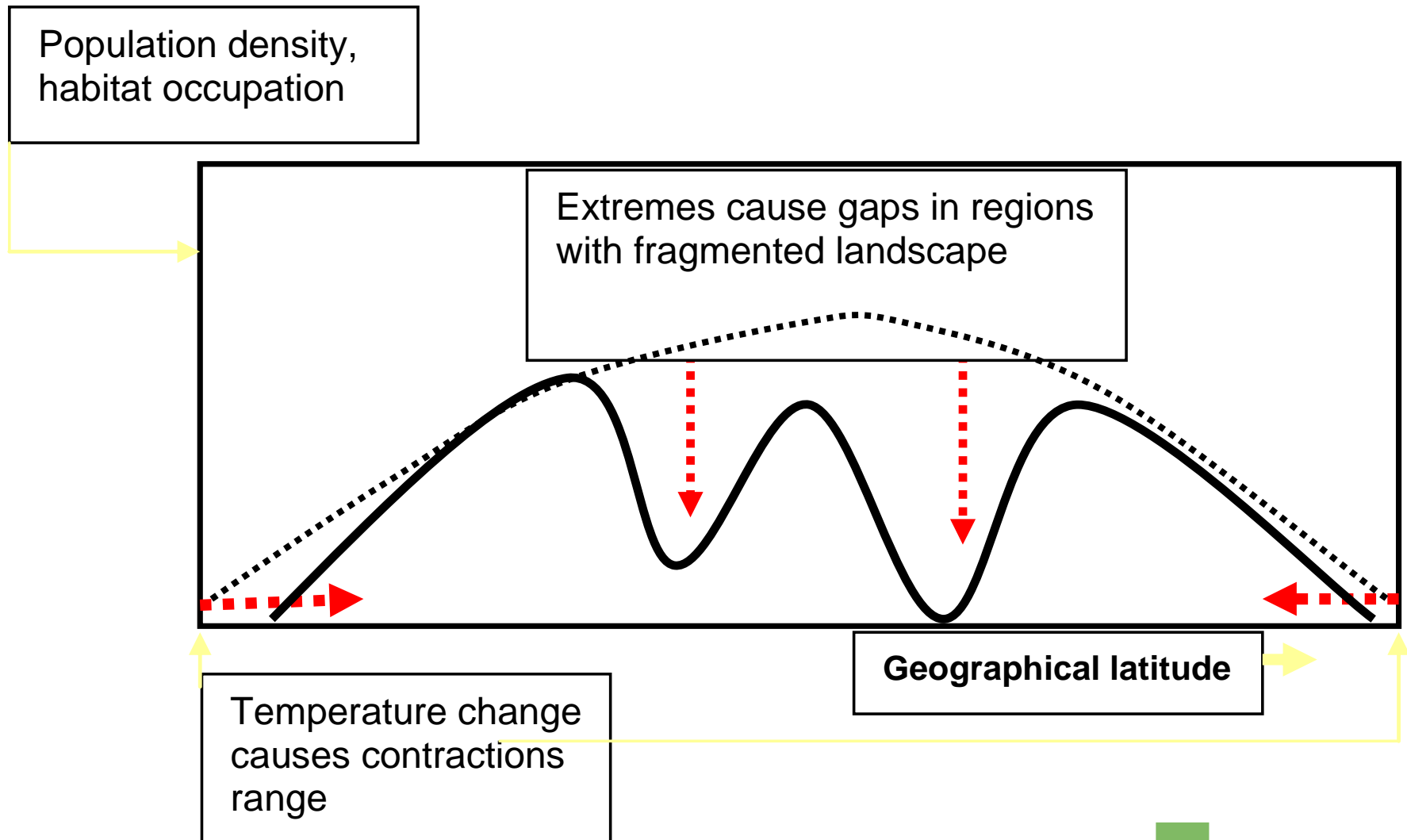
Network cohesion

Foppen et al. 1999



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Predicted range dynamics



2. Quantifying effects of weather extremes in habitat networks

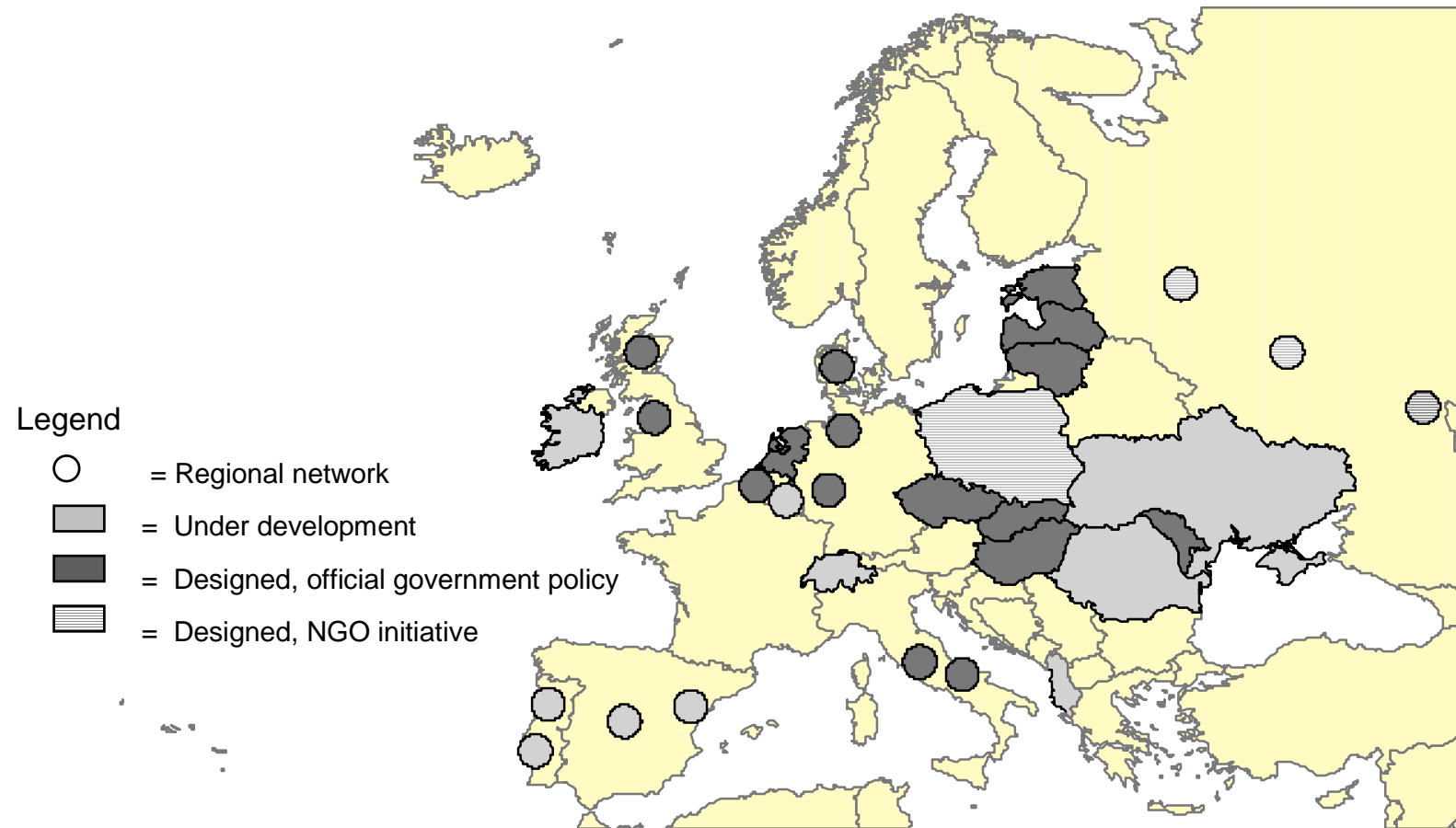
- How do habitat fragmentation and weather extremes change structure of distribution range?
- Critical levels of spatial cohesion in case of weather extremes?
- Role of large heterogeneous areas in lowering risks of regional extinction?

3. Will the Natura 2000 network be climate proof?

The Natura 2000

“network:

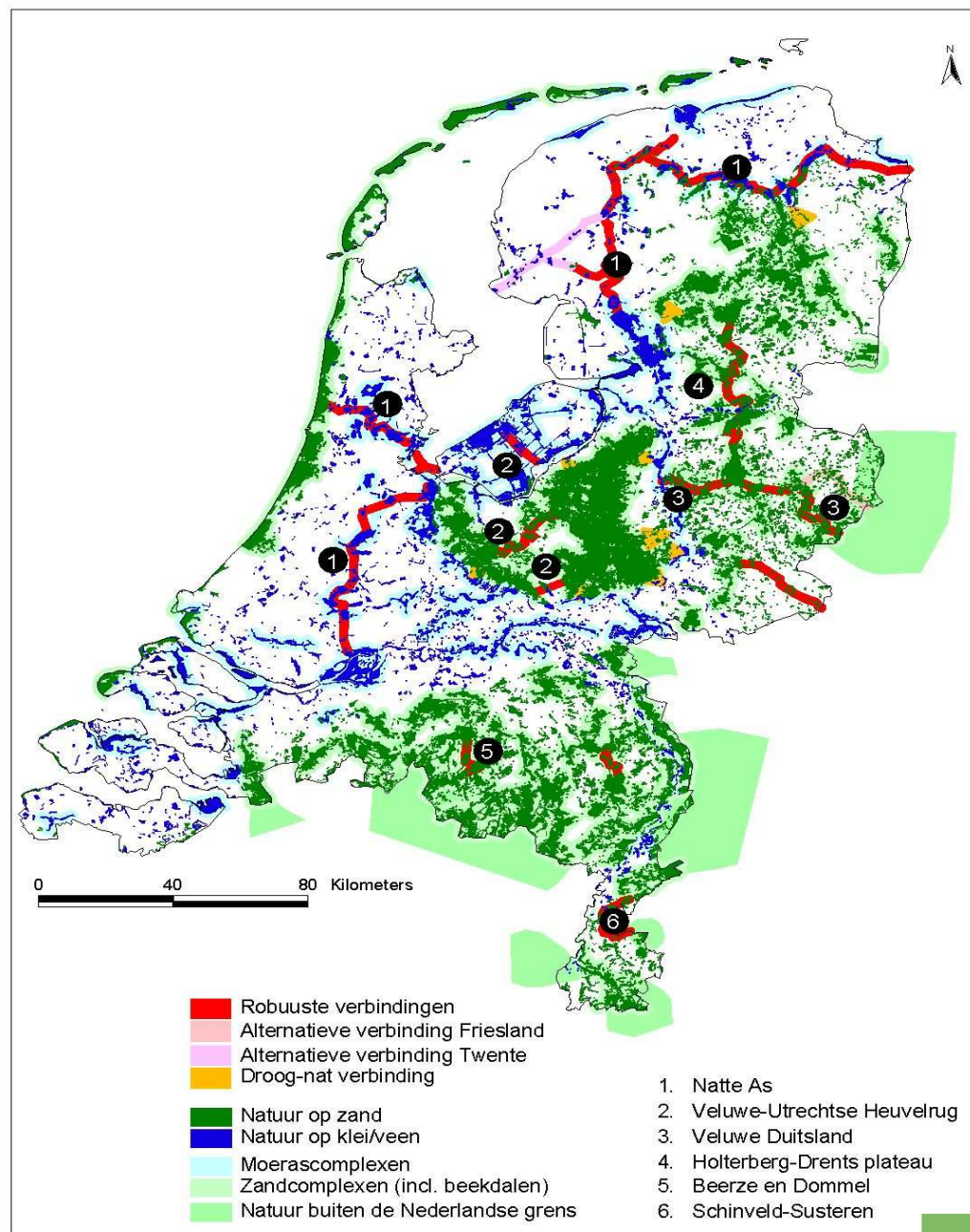
Countries at work



Based on Jongman, R.H.G. & I. Kristiansen, 2001, Sepp & Kaasik, 2003

Dutch National Ecological Network: the only network in Europe in which article 10 of the Habitat directive is already being implemented: (being developed as a functionally coherent network) (ready 2018).

ROBUUSTE VERBINDINGEN (indicatief)



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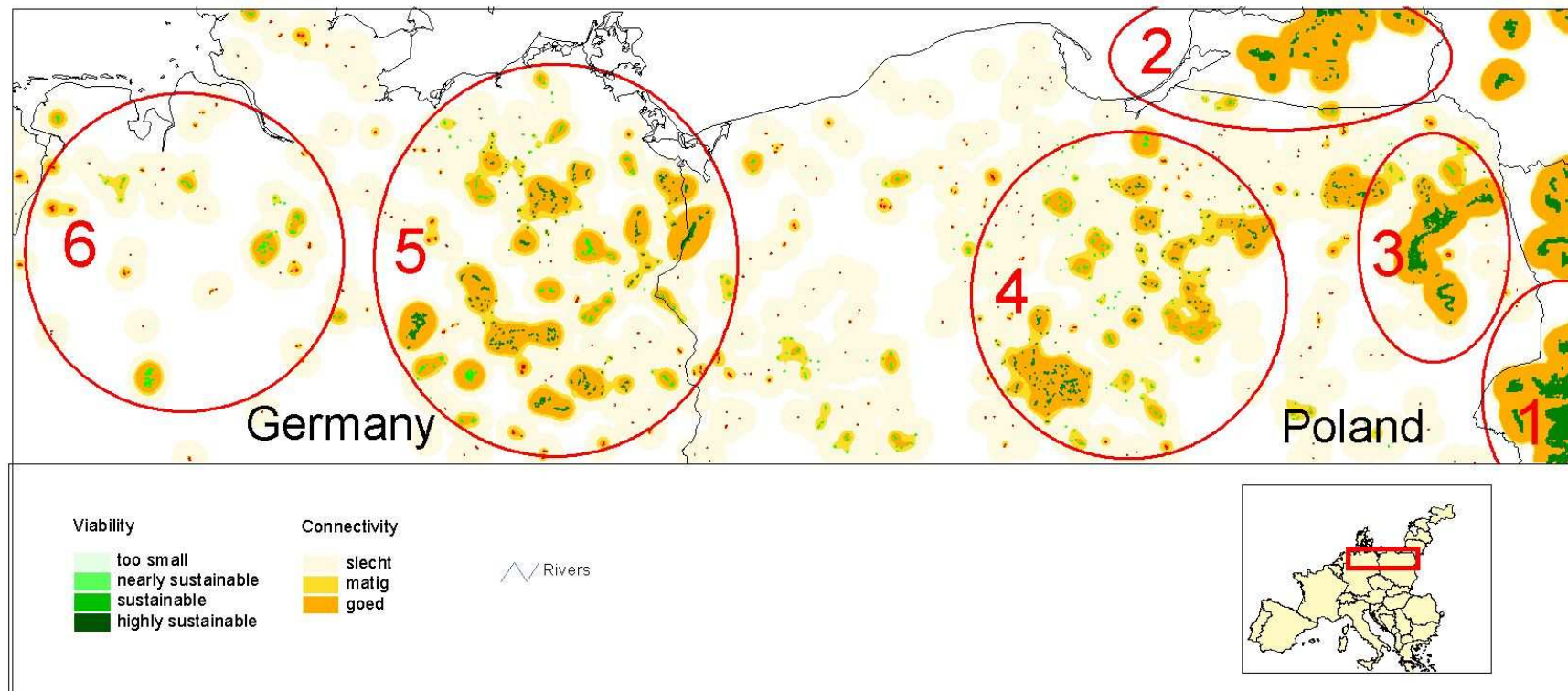
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Example by LARCH model (Alterra): Spatial cohesion for Red copper in Middle Europe



3. Assessing natura 2000 network

- Need a spatially explicit assessment instrument for the European scale,
- based on ecologically scaled landscape (GIS)-metrics (instead of standard geographic metrics),
- Using risk groups (ecoprofiles) rather than species.

4. Adaptation strategies based on 4 components of spatial cohesion


Patch
quality

Network
density

Network
area

Matrix
permeability

3. Development, design and testing of solutions.

	Change spatial structure of N-2000 network	Improve surrounding landscape	Management of existing nature
Network quality		<ul style="list-style-type: none"> - Diminish flow of nutrients - Lower recreation pressure 	<ul style="list-style-type: none"> - Increase heterogeneity of vegetation of critical ecosystems
Total network area	<ul style="list-style-type: none"> -Extend large areas and merge smaller areas to get one large - Develop robust corridors 	<ul style="list-style-type: none"> - Create new habitat patches 	<ul style="list-style-type: none"> Change distribution of ecosystem types in favor of most critical ones
Network density	Increase stepping stones	Develop habitat patches	
Matrix permeability	Increase density of corridors	Improve matrix permeability	

5. Implementation into regional development

- A common vision on where the cohesion of the European landscape has to be improved (article 10)
- Develop and test planning and design methods, rules and tools suitable for stakeholder involvement in decision making
- Search for opportunities of synergy with other EU- and national policy and measures to adapt the landscape to climate change (water management, agriculture, valuable landscapes)



Messages



- Promote ecological networks as spatial concept in spatial adaptation
- Let the landscape matrix be part of the solution
- The solution is in the hands of regional actors

