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GREEN WORLD RESEARCH

Metapopulation modelling, application in landscape assessments, and dealing with climate change

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Alterra

Contents

- Modelling philosophy: mechanistic models and simple tools for assessments (Example 1: LARCH)
- Example 2: EURURALIS study
- Example 3: FATE model chain

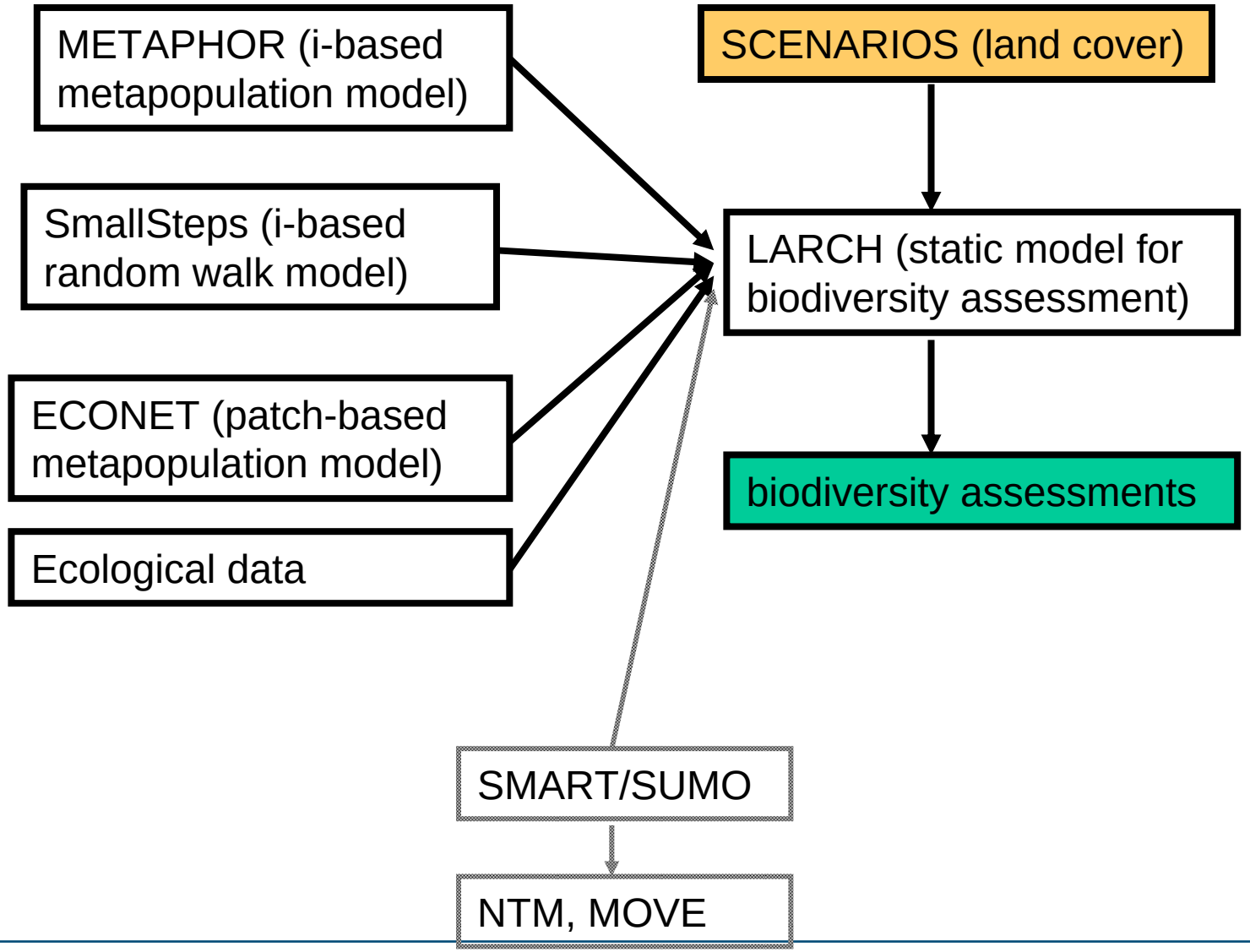
1. Mechanistic models and simple tools for assessments:

Mechanistic models are used to find thresholds, rules of thumb and standards, these are combined with ecological knowledge of species (habitat preferences, home range size, dispersal distance etc.) into landscape assessment tools.

Verboom, J., Foppen, R., Chardon, P., Opdam, P., Luttikhuizen, P., 2001. Introducing the key patch approach for habitat networks with persistent populations: an example for marshland birds. Biological Conservation 100: 89-101

Vos, C.C.; J. Verboom; P. F. M. Opdam; and C. J. F. Ter Braak. 2001. Toward Ecologically Scaled Landscape Indices. American Naturalist. Jan 2001. Vol. 157, pp. 24-41.

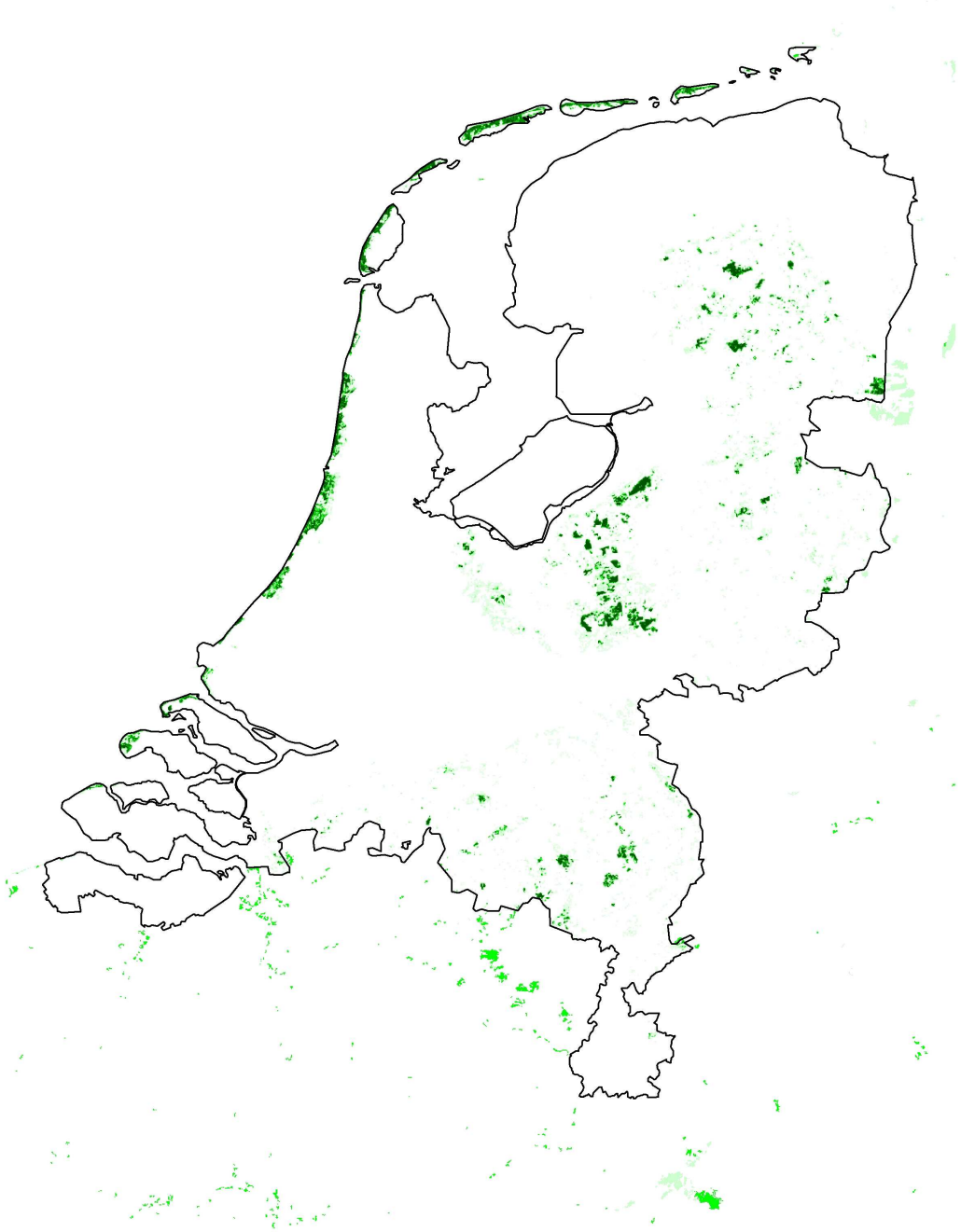
Opdam, P., Verboom, J., Pouwels, R,. 2003. Landscape cohesion: an index for the conservation potential of landscapes for biodiversity. Landscape Ecology 18: 113-126.


METAPHOR (i-based metapopulation model)
SmallSteps (i-based random walk model)
ECONET (patch-based metapopulation model)
Ecological data
SCENARIOS (land cover)
LARCH (static model for biodiversity assessment)
biodiversity assessments
SMART/SUMO
NTM, MOVE

Indicator species chosen for national study (LARCH)

Acrocephalus schoenobaenus	acrsch	Sedge Warbler	small bird	Marshland
Anthus campestris	antcam	Tawny Pipit	small bird	Heathland
Botaurus stellaris	botste	Bittern	large bird	Marshland
Clethrionomys glareolus	clegla	Bank Vole	small mammal	Woodland
Clossiana selene	closel	Small Pearl-Bordered Fritillary	butterfly area	Marshland
Dendrocopos medius	denmed	Middle Spotted Woodpecker	medium bird	Woodland
Hipparchia semele	hipsem	Grayling	butterfly area	Heathland
Lacerta agilis	**lacagi**	**Sand Lizard**	**reptile area**	**Heathland**
Lullula arborea	lularb	Wood Lark	medium bird	Heathland
Lutra lutra	**lutlut**	**Otter**	**large mammal**	**Marshland**
Martes martes	marmar	Pine Marten	large mammal	Woodland
Microtus oeconomus	micoec	Root Vole	small mammal	Marshland
Oenanthe oenanthe	oenoen	Wheatear	small bird	Heathland
Parus cristatus	parcri	Crested Tit	small bird	Woodland
Picus viridis	picvir	Green Woodpecker	medium bird	Woodland
Plebejus argus	plearg	Silver-Studded Blue	butterfly area	Heathland
Sitta europaea	**siteur**	**Nuthatch**	**medium bird**	**Woodland**
Vipera berus	vipber	Adder	reptile area	Heathland

Sand lizard habitat



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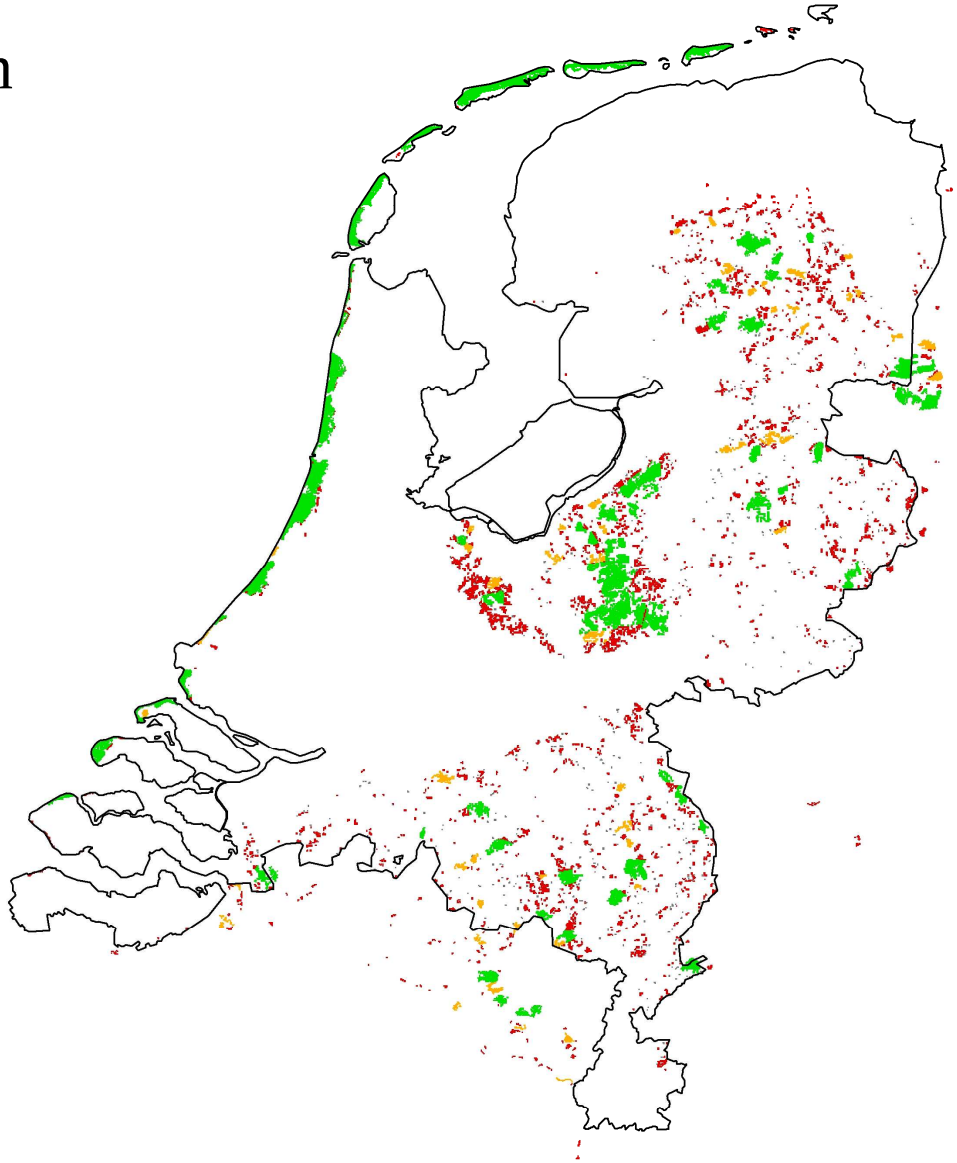
Sand lizard habitat classification

- No carrying capacity
- Too small
- Key Patch
- MVP



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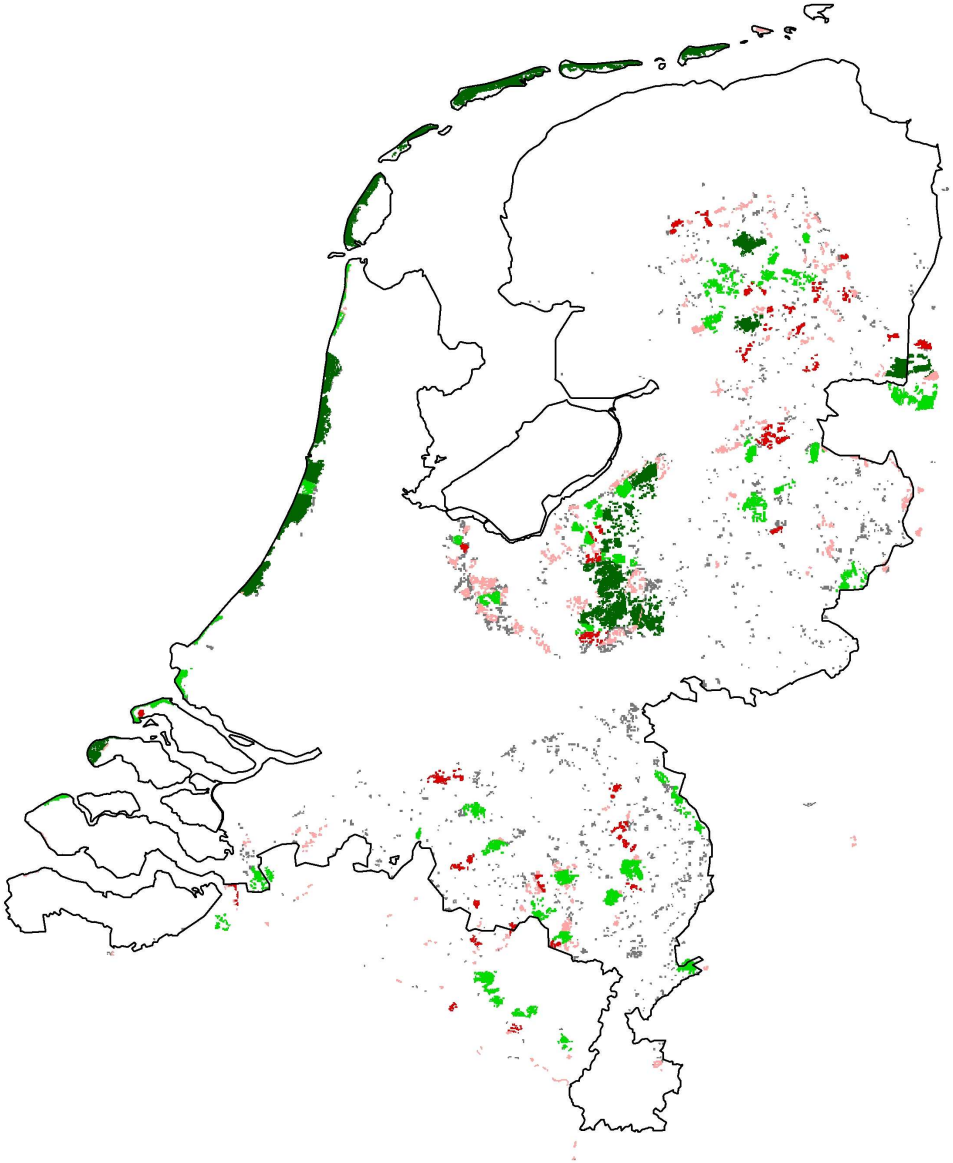
Sand lizard viability

- No viability
- Very low viability
- Low viability
- Medium viability
- High viability



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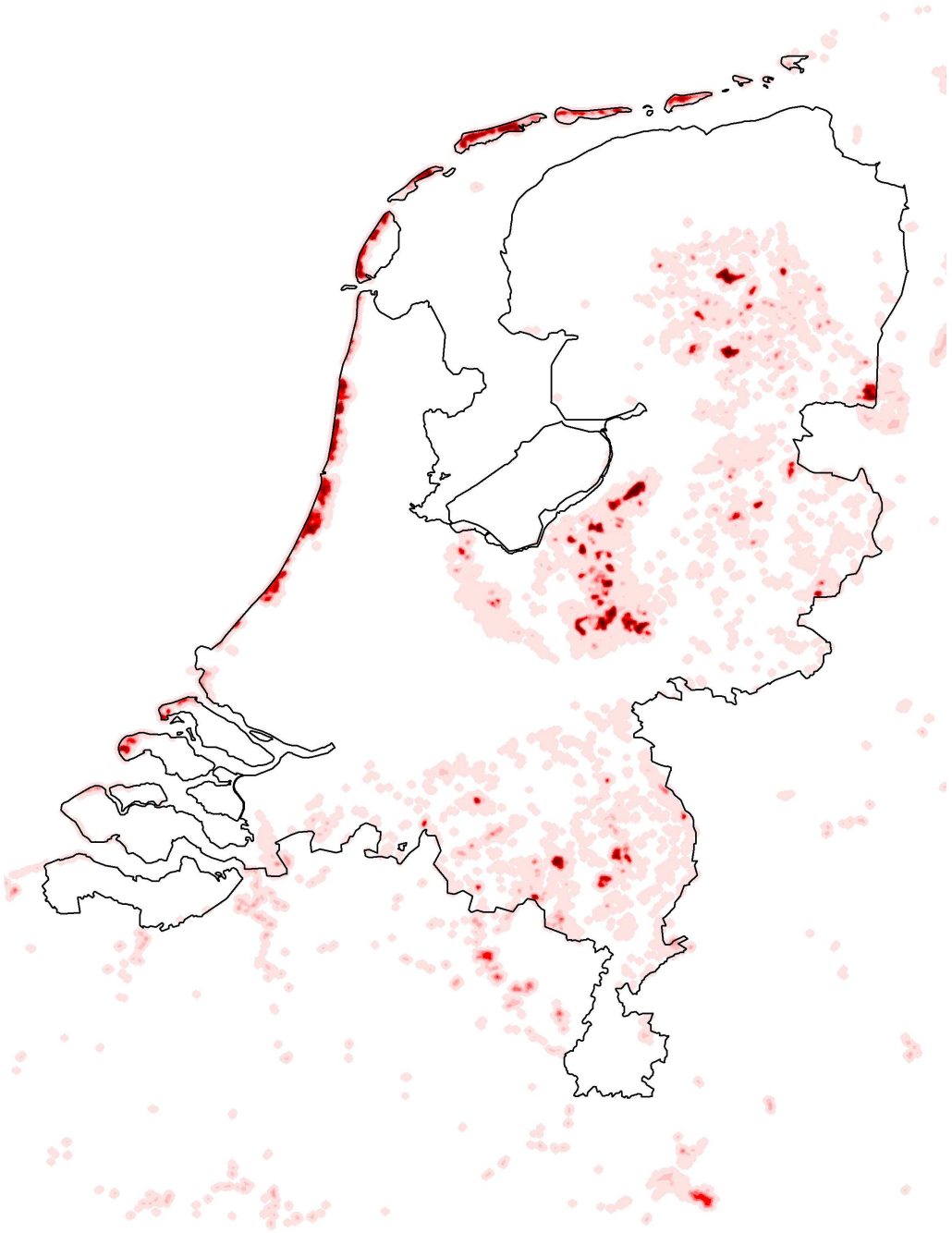
Sand lizard spatial cohesion



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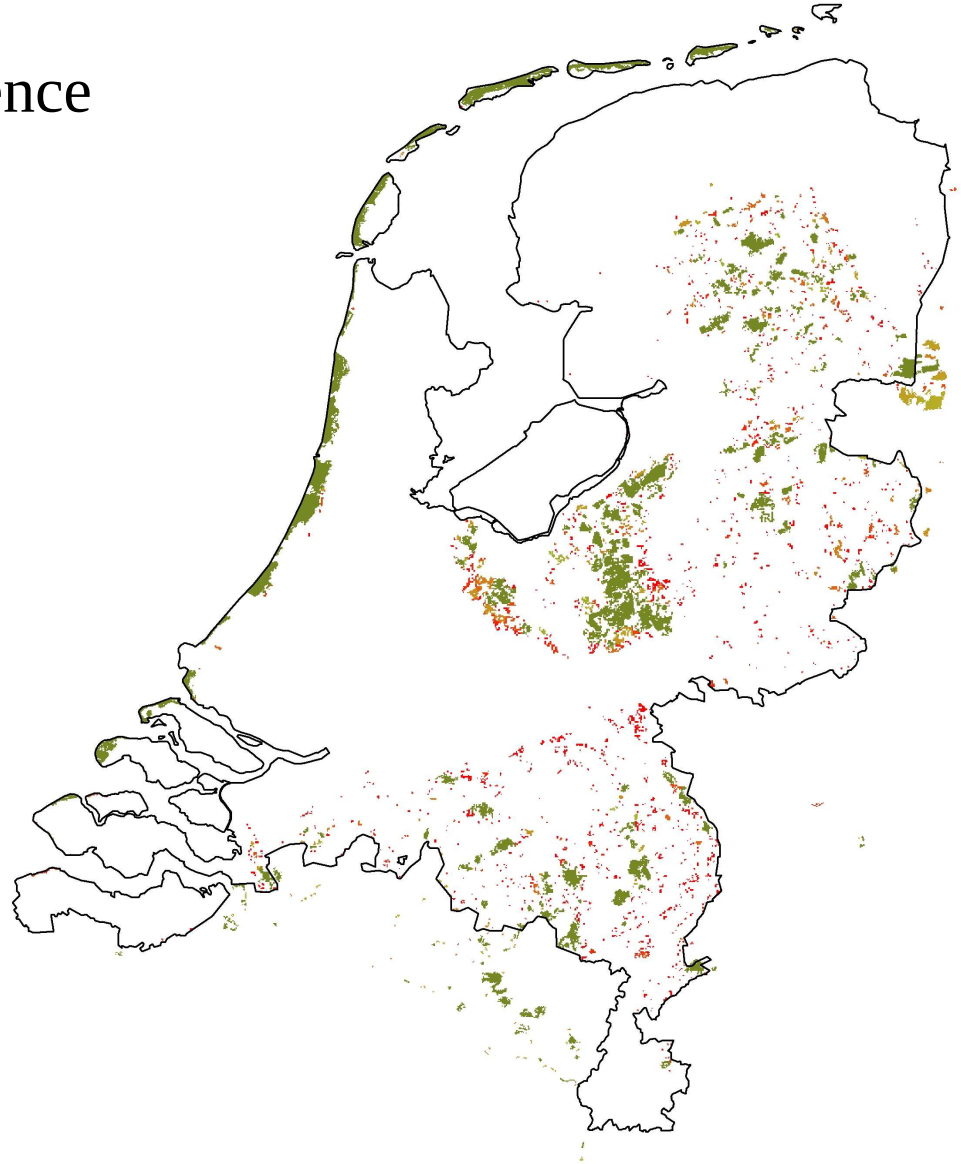
Sand lizard probability of occurrence

Low

Medium

High



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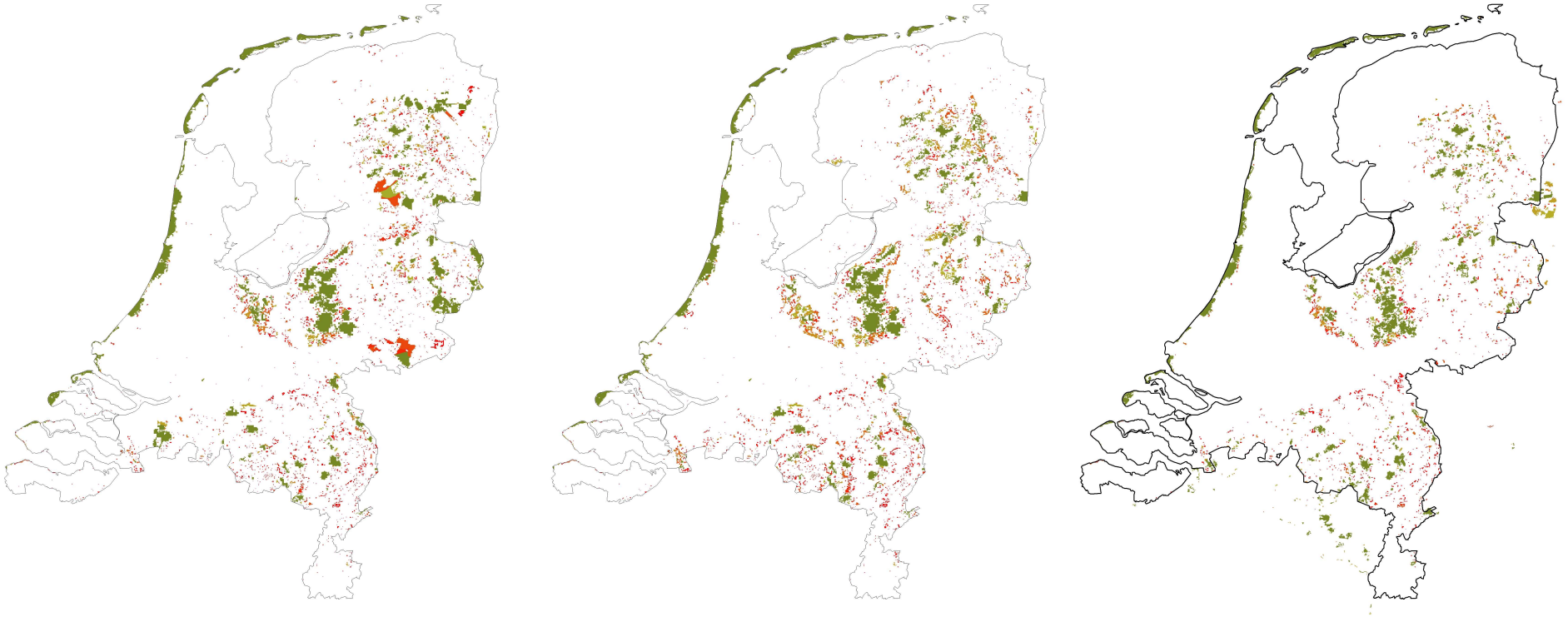
Low

Medium

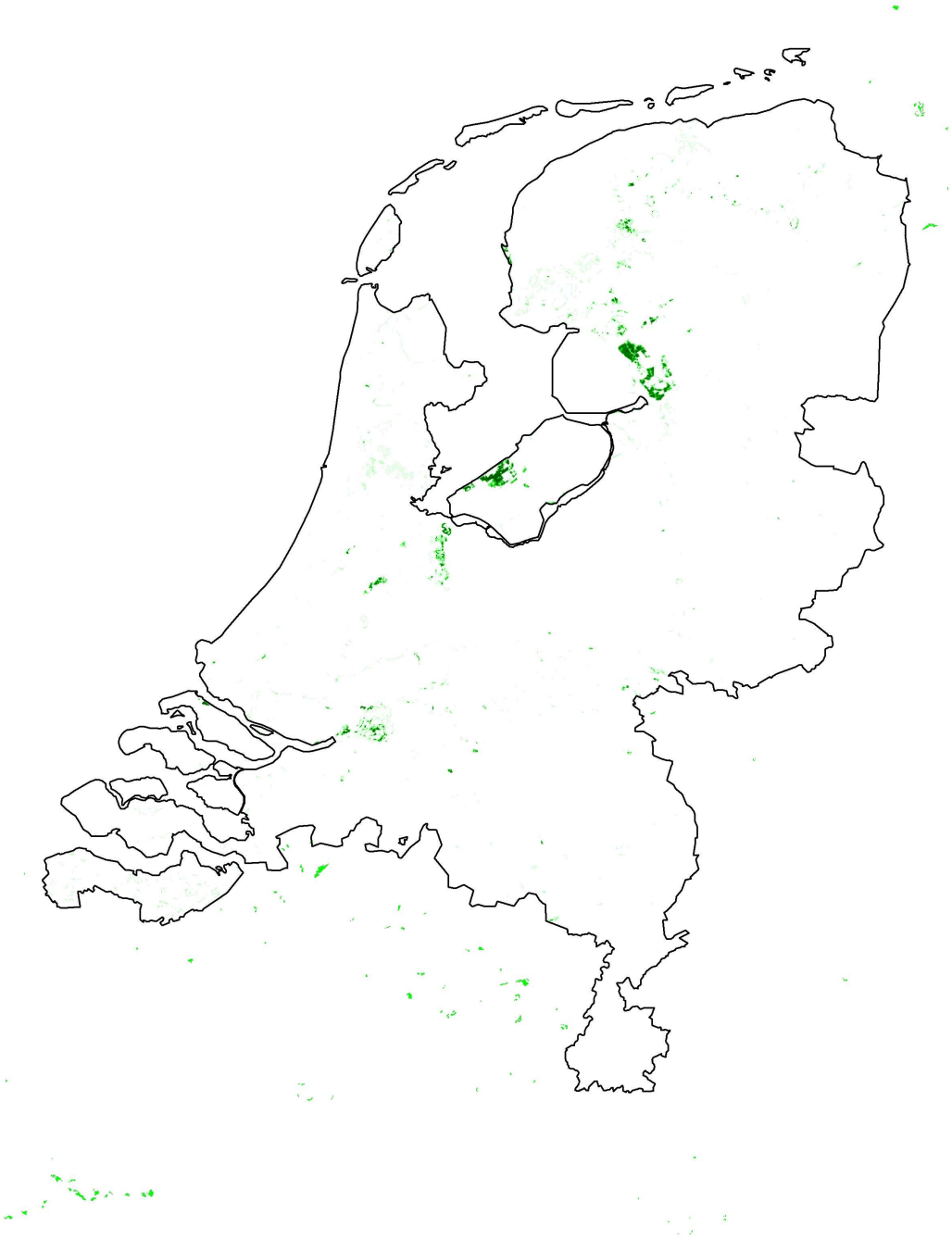
High

Comparing three scenarios (SAND LIZARD)



Current situation

Otter habitat



ALTERRA
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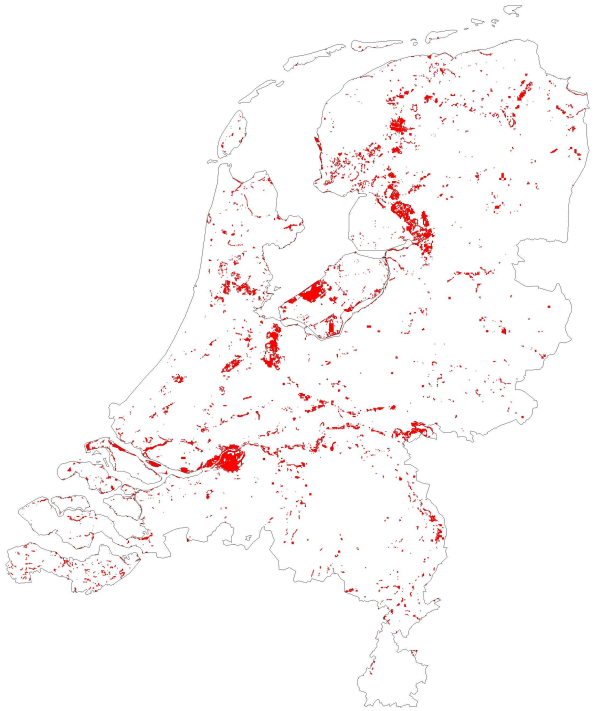
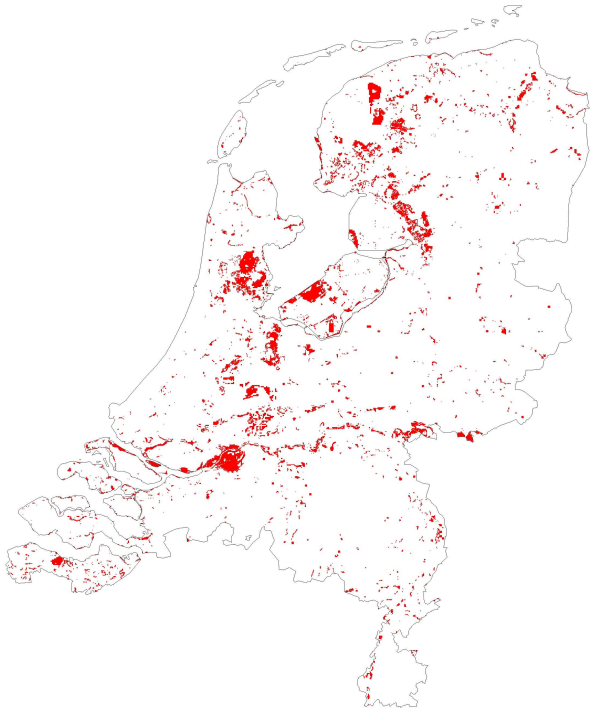
Low

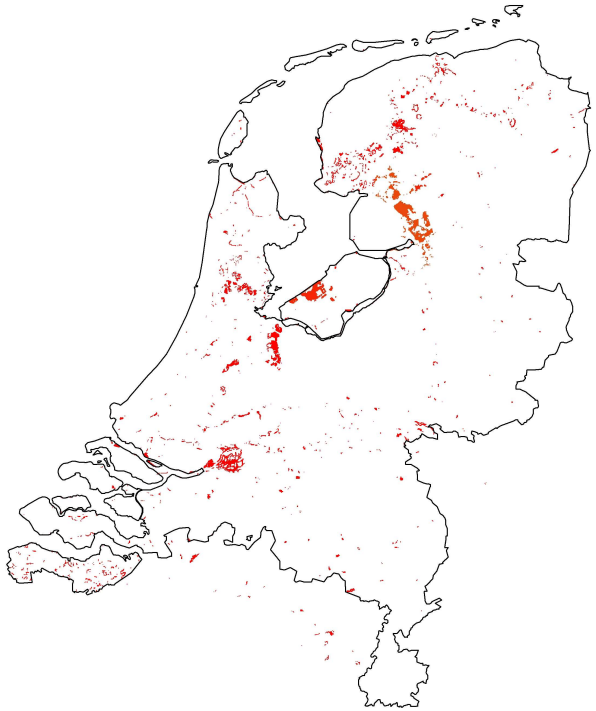
Medium

High

Comparing three scenarios (OTTER)

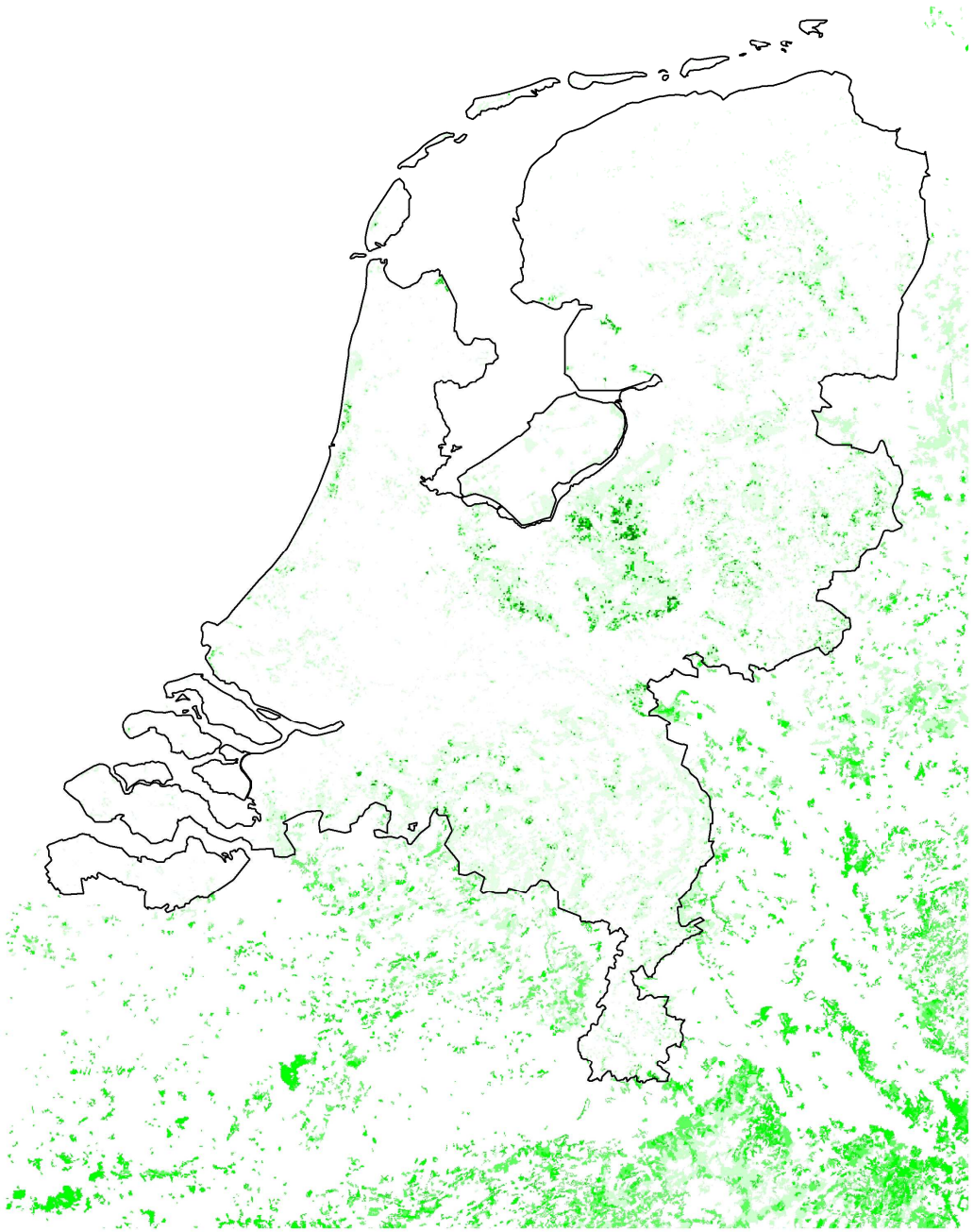






Current situation

Nuthatch habitat



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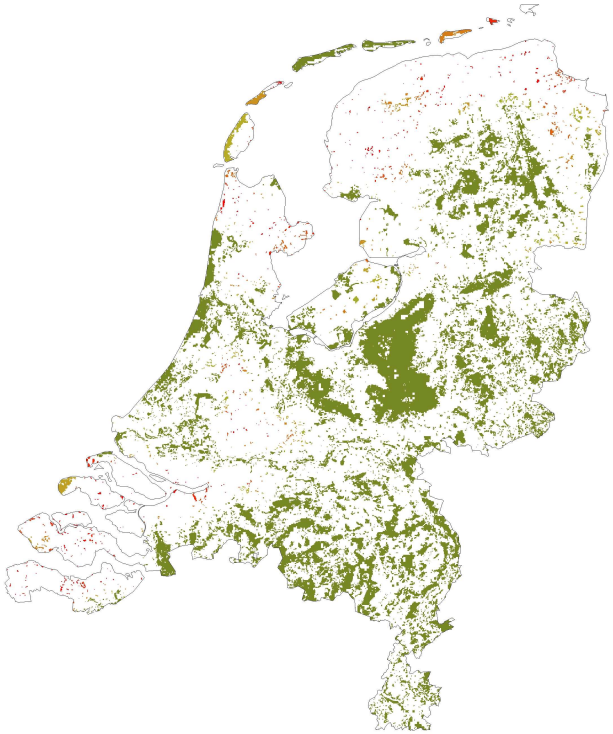
Low

Medium

High

Comparing the three scenarios (NUTHATCH)



Current situation

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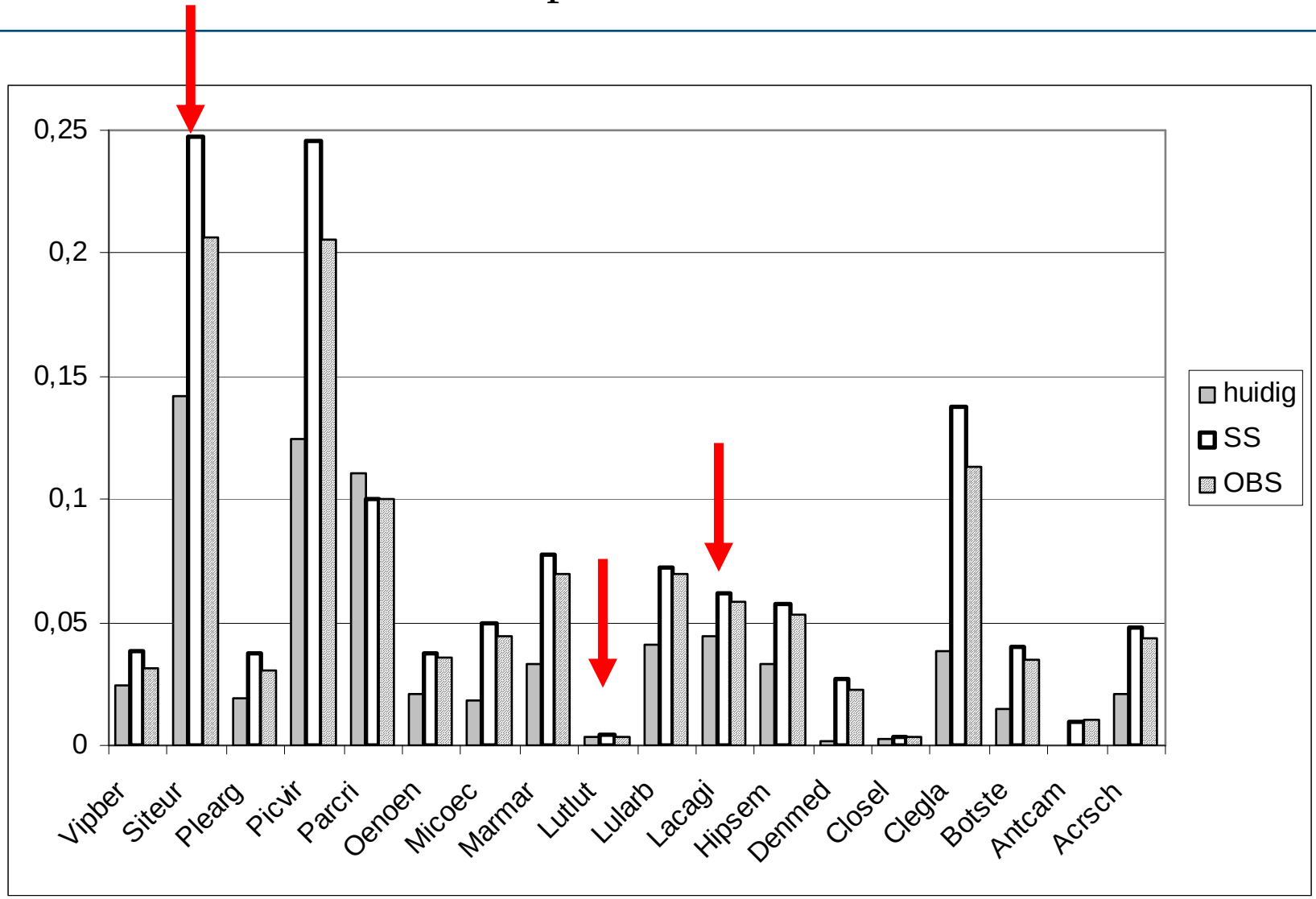
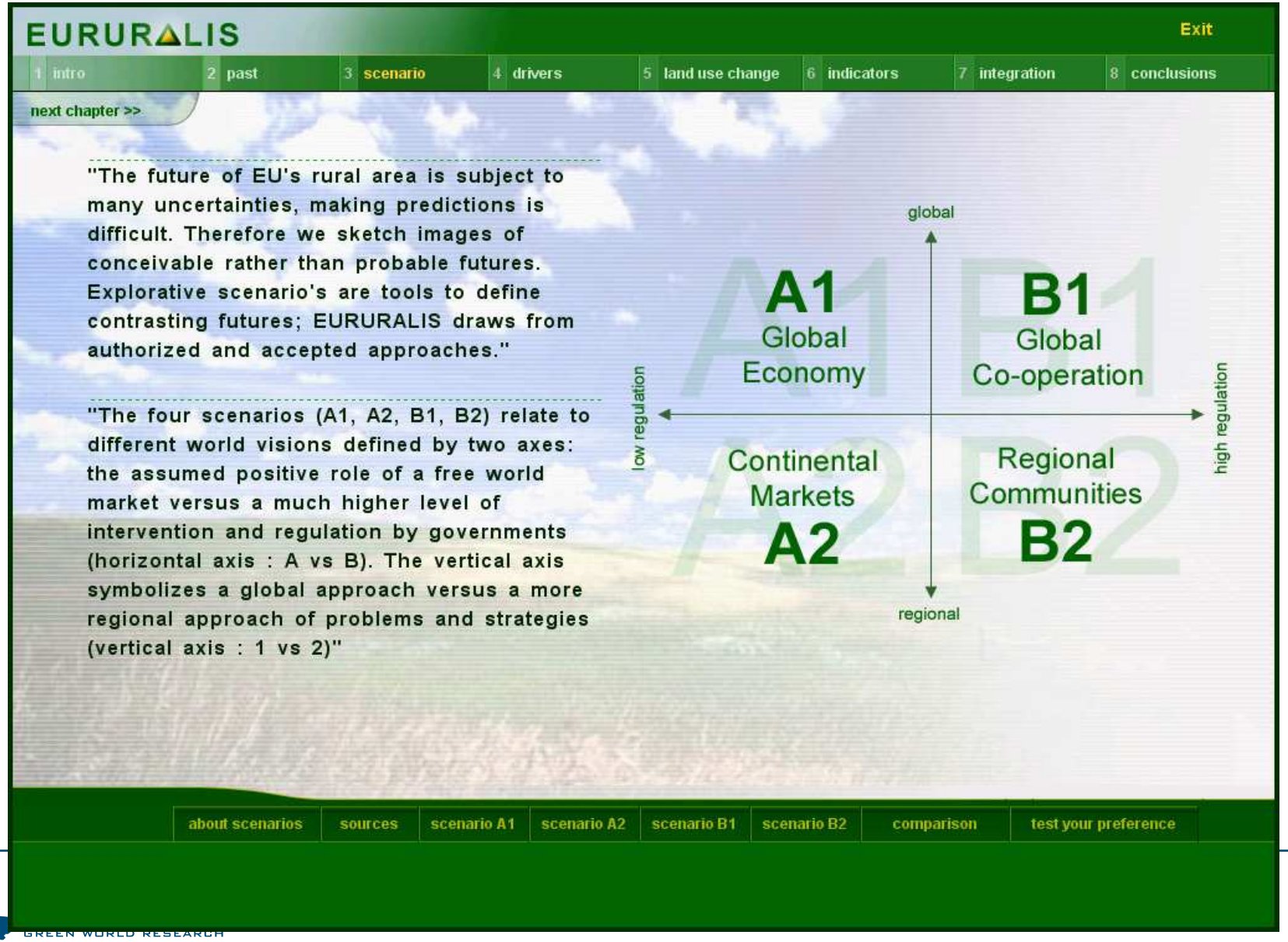
Statistics for all species, 3 scenario's



Example 2: EURURALIS study



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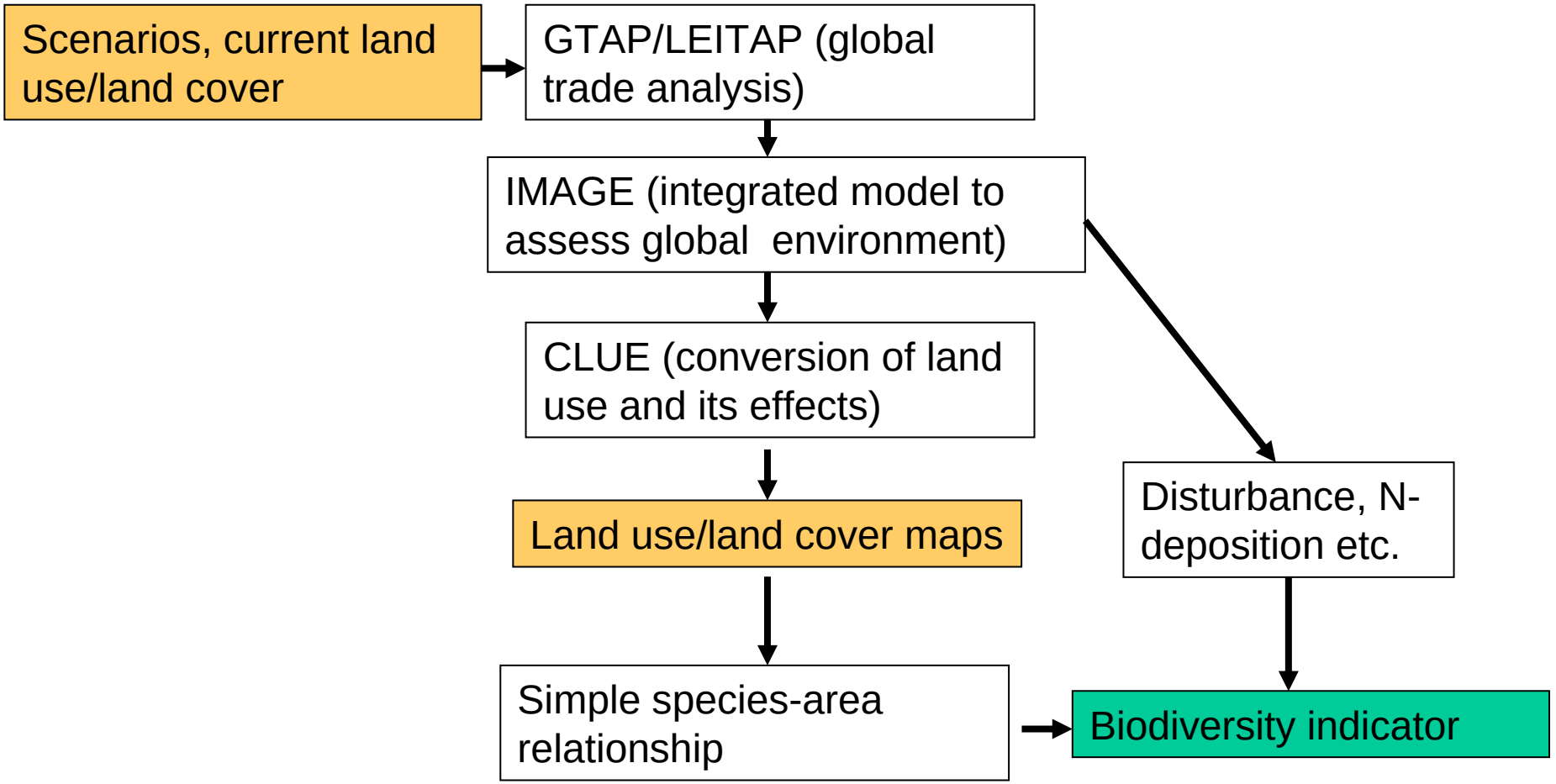
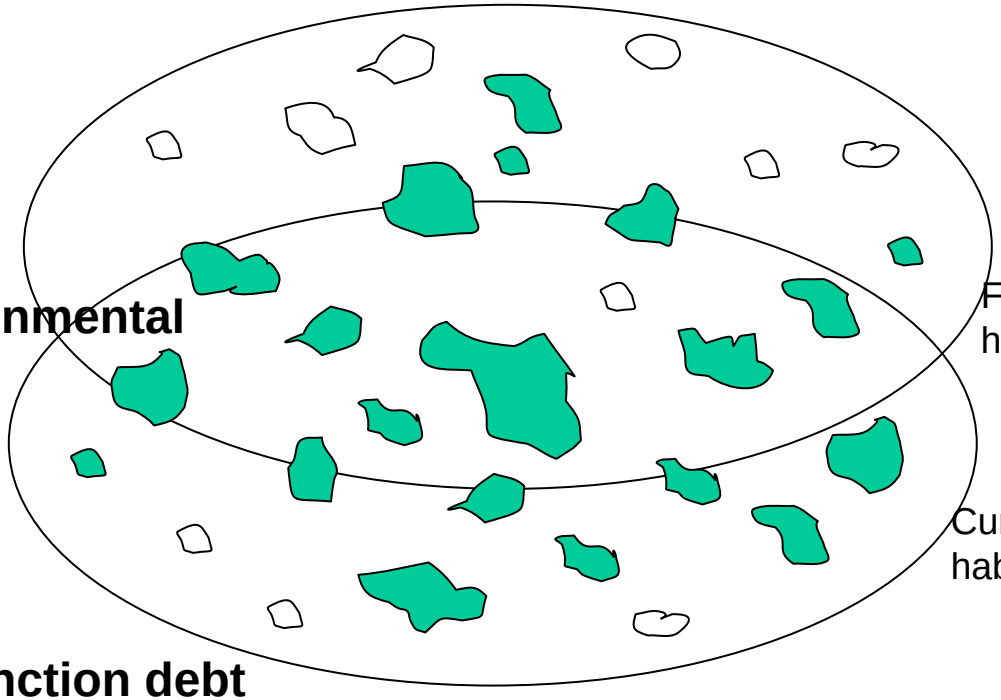
EURURALIS: static biodiversity algorithm



Dynamic aspects of climate change

Time lag: dispersal limitation



Increased environmental stochasticity

Future distribution of suitable habitat

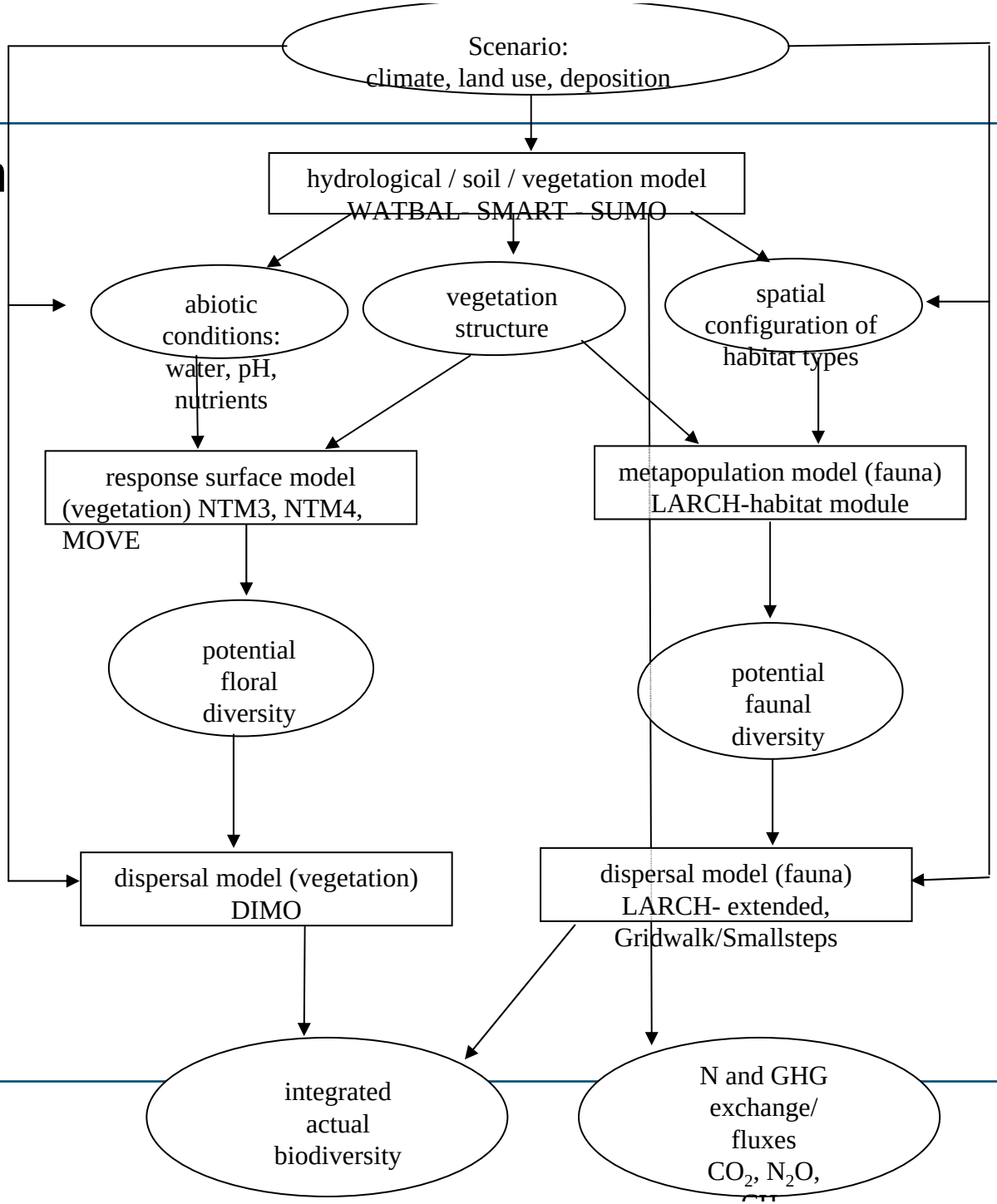
Current distribution of suitable habitat

Time lag: extinction debt

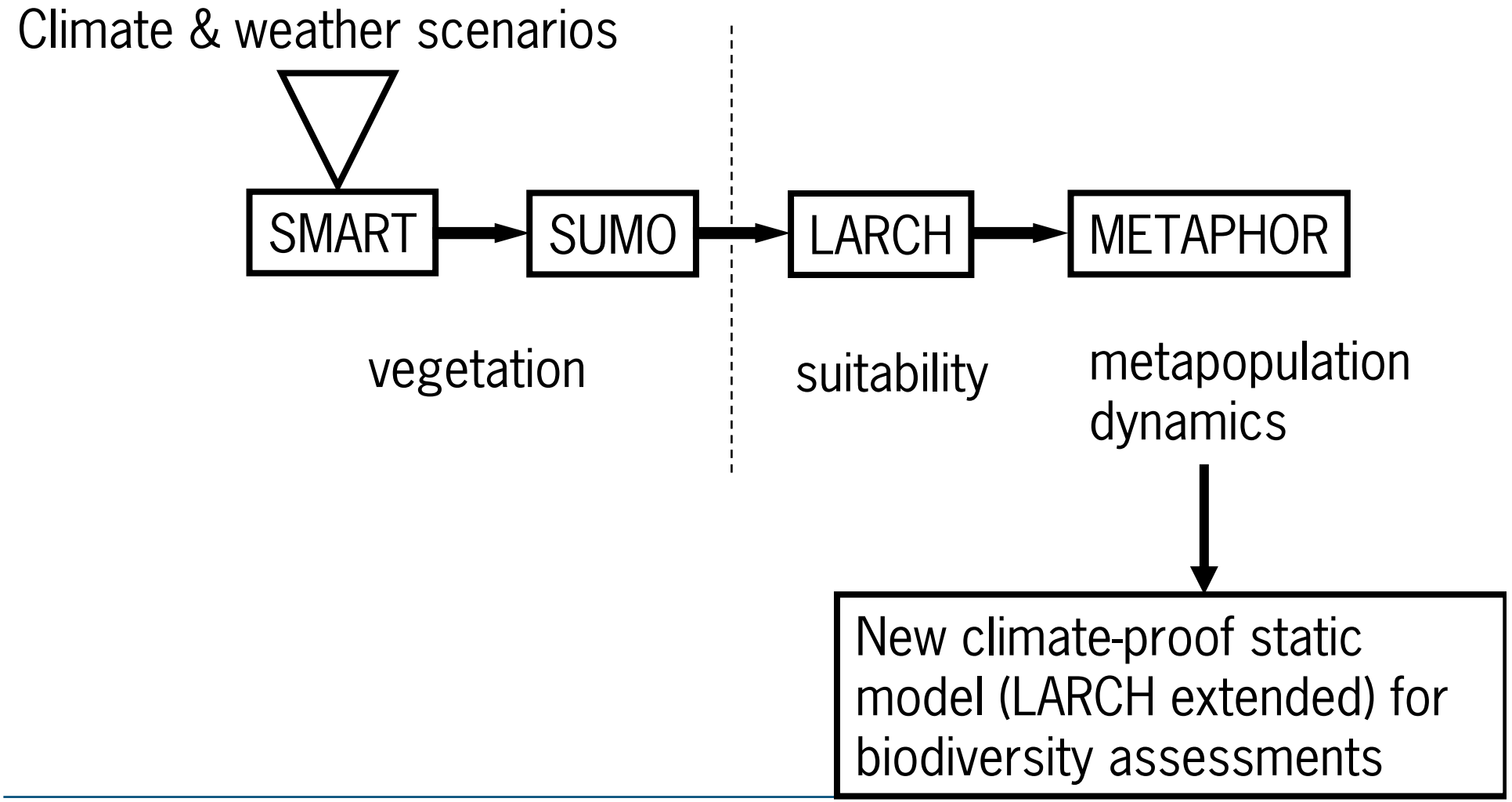
Application: is national ecological network climate proof?

Example 3:

FATE approach



Future:


Climate & weather scenarios
SMART
SUMO
LARCH
METAPHOR
vegetation
suitability
metapopulation dynamics
New climate-proof static model (LARCH extended) for biodiversity assessments