

Priority sites for forest dwelling owl protection: evaluation of habitat suitability

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Dabas aizsardzības
pārvalde



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Forestry and Biodiversity: International Perspectives on Trade-offs, Problems, and Solutions
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Owl species regularly breeding in Latvia



Foto: Pēteris Daknis



Foto: Andris Avotiņš jun.



Foto: LPIB



Foto: Edgars Lediņš



Foto: Selga Bērziņa



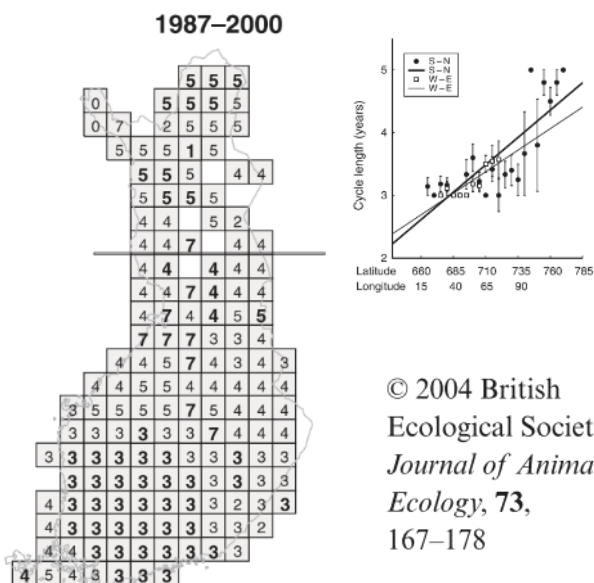
Foto: Uģis Piterāns

Annex I 2009/147/EC	-	+	+	+	-	+
Specially protected	-	+	+	+	-	+
Trigger species	-	-	+	+	-	+
Indicator	+	+	+	+	+	+
Umbrella	-	+	+	+	+	+
Short-term trend	-	-	-	-	-	X (-)

Introduction: system

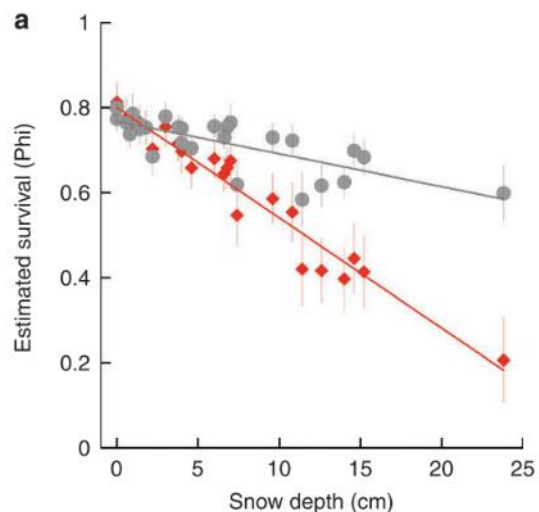
Prey

- Bottom-up regulation of main prey, but alternatives exist
- Direct impacts on reproduction
- Accumulating effects on population



Climate

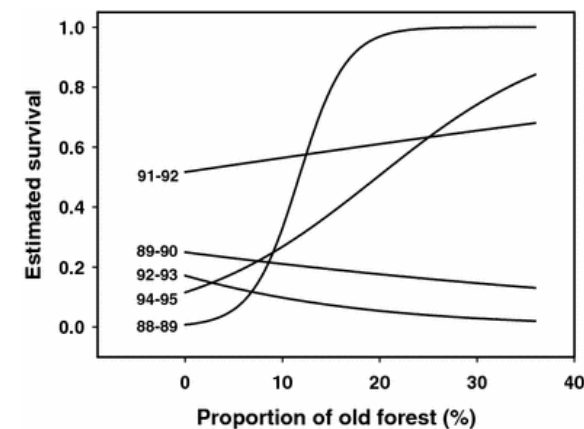
- Limits distribution
- May influence reproduction
- Extremes affect survival



NATURE COMMUNICATIONS | DOI: 10.1038/ncomms1213

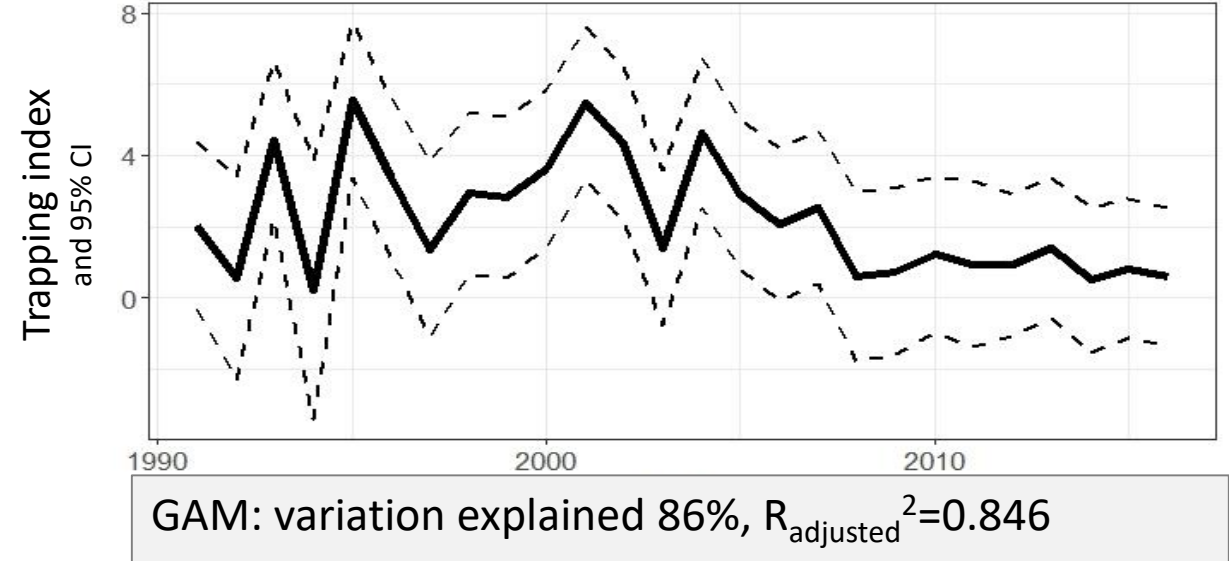
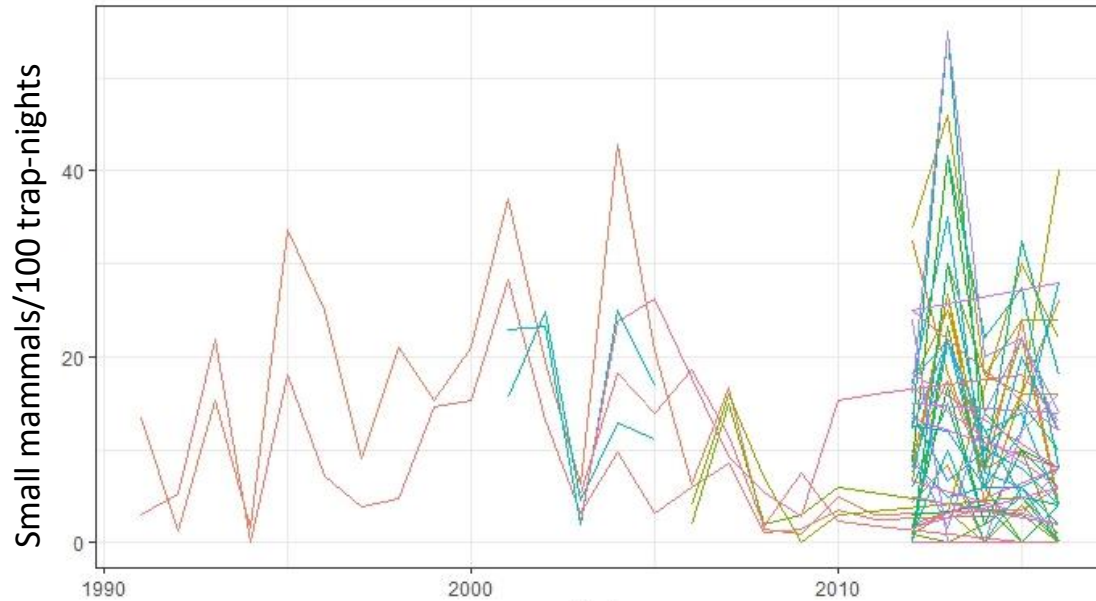
Habitat

- **Forms distribution**
- **Buffers weather**
- **Ensures prey availability**
- **Determines reproduction**
- **Impacts population**



Oecologia (2002) 131:83–88
DOI 10.1007/s00442-001-0865-5

Small mammals

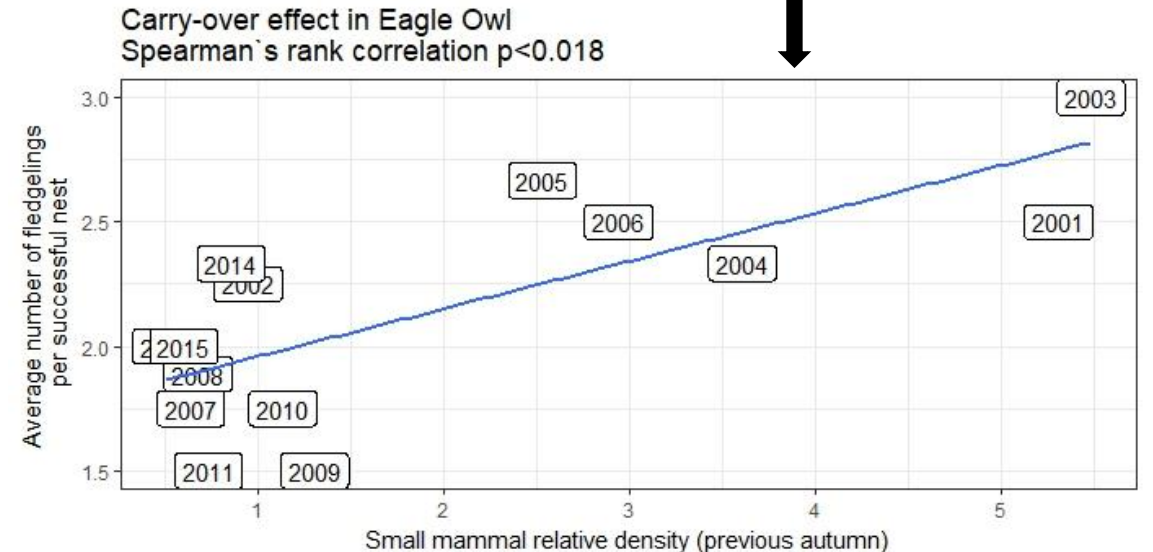
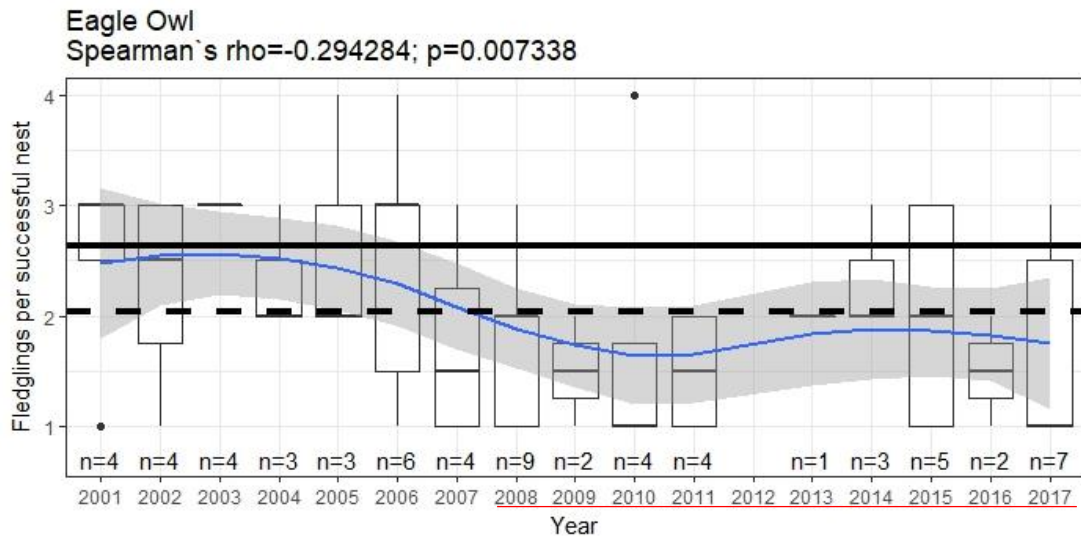
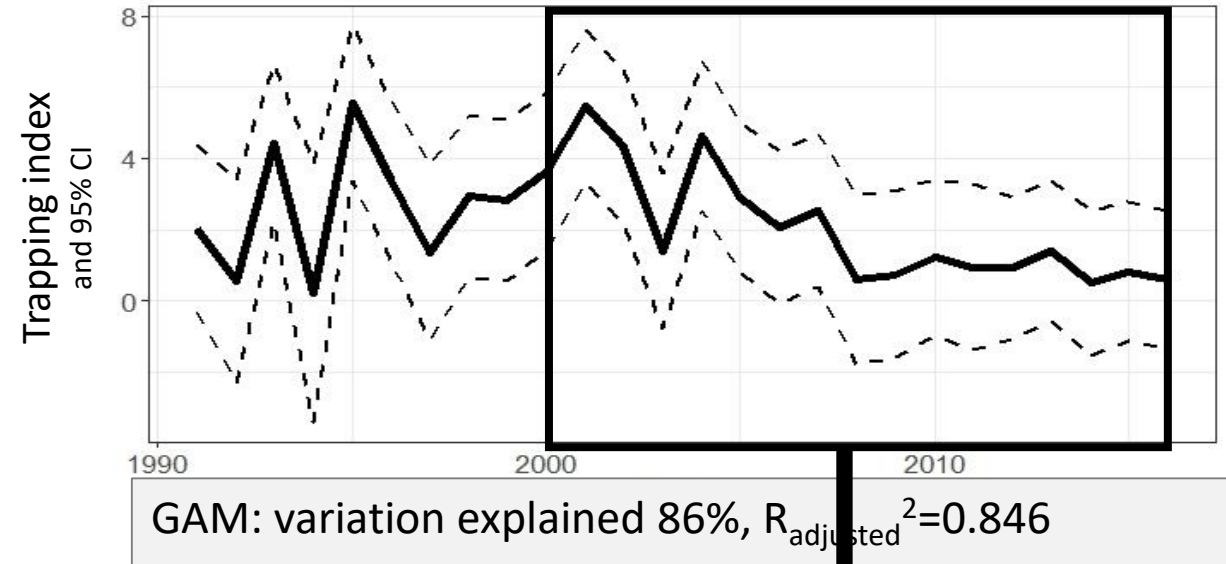


- Small mammal abundance is highly habitat-dependant

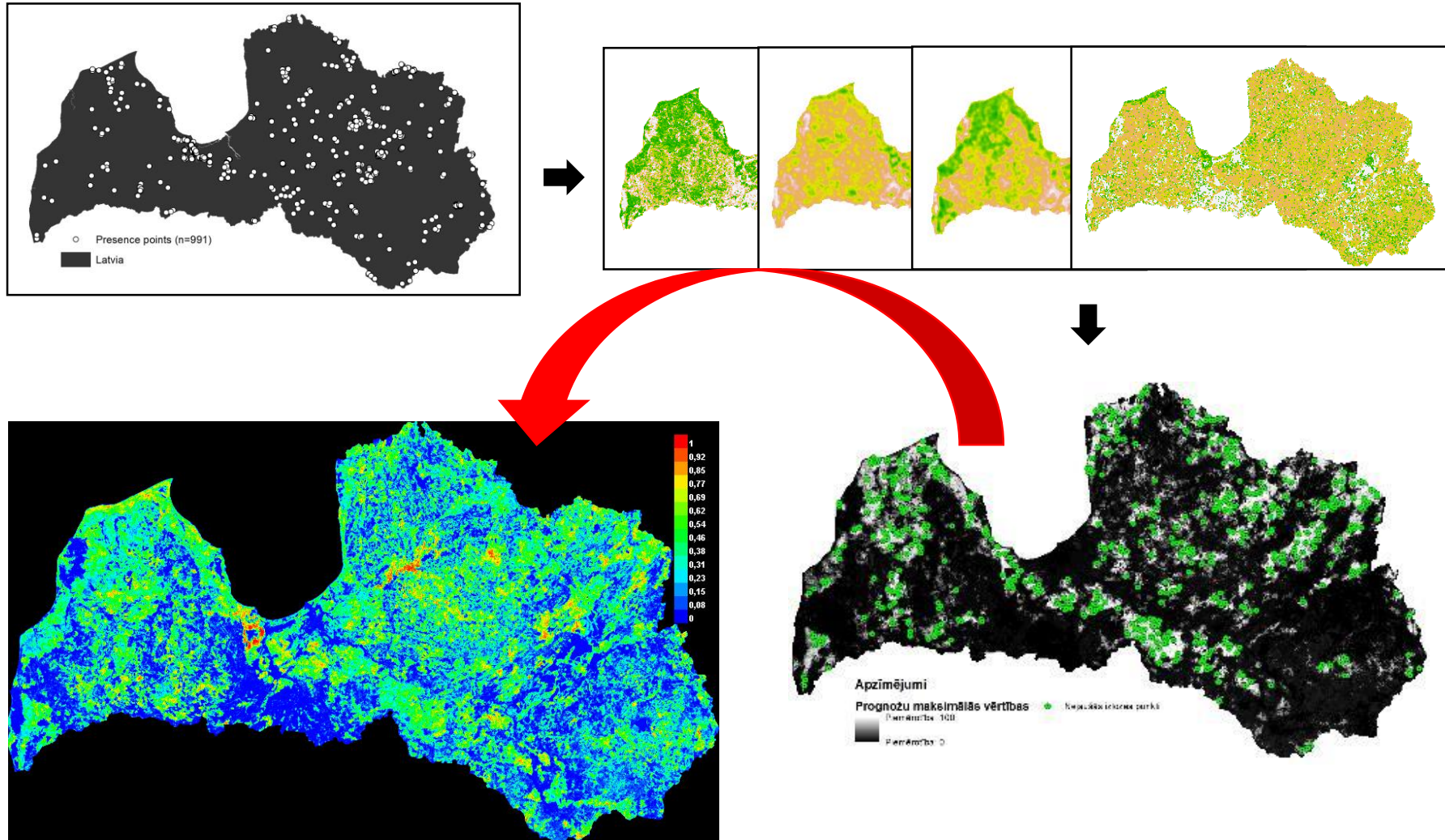
- Regional and temporal fluctuations are similar
- Population cyclicality has vanished
- Relative density is low and stable

Small mammals

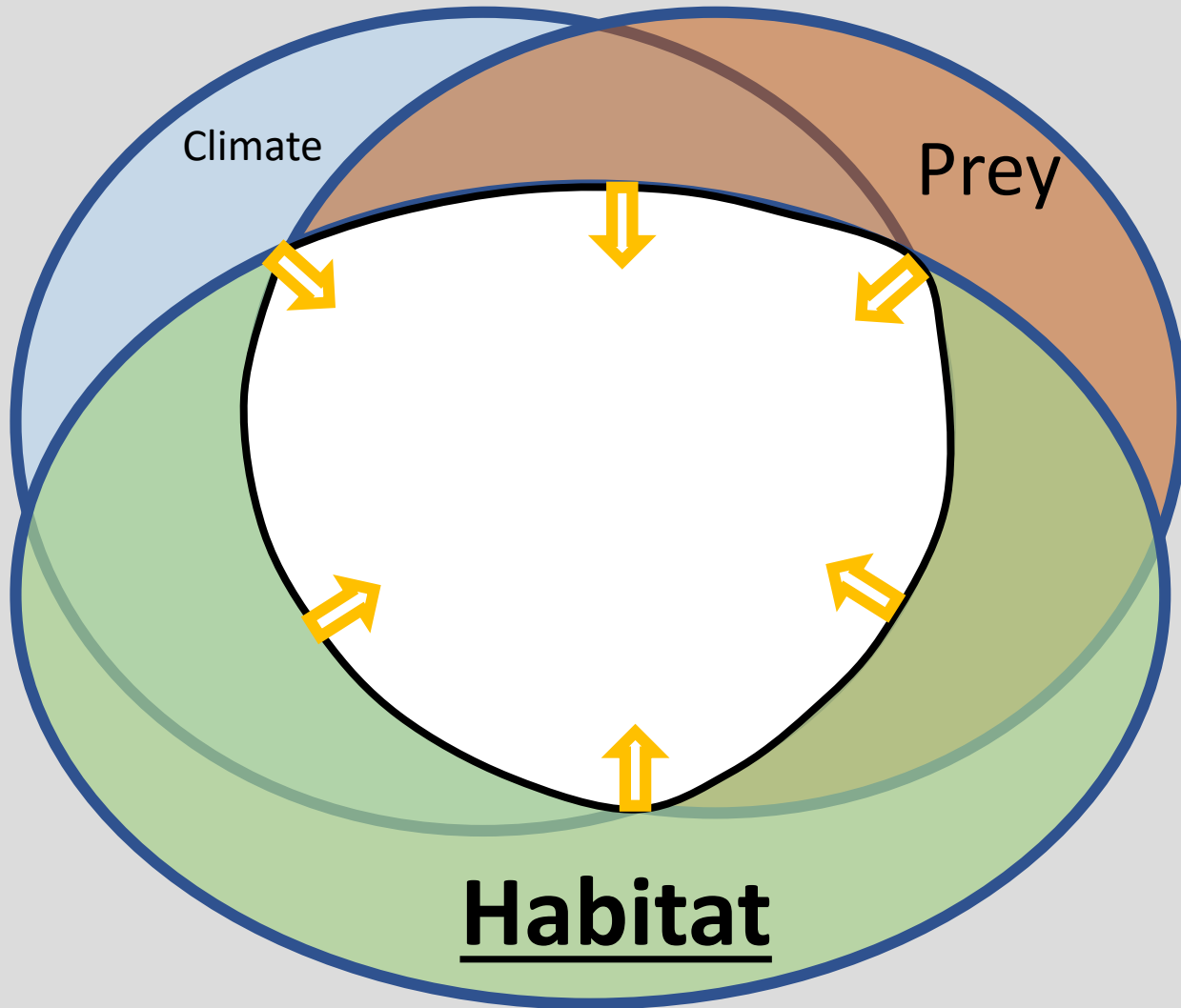
- Eagle owl is the largest Owl species (3-4 kg, length 60-75 cm)
- Cohort length - 9 years
- Breeding success below 2 fledgling
- Carry-over effect in breeding success



Presence point = good «enough»
more points = better
calibration in field



Ecological niche



○ Fundamental niche
⇒ Realized niche

The objective

Understanding of factors prevailing species distribution and the management needs for implementation of effective conservation measures for each species and the community

Tasks

1. Analyse ecological niche of each species and identify main conditions underlying their distribution;
2. Evaluate existing conservation measures and suggest priority areas and activities for targeted management

Ecological niche



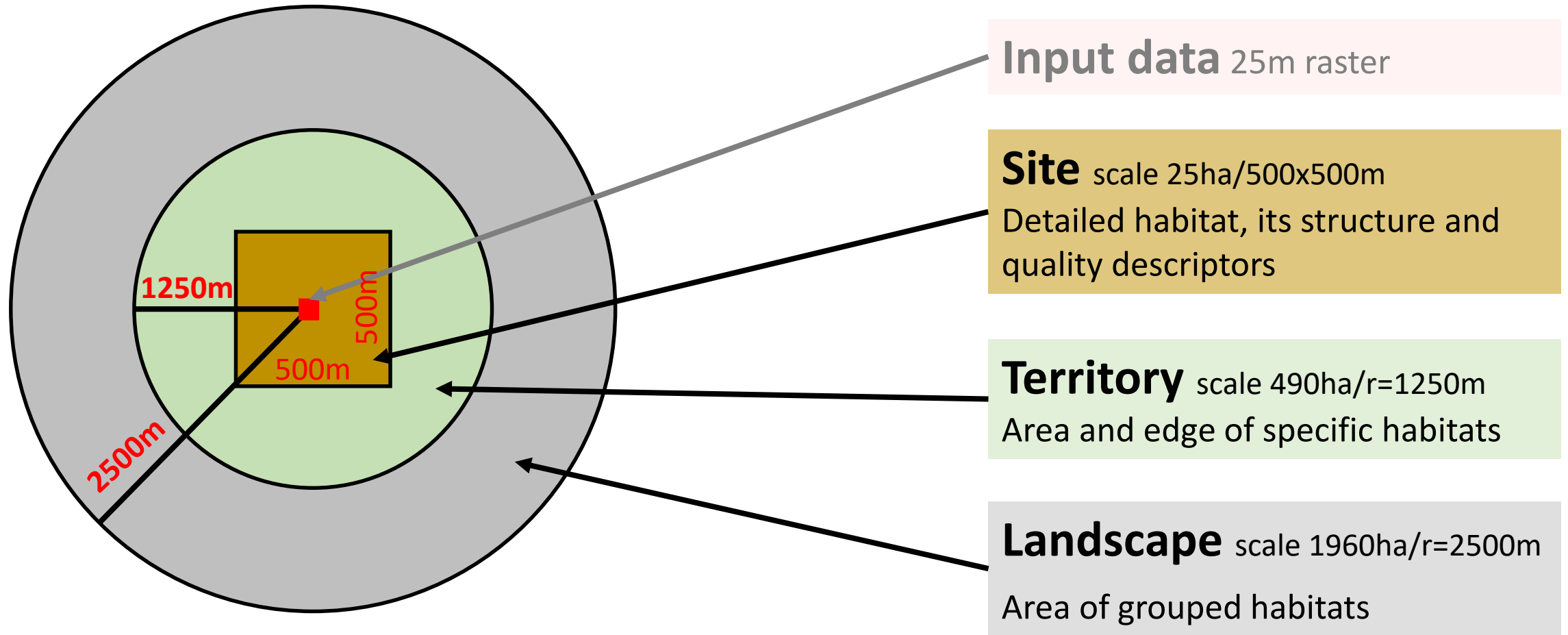
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Methods: environment



Set of 20...80 ecologically meaningful parameters

Additional 'bias-layer', accounting for geographical and environmental biases of presence points

Methods: MaxEnt & Zonation

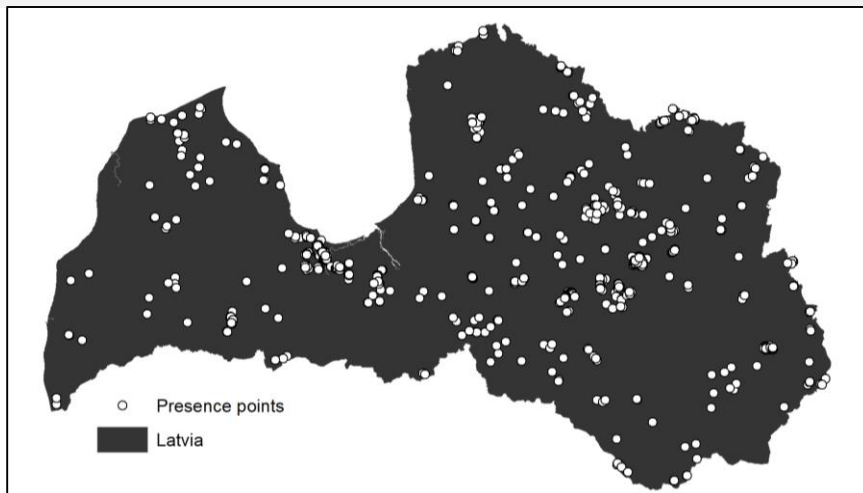
Maximum Entropy analysis

- 500m raster cell
- 31 different algorithm
- Algorithm specific regularization
- 10 cross-validations
- Model evaluation criteria:
AICc->Omission rates->Overfitting

Cloglog transformed
output map

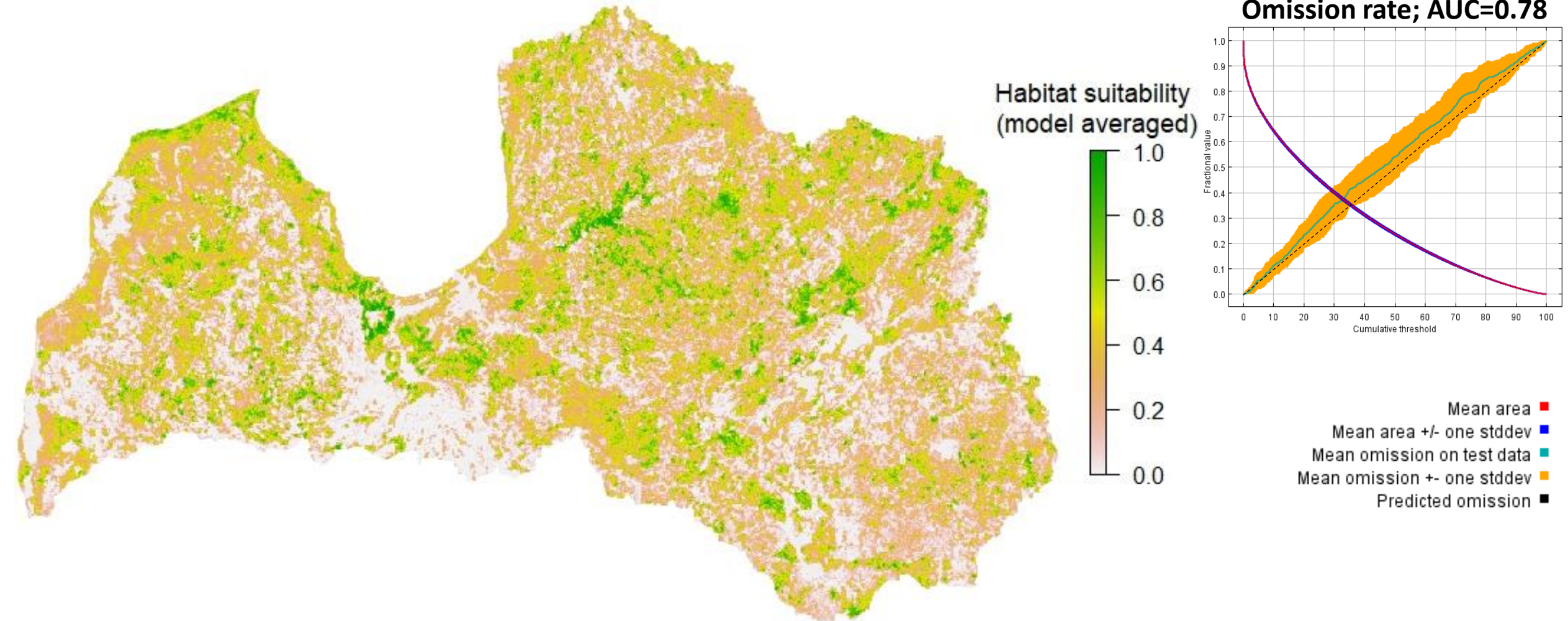
Priority site Zonation

- Uncertainty analysis
- Core area zonation vs. ABF vs. GBF
- Distribution smoothing: site, territory, dispersal landscape
- Boundary Penalty Length strength: 0, 0.0005, 0.005, 0.05, 0.1, 0.2
- Balance between extinction risk and fraction of protected population = priority for conservation



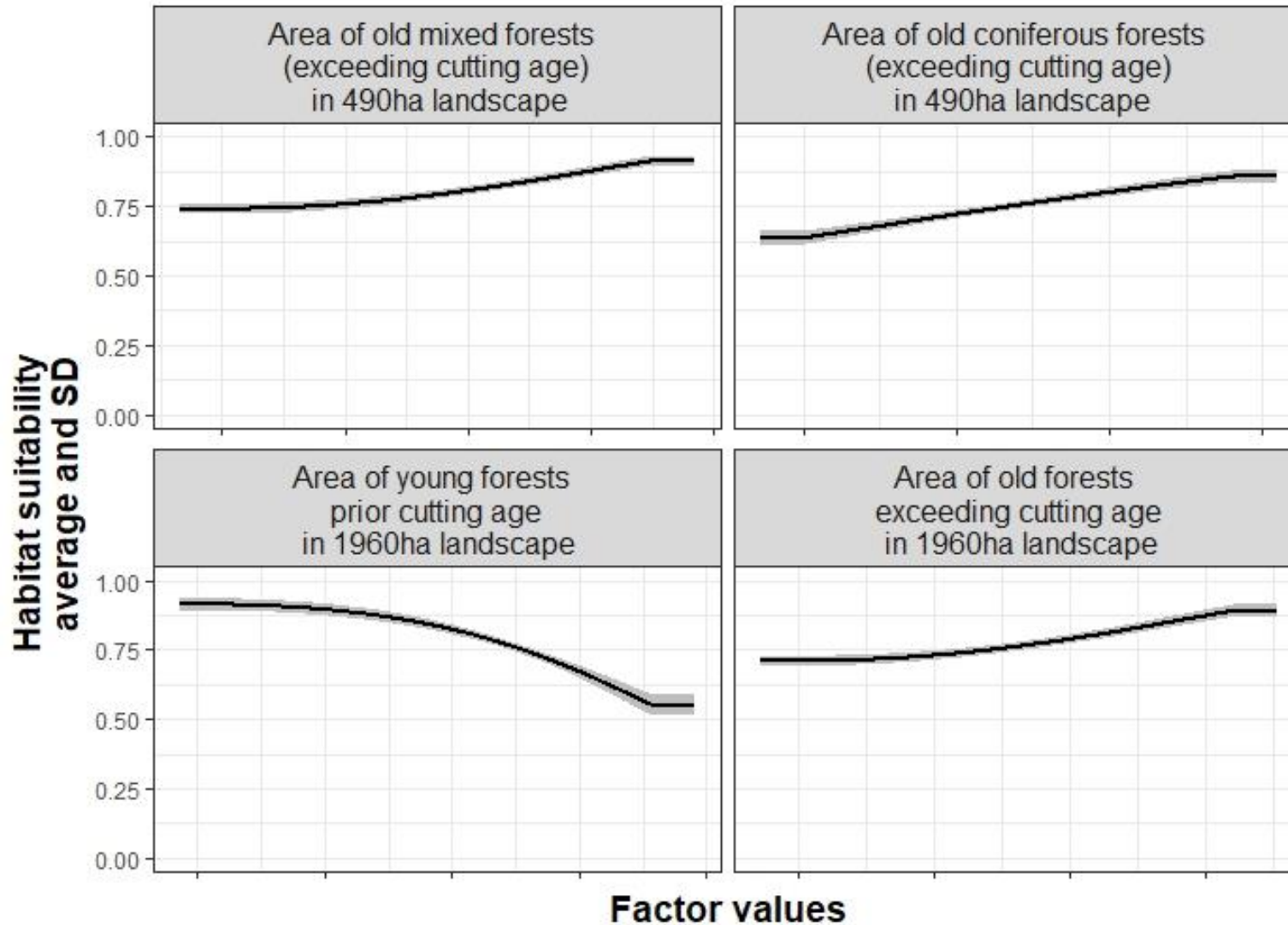
- Breeding related presence points from citizen science and special monitoring projects
- **Not a nest-box population!**

Results: Pygmy Owl habitat suitability map



The best non-overfitted model is based on Linear-Quadratic features, that constrain the output distribution to have the same expectation and variance of the environmental variables as the samples. Model has small standard deviation and its sample omission follows quantile distribution throughout 10 cross-validations.

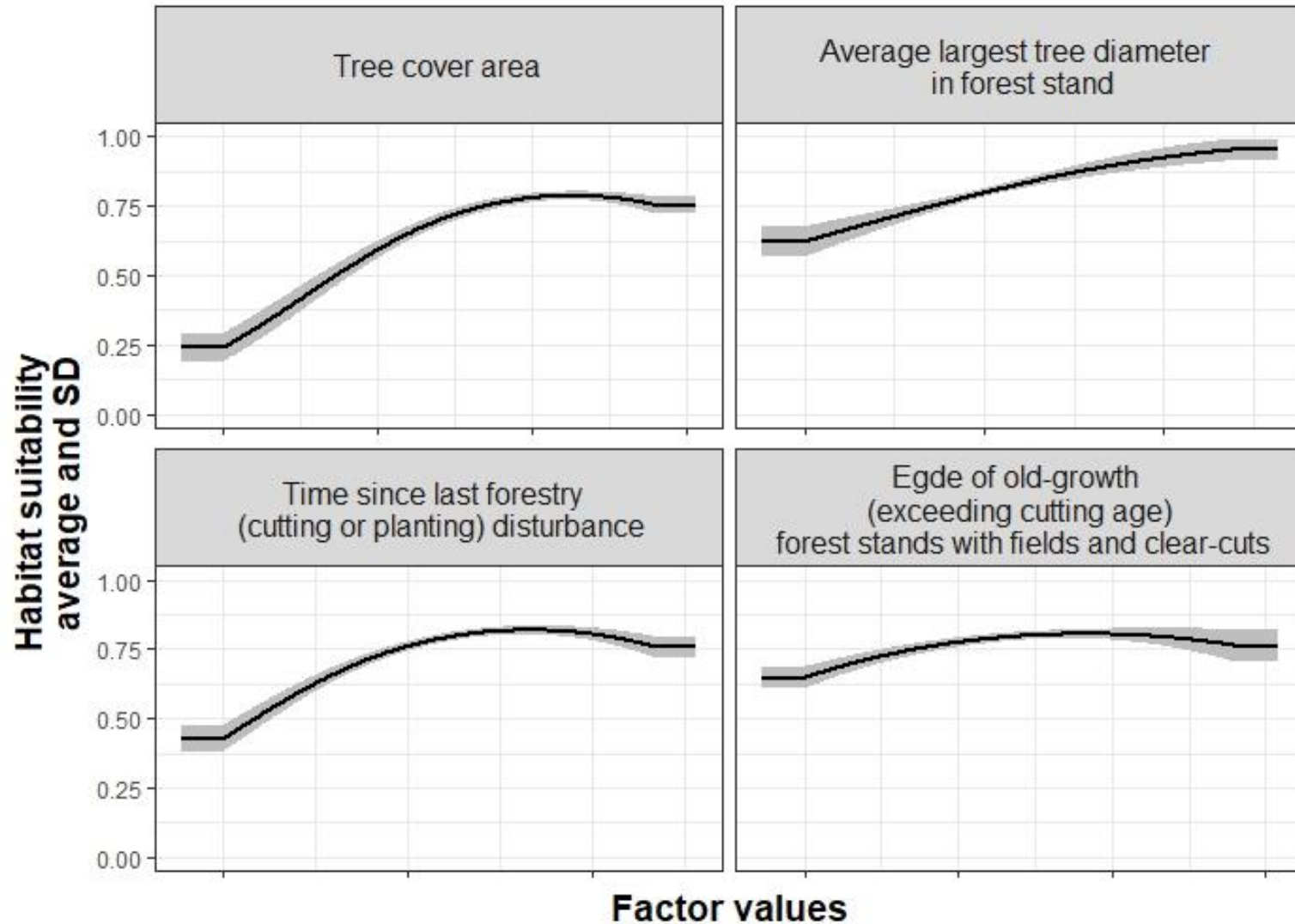
Results: Pygmy Owl territory & landscape



- **At territory scale mixed and coniferous forests exceeding stand specific cutting age are the most important and positive predictors**

- **Large scale landscape must be formed by old growth forests**

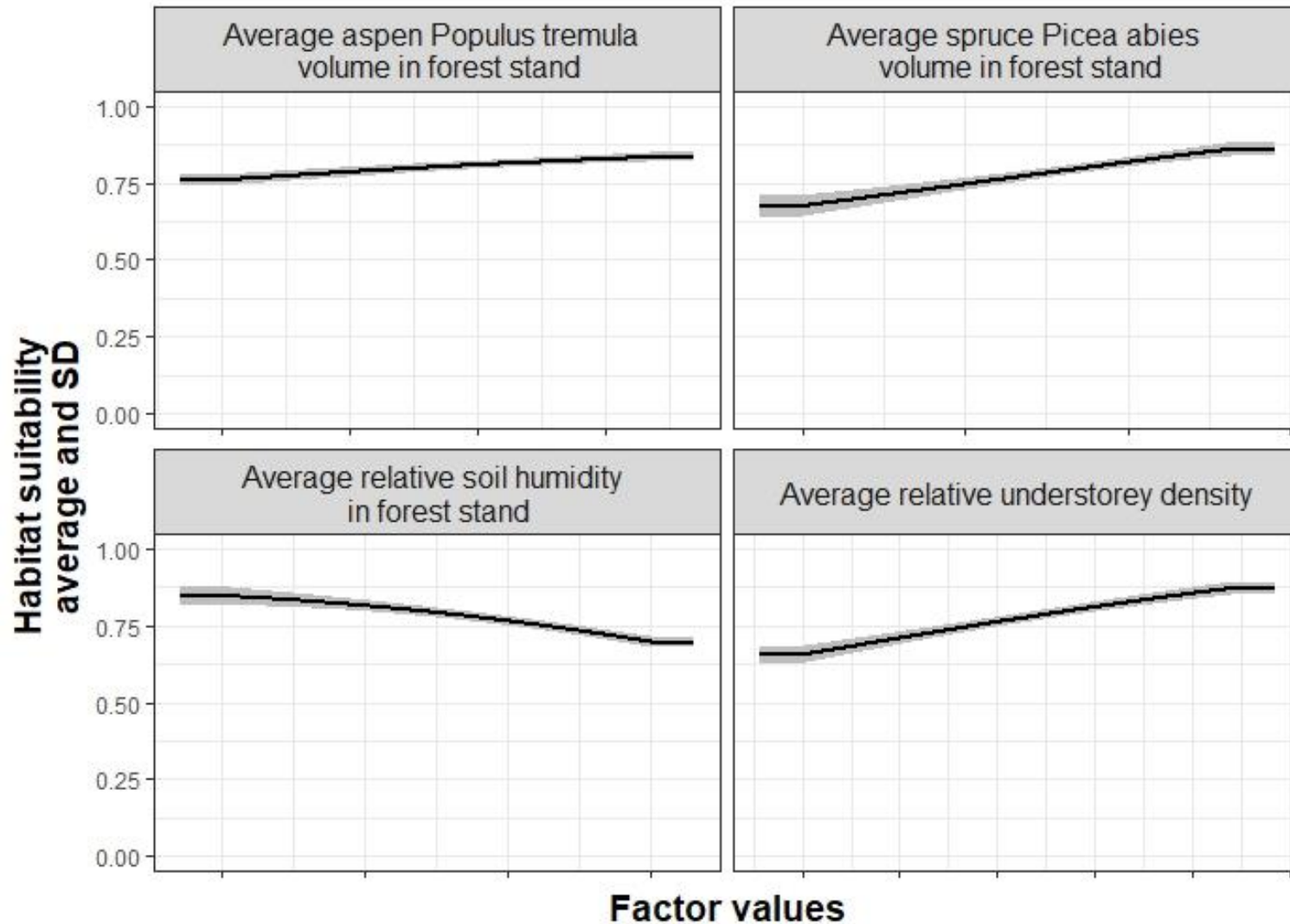
Results: Pygmy Owl site level factors



- **Each local cell must be formed by forest, made by large trees (large diameter)**

- **Local disturbances have long-term effects**
- *Some* edge of old-growth forest *may be* suitable (perches for hunting and territory defense)

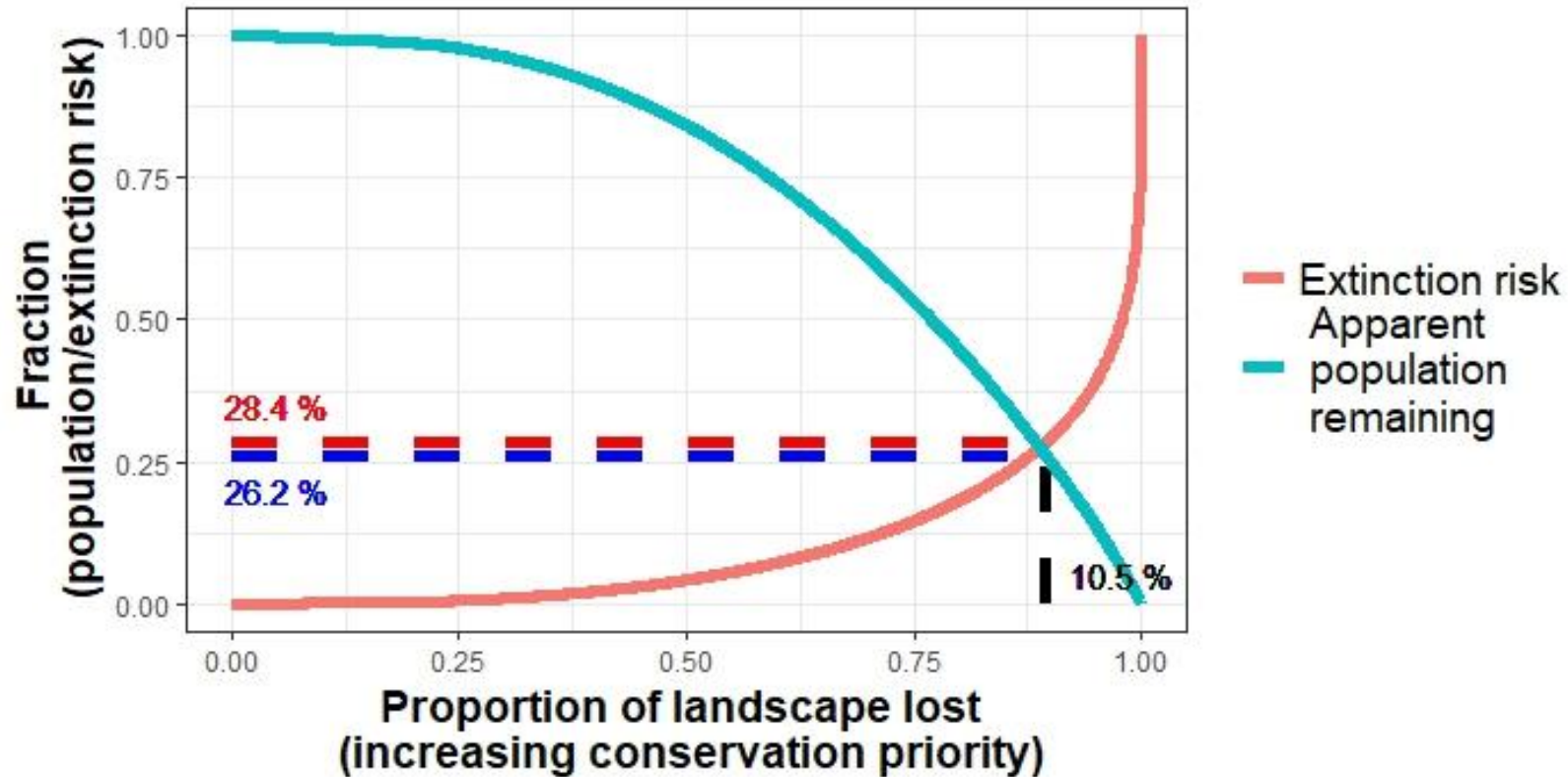
Results: Pygmy Owl site level factors



- **The most important tree species is spruce *Picea abies*** (breeding cavities and closure)
- *Aspen *Populus tremula** is a popular cavity tree

- **Dense forests in dry soils: closed forests with large trees and high potential prey density**

Results: Pygmy Owl conservation priority

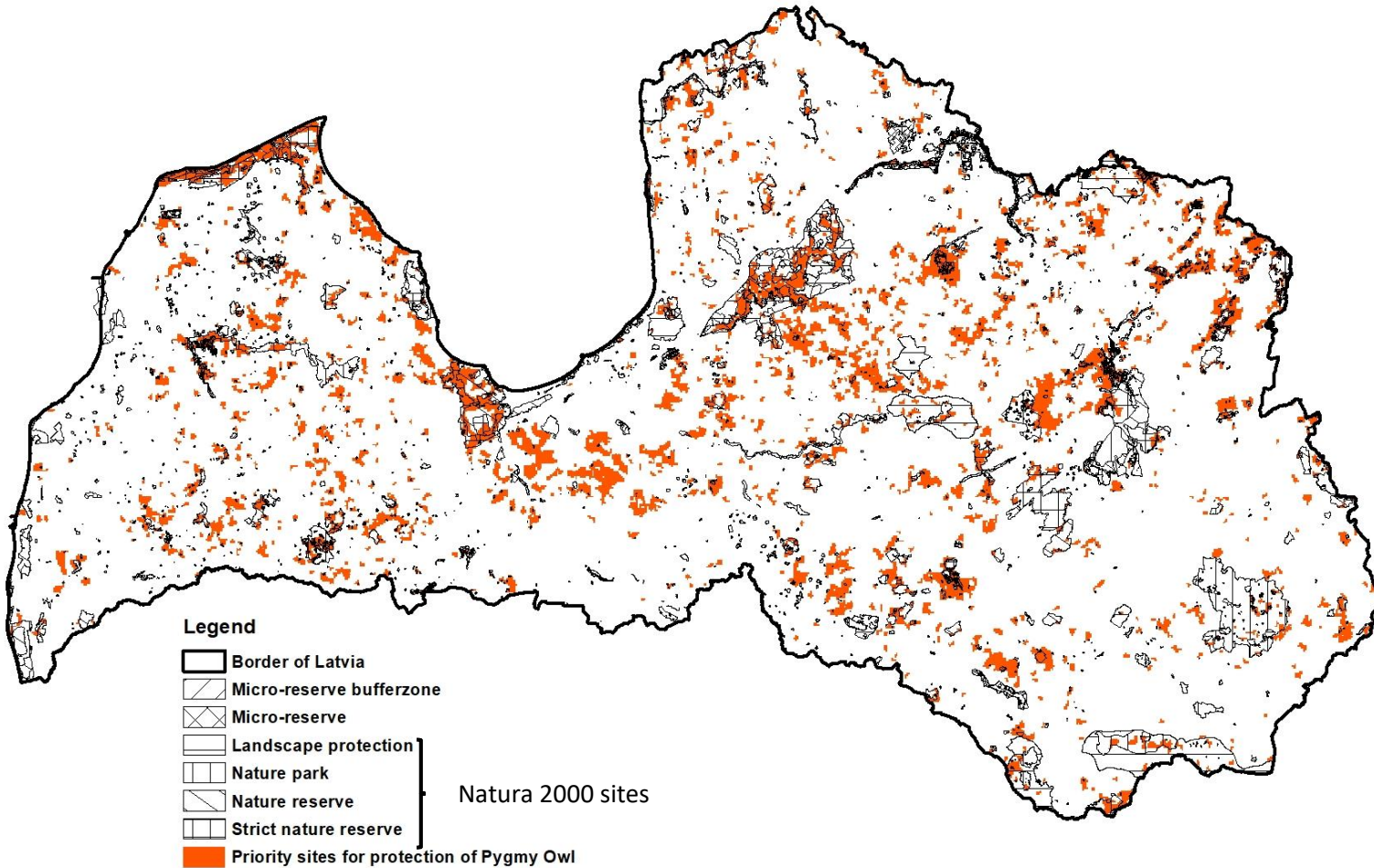


- 11% of national inland area hold 27.5% of apparent population. Conservation of those sites reduce extinction risk to 27.5%

- Sites >100ha cover 10.5% of national territory, protect 26.2% of apparent population and reduce extinction risk to 28.4%

Distribution smoothing had no effect on the result, the best site size-to-suitability ratio with BLPs=0.05

Results: Pygmy Owl conservation gaps

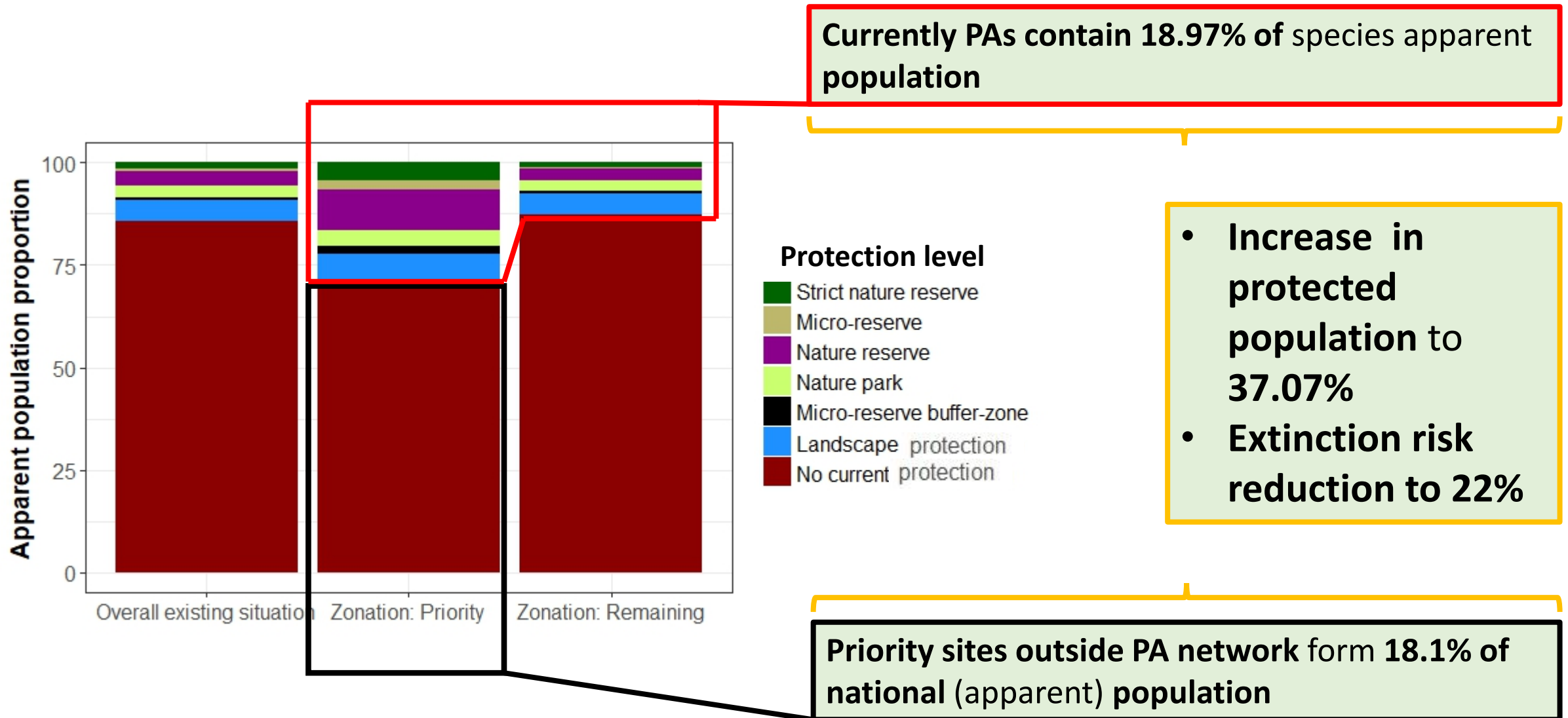


- **Currently PAs form 14.35% of national inland territory but 78.6% are not priority**

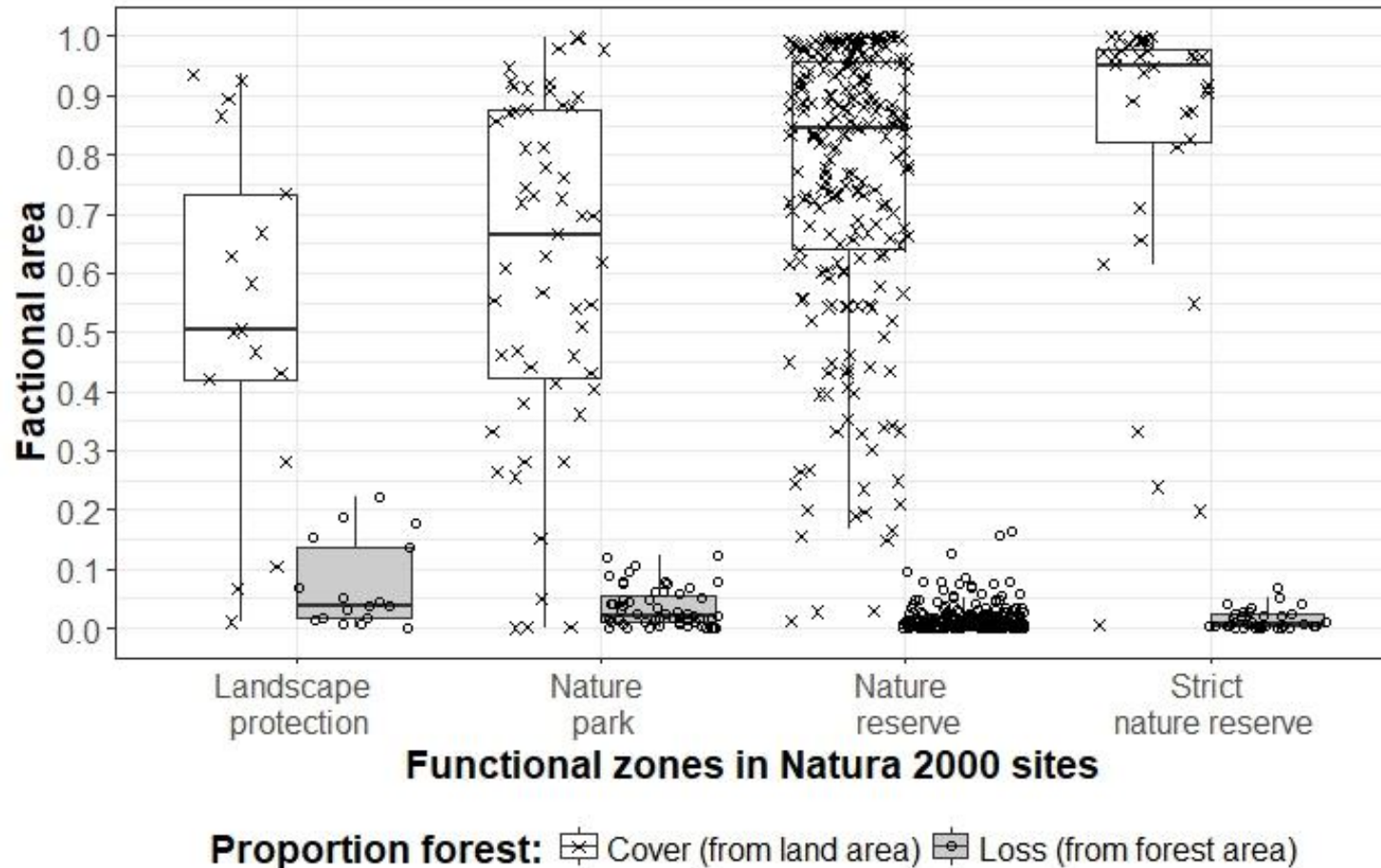
- **70.32% of priority sites are outside PA network**

- **Addition of priority sites to PA network would result in 18.76% inland territory (\approx average in EU28)**

Results: Pygmy Owl conservation gaps



Results: forest coverage (2000) and loss (2000-2016) in different protection regimes



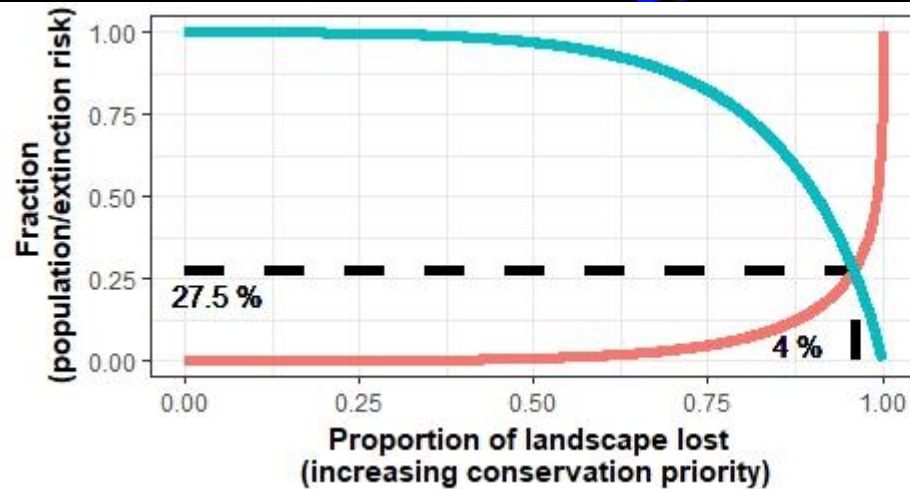
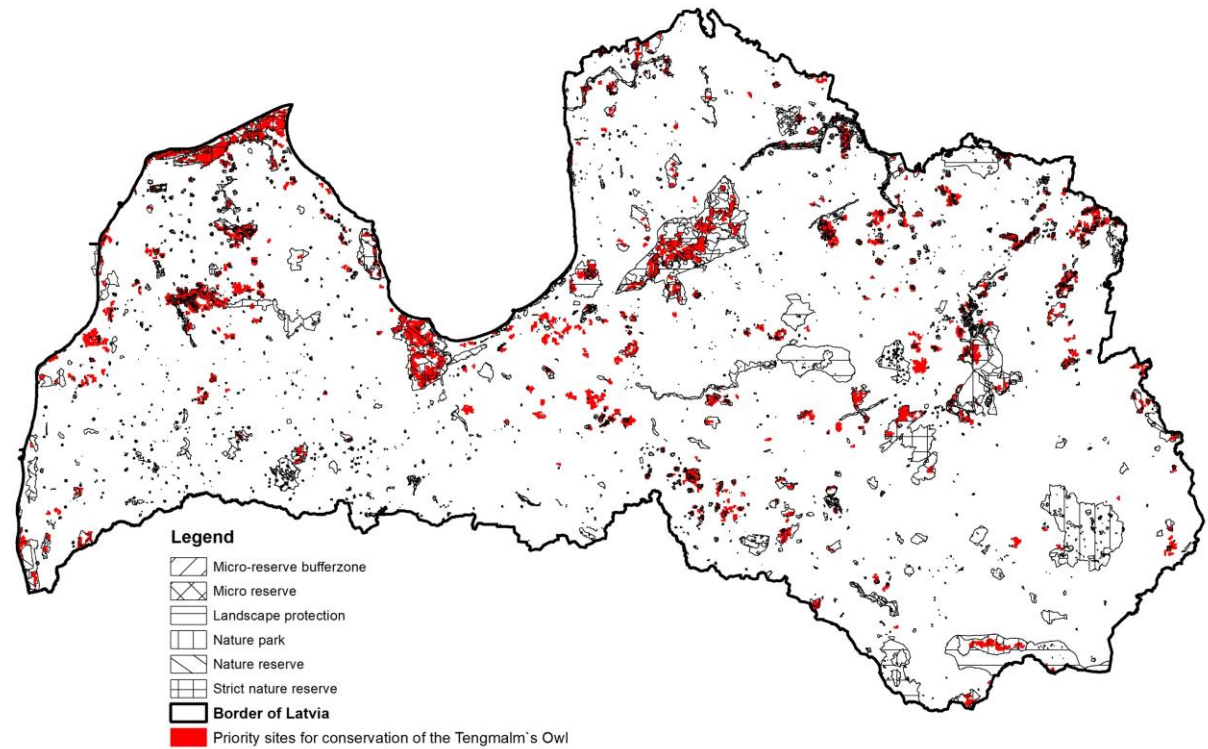
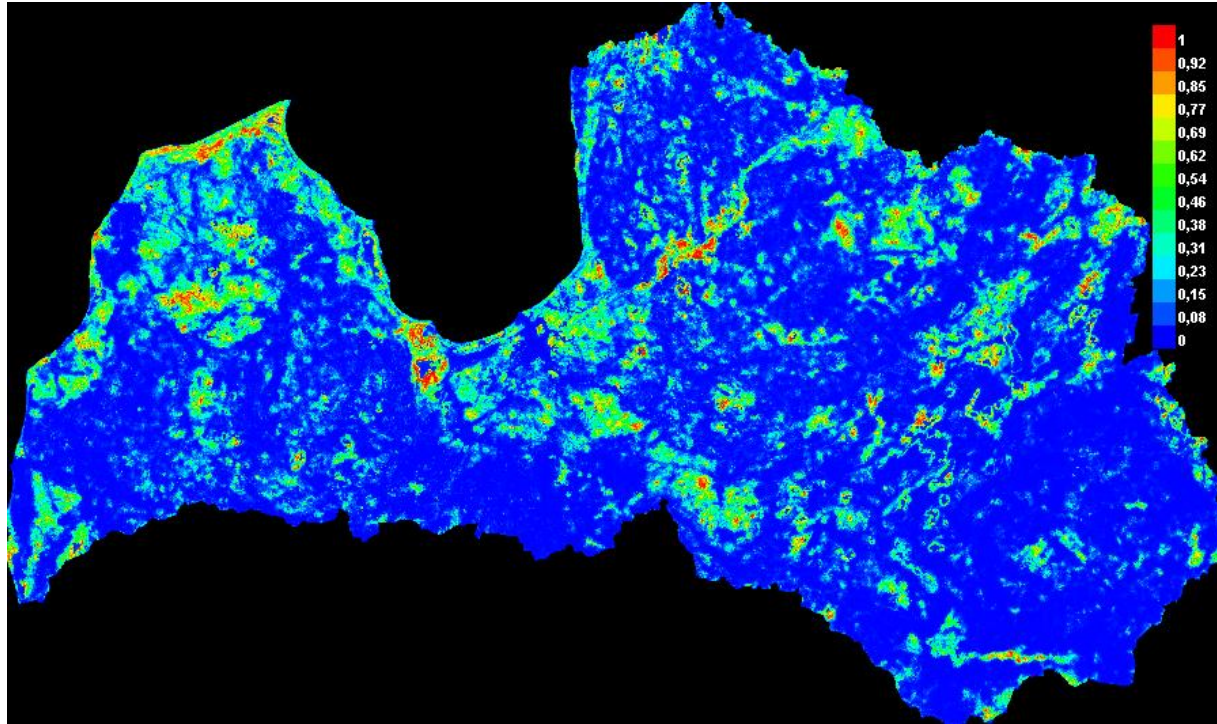
- Many areas formed by forests are «protected» while still allowing clear-cuts

- Tree cover loss from 2000 to 2016 is up to 24%

- Weaker legislation=higher tree cover loss

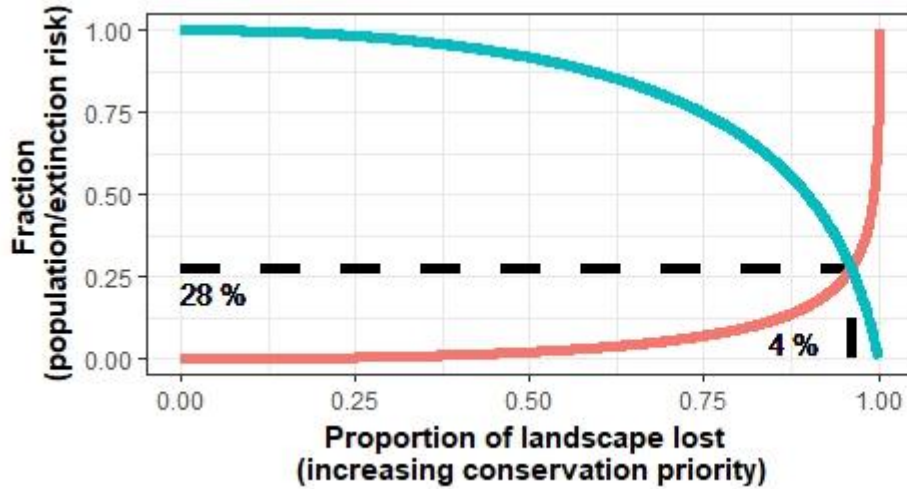
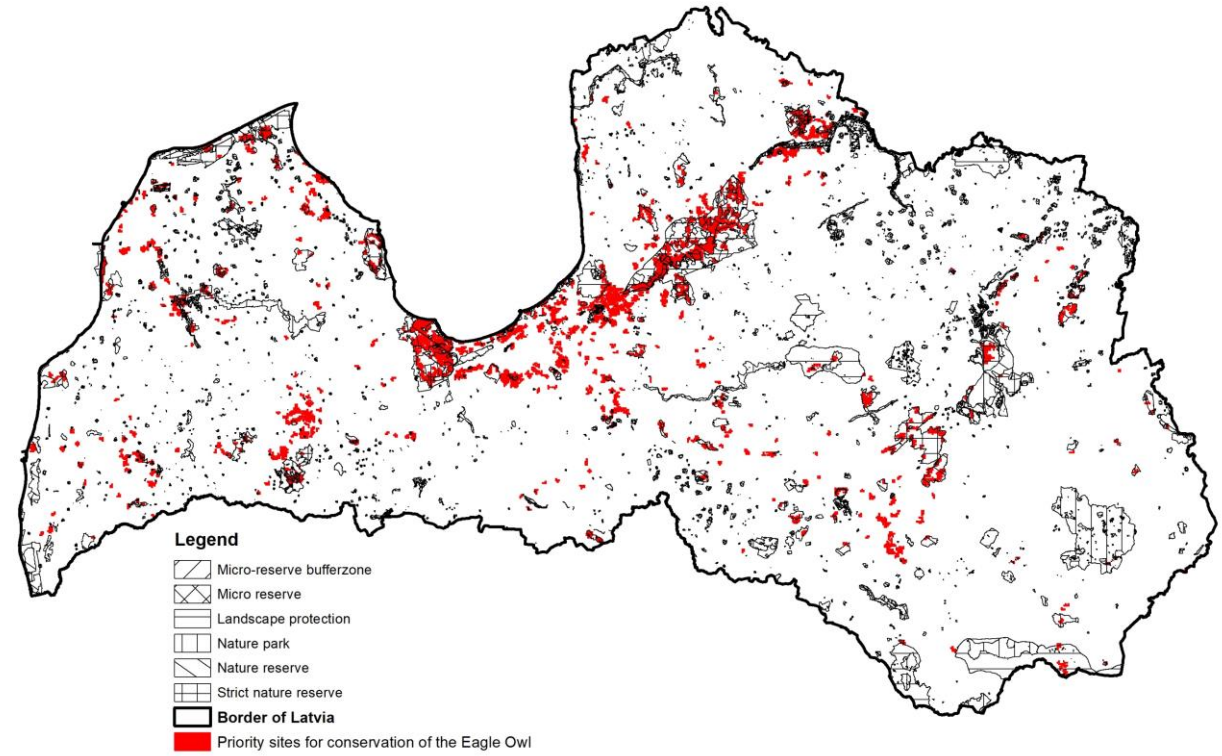
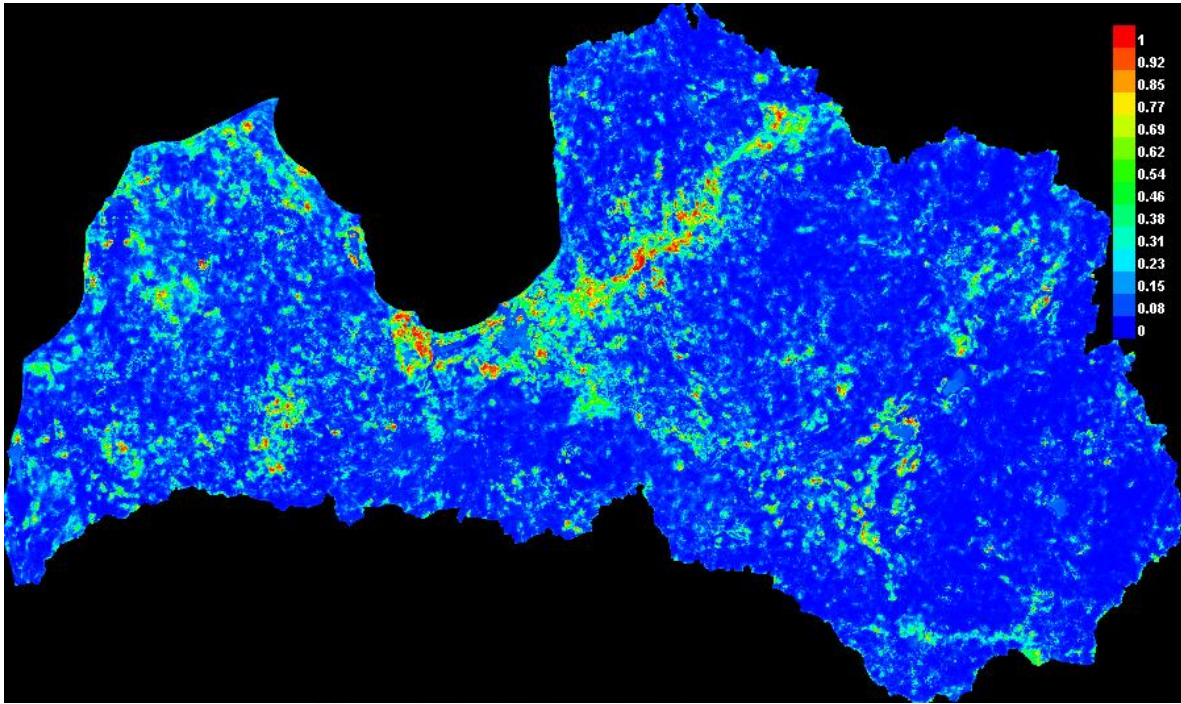
- For old-growth forest specialist suitable zones are Nature reserve and Strict nature reserve

Tengmalm's Owl



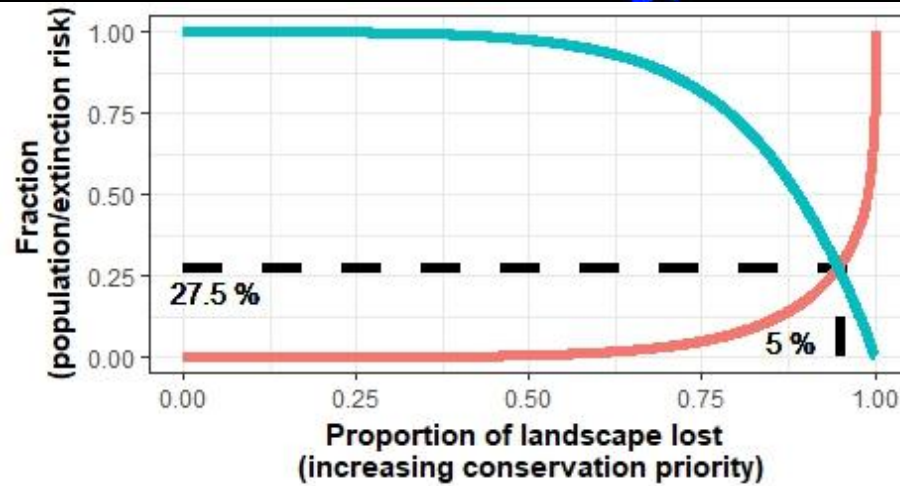
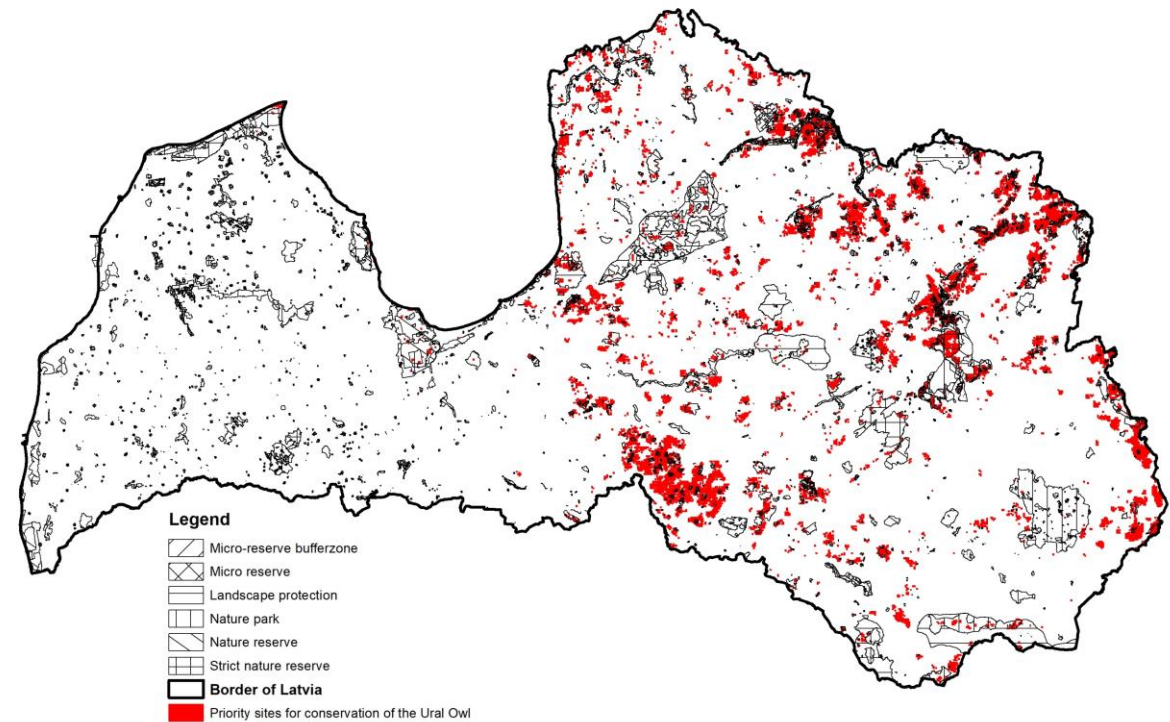
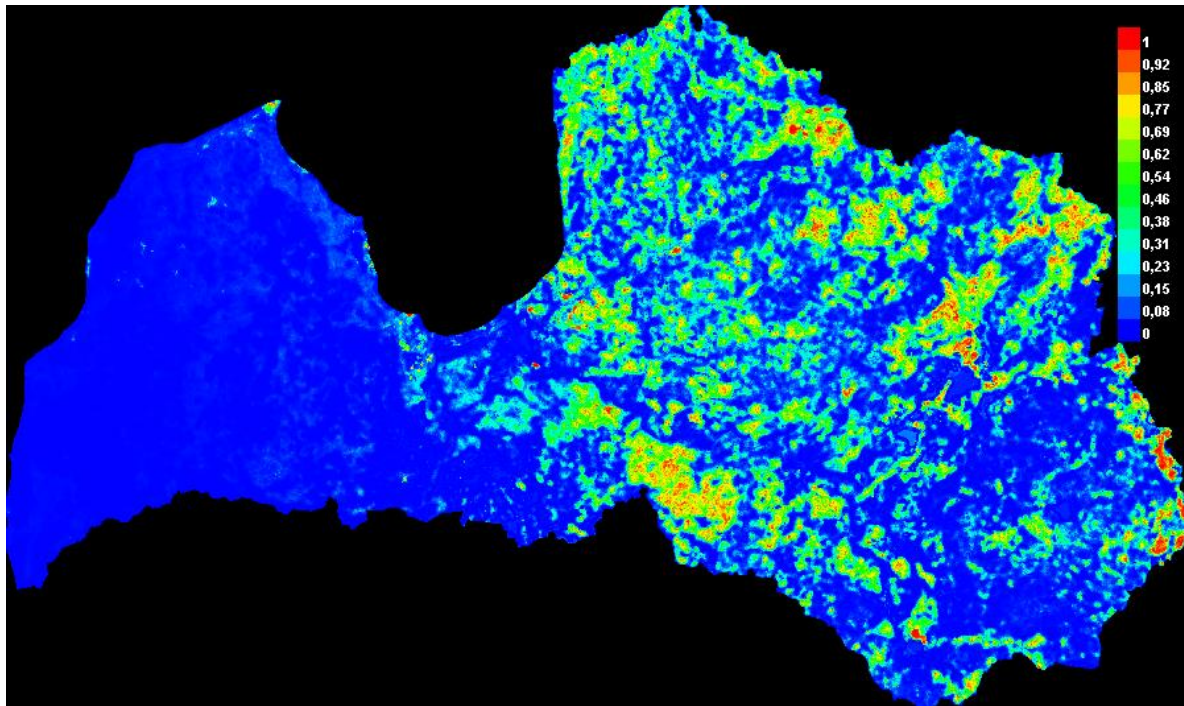
— Extinction risk
— Apparent population remaining

Eagle Owl



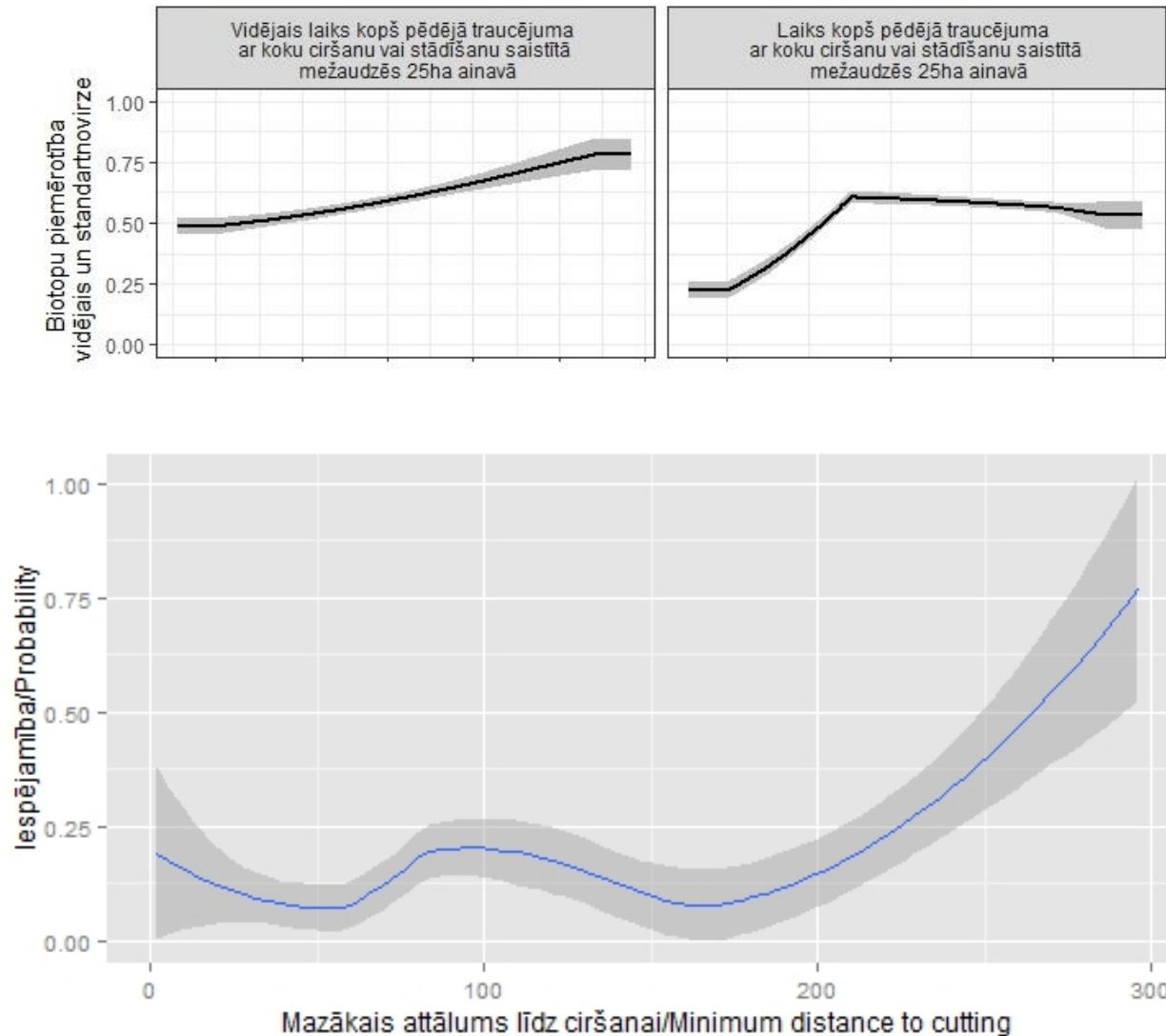
Extinction risk
Apparent population remaining

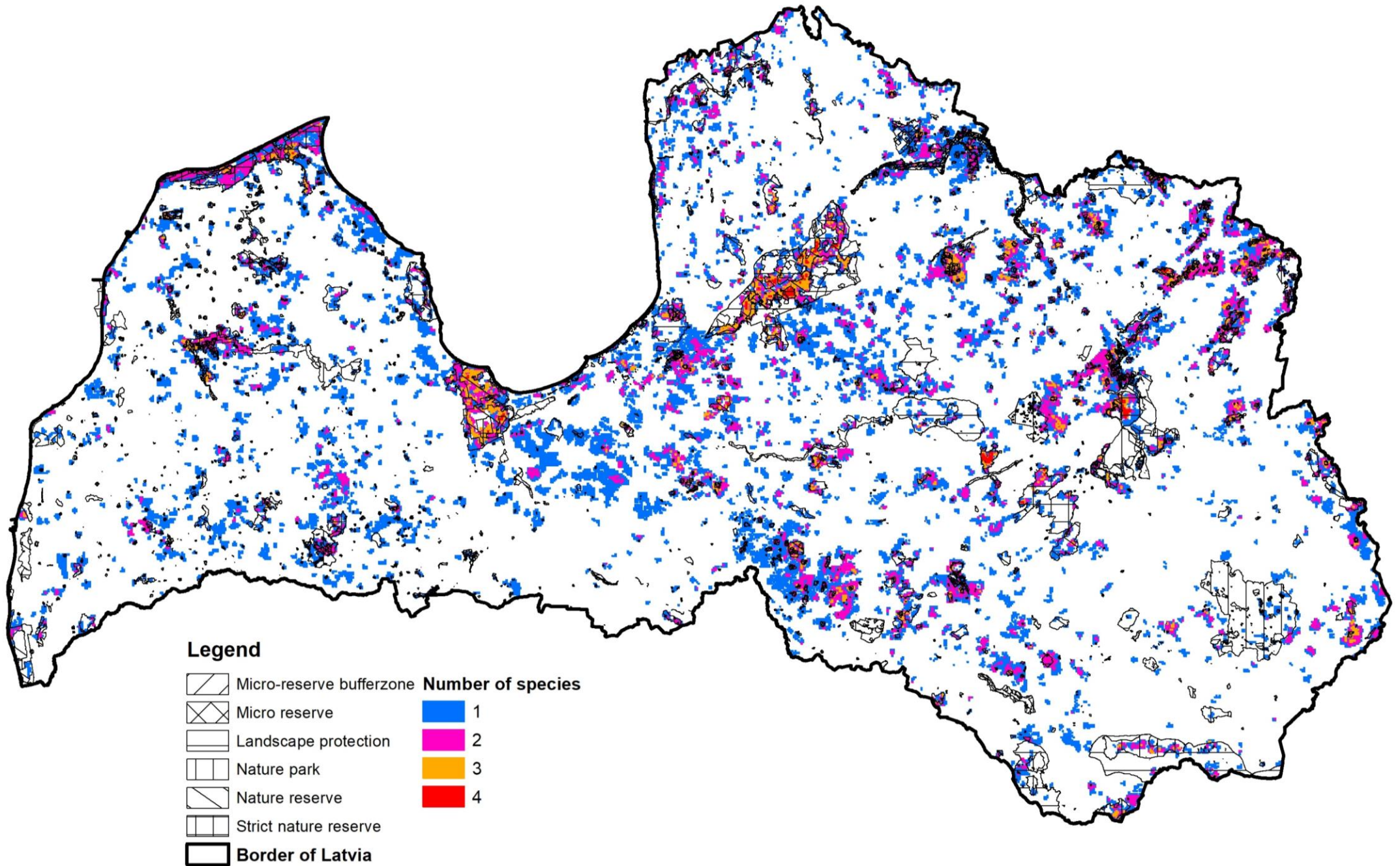
Ural Owl



— Extinction risk
— Apparent population remaining

Ural Owl and forestry disturbances





Legend

- | | | |
|--|--------------------------|--------------------------|
| | Micro-reserve bufferzone | Number of species |
| | Micro reserve | 1 |
| | Landscape protection | 2 |
| | Nature park | 3 |
| | Nature reserve | 4 |
| | Strict nature reserve | |
| | Border of Latvia | |

Owls and forests

Sugu skaits	Land %	% no GLAPAS	% no AEGFUN	% no STRURA	% no BUBBUB	Land % non-protected
1	12,03	63,71	26,01	49,72	56,62	11,60
2	3,59	27,46	45,41	39,02	24,56	3,15
3	0,90	8,14	26,36	9,80	14,65	0,55
4	0,0007	0,69	2,21	1,46	2,17	0,000008

To protect forest dwelling owls 16,6% must be managed for forest specialist conservation, increasing PA`s by 15,32% of the land

Thank You!



Geodatabases for environmental data preparation were received from Nature Conservation Agency and ecogeographical parameters were created as a part of conservation activity plan for owls in Latvia.

Data analysis and interpretation of the results was done within the state research program 'The value and dynamic of Latvia's ecosystems under changing climate'.