Welcome to beaver paradise?

Modelling habitat suitability and carrying capacity for European beaver (Castor fiber) in a highly modified lowland landscape

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Altenburg & Wymenga ecologisch onderzoek

Independent ecological research and consultancy firm based in The Netherlands

Since 2017 working on beaver projects:

- Monitoring, surveys, ecological advice
- Habitat suitability analyses
- Risk assessments
- Beaver management plans

Our Beaver-team:

Sophie Ward
Ecologist

Ferdi Selee
Fauna Ecologist

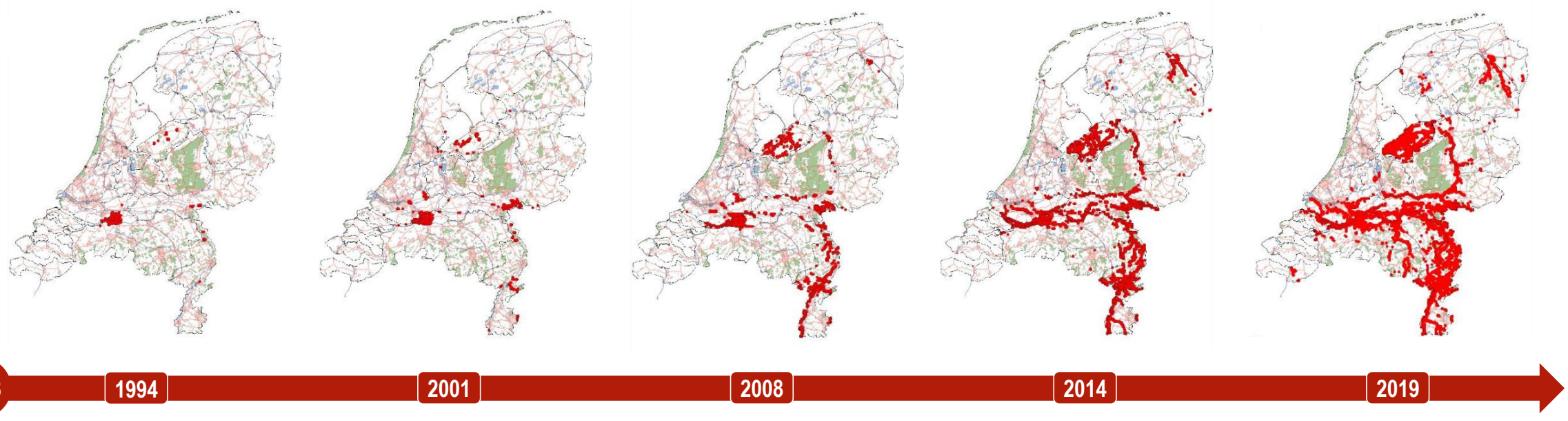
Ilse Sijtsma
Ecologist

Ronald de Jong
GIS analyst

Why is this research needed?

Return of the beaver

- After reintroduction, beaver populations in The Netherlands are expanding fast
- Further expansion to the northwestern part of the country is taking start



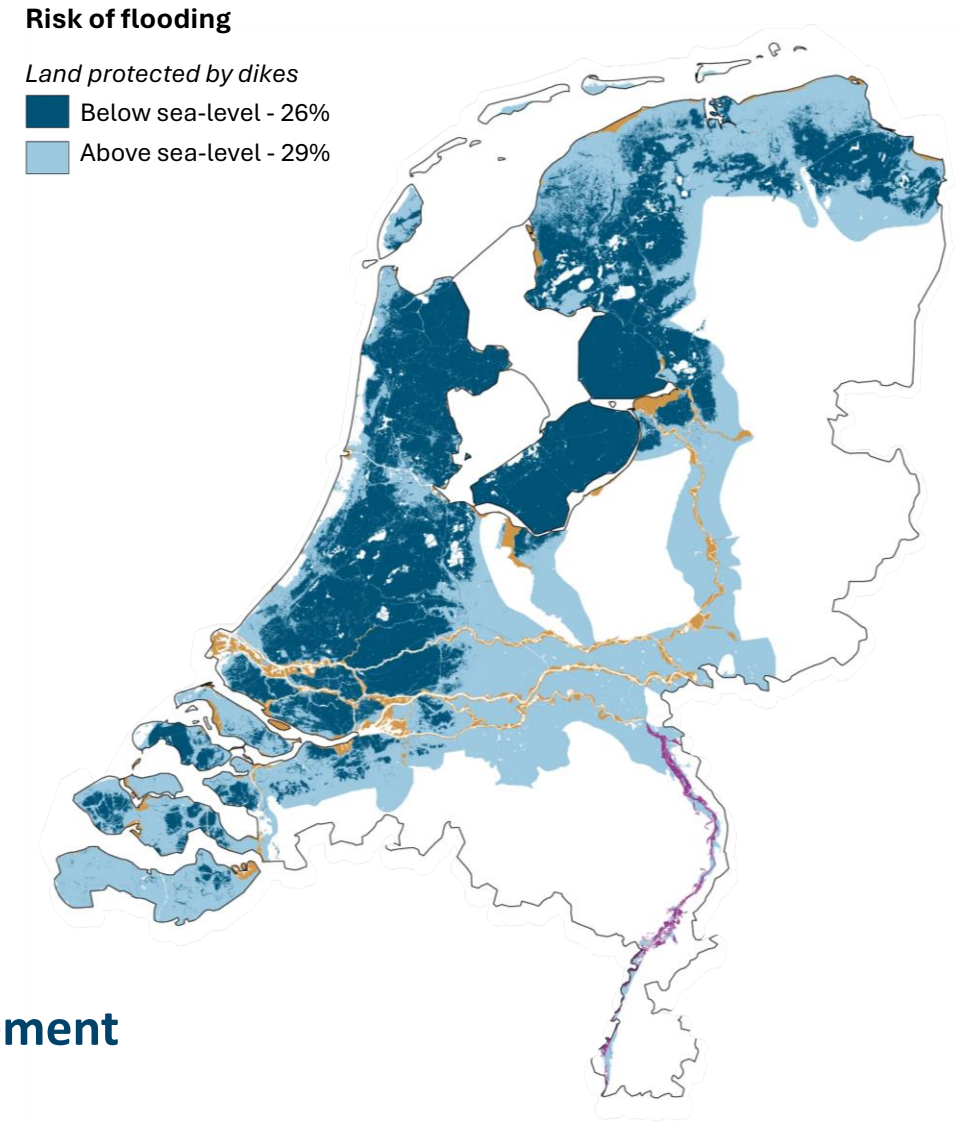
What to expect?

What to expect?

Hydrological and landscape context

- River delta with a very dense water network
- Significant part below sea-level and at risk for flooding
- Densely populated and highly anthropogenic landscape

→ **High potential for conflicts and safety concerns**

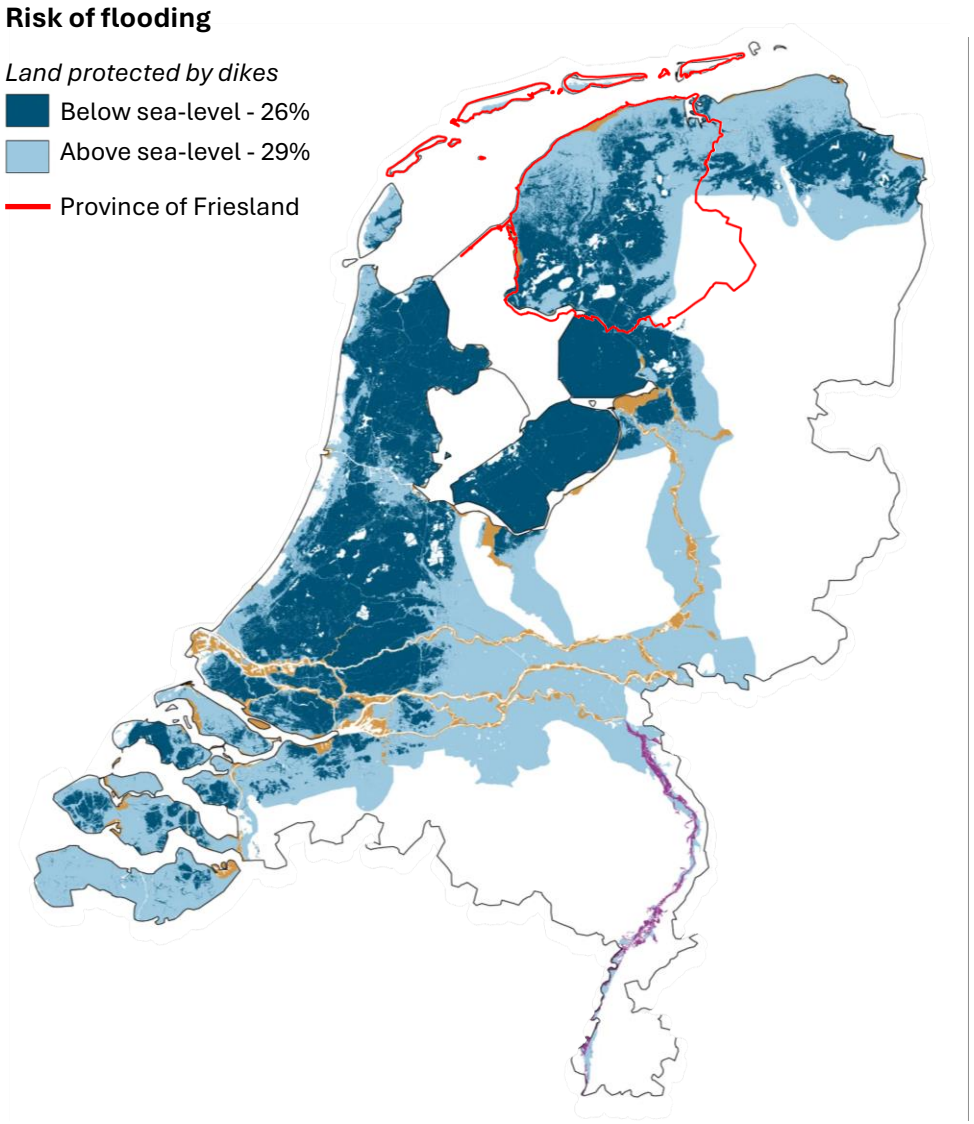


→ **Need for a sound information base for future beaver management**

What to expect in Friesland?

Province of Friesland asking for a prediction of the potential future beaver population

- What to expect? Where? When?
- On a purely ecological basis



Friesland – a potential beaver paradise?

Our approach

Literature study

- Beaver territory size
- Beaver family size
- Beaver habitat modelling

→ Beaver habitat:

Sufficient food and building material in the near presence of water

GIS-based Multi-Criteria Analysis

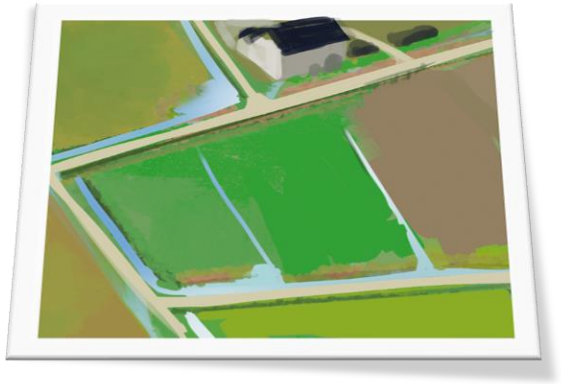
- Combine spatial data about potential food sources with data about the presence of water
- Use nationwide available data sources
- Define core, dispersal and null habitat
- Define and distinguish habitat quality

Challenge in methodology

Literature study

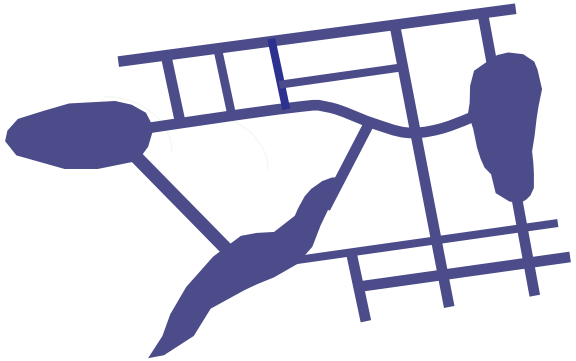
- Mostly natural water systems
- Analysis based on ordered stream networks
- Territories calculated based on length of the river network's banks

Province of Friesland



- Water system heavily influenced by humans
- More of a network structure
- Territories (potentially) not line shaped

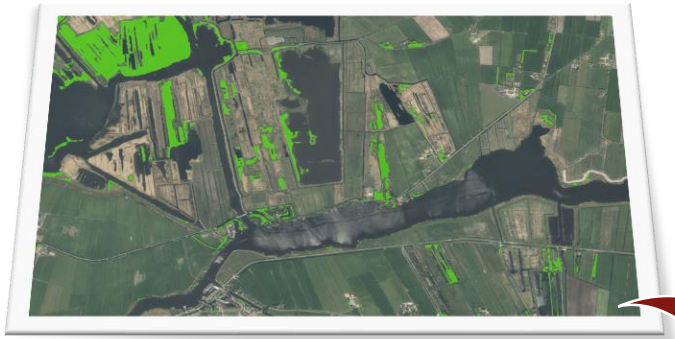
  → Risk of overestimation potential habitat due to dense water network



Solution → Calculate beaver territories based upon area suitable habitat instead of bank length

Defining potential foraging habitat

Forest - Topographic basemap

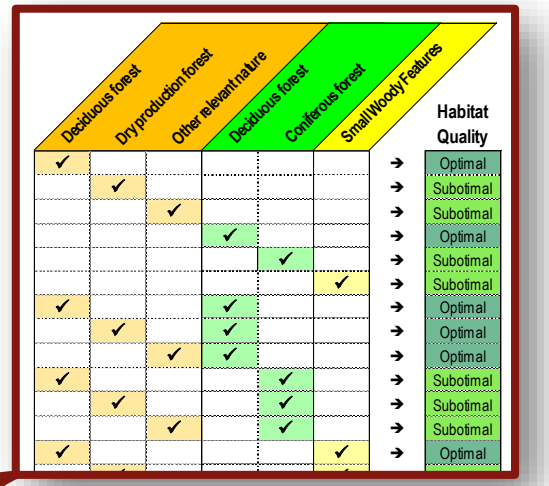


Small woody features - Satellite imagery

Relevant nature types - Nature mgmt. plans

Sufficient food and building material

Combing and weighing potential food source data to locate potential foraging habitat and its quality.



Decision matrix habitat quality

Potential foraging habitat

Quality
optimal
suboptimal

Determining Core habitat

Fresh water - Topographic basemap

… in the near presence of water

Combing potential residential habitat (proximity to water) with potential foraging habitat to determine core habitat.

Potential ‘residential habitat’

Potential foraging habitat

Core habitat

Potential ‘residential habitat’

- Use of detailed vector polygon data for high accuracy data on shoreline location
- Potential ‘residential habitat’ = ≤20m water

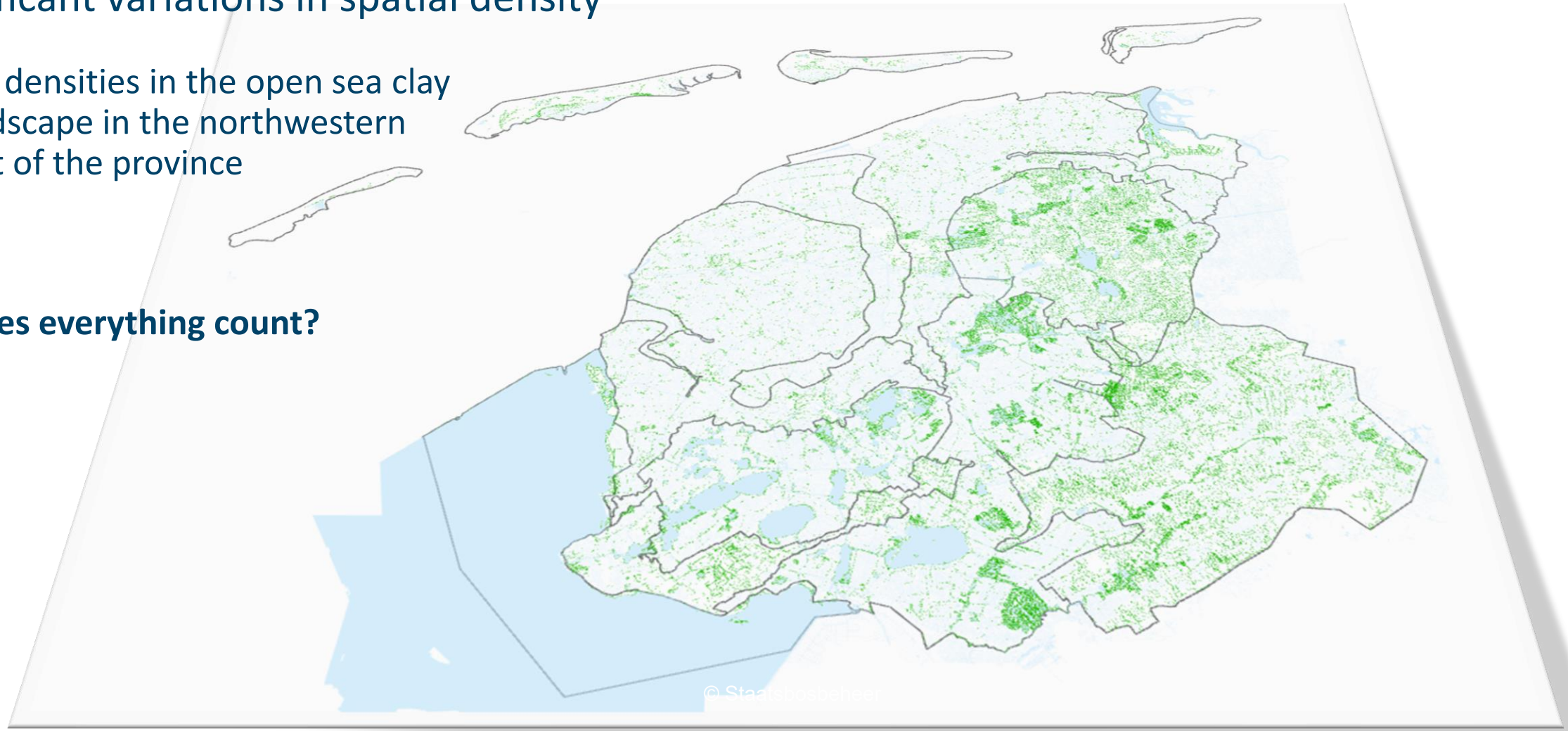
  → Zone in which core habitat is located

Core habitat in Friesland

Significant variations in spatial density

- low densities in the open sea clay landscape in the northwestern part of the province

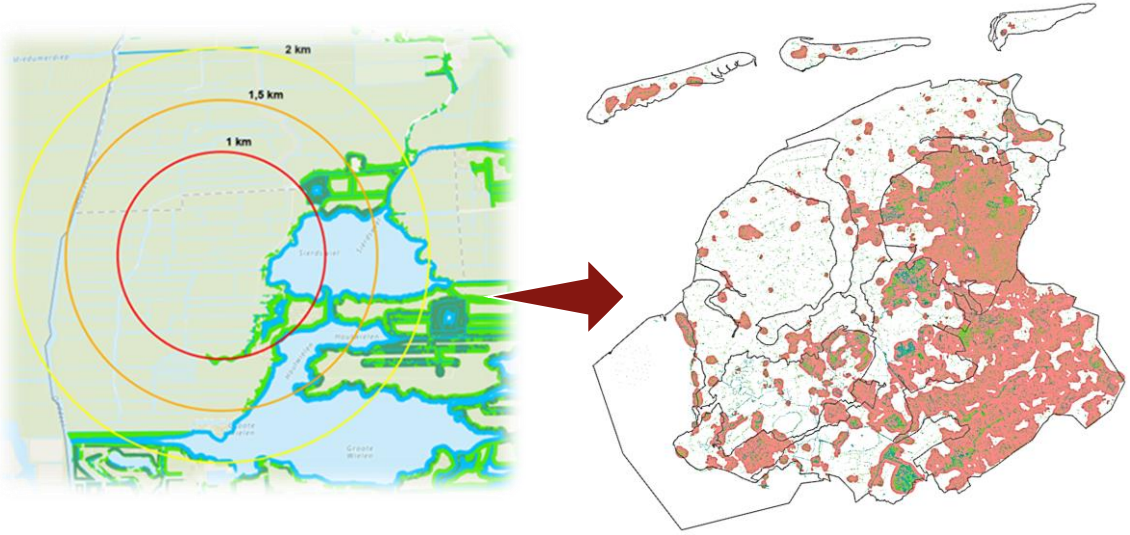
→ **Does everything count?**



Corrections

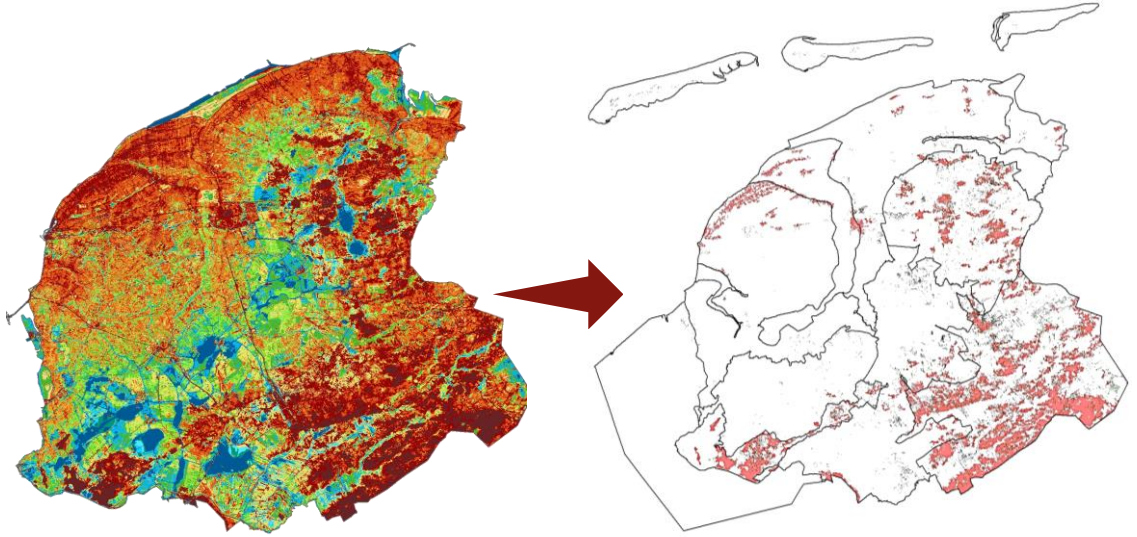
Exclude areas with low core habitat density

- Formation of territories in areas where core habitat is scarce is highly unlikely.
- Filter: ≥ 6 ha core habitat within a search radius of 750 m (1.5 km diameter).



Correct for areas with low groundwater levels

- Areas where part of the water system likely does not carry water all year round.
- Downscale habitat quality;
  optimal → suboptimal
  suboptimal → marginal

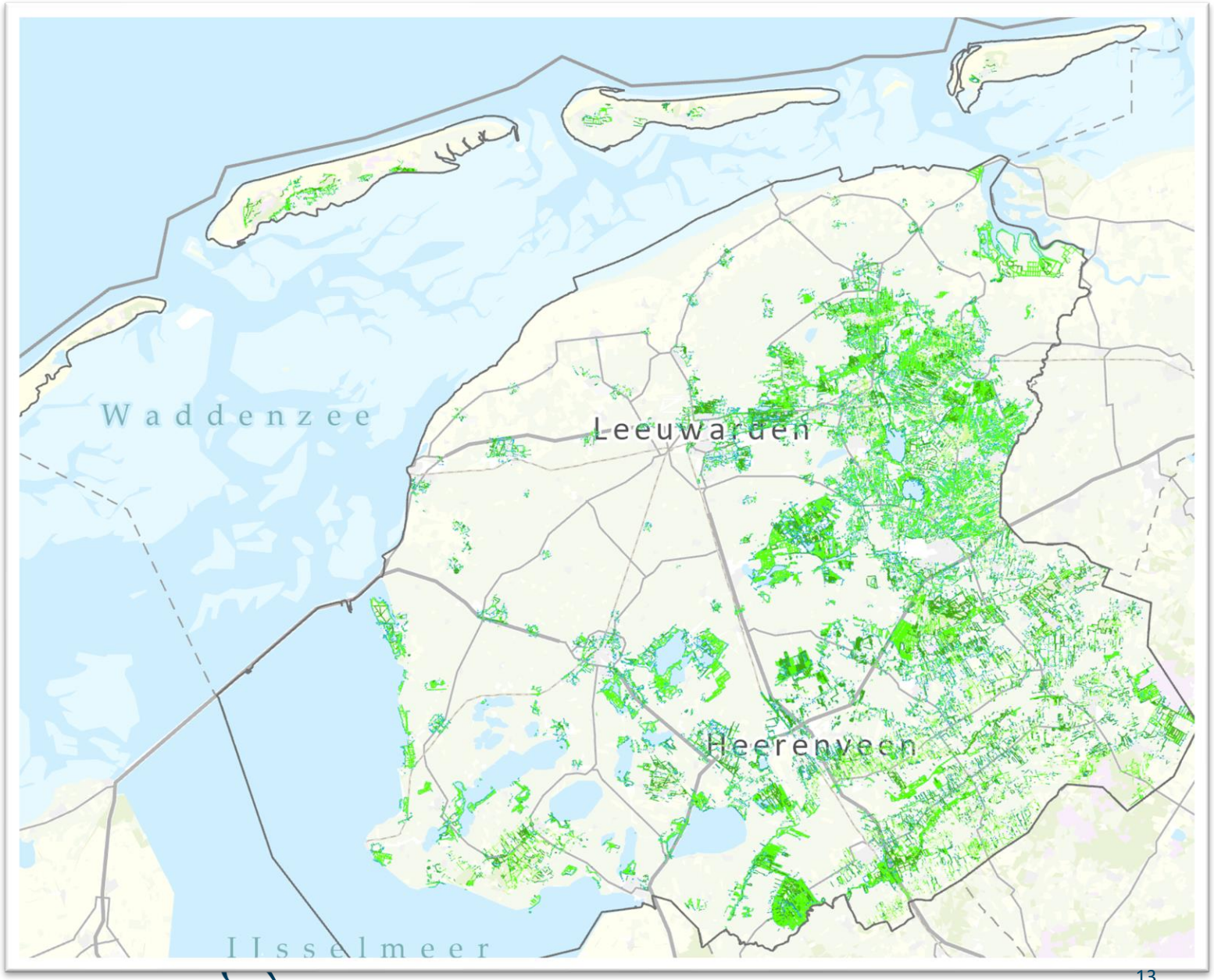


Final result

Beaver habitat in Friesland

- 11,163 ha of potential beaver habitat has been identified.
- Quality distinguished in optimal, suboptimal and marginal.
- Majority of the habitat lays in the more closed landscape of the east and south of the province.

→ So how many beavers can this landscape support?



How many beavers can the landscape support?

Carrying Capacity calculation

- Scenarios based on territory size and family (group) size
- Model estimates: 3,349 – 14,512 beavers in Friesland
- Best supported outcome: ~7,070 individuals; 2.1 beavers per km2
- Lithuania: 1.9 / km2 (Belova et al., 2017)

SIZE		TERRITORY		
		low - 8 ha	average - 6 ha	high - 4 ha
FAMILY	low – 2.4	3,349	4,465	6,698
	average – 3.8	5,302	7,070	10,605
	high – 5.2	7,256	9,675	14,512

Numbers are based on the calculated total of 11,168 hectares of potential beaver habitat.

How quickly can population development take place?

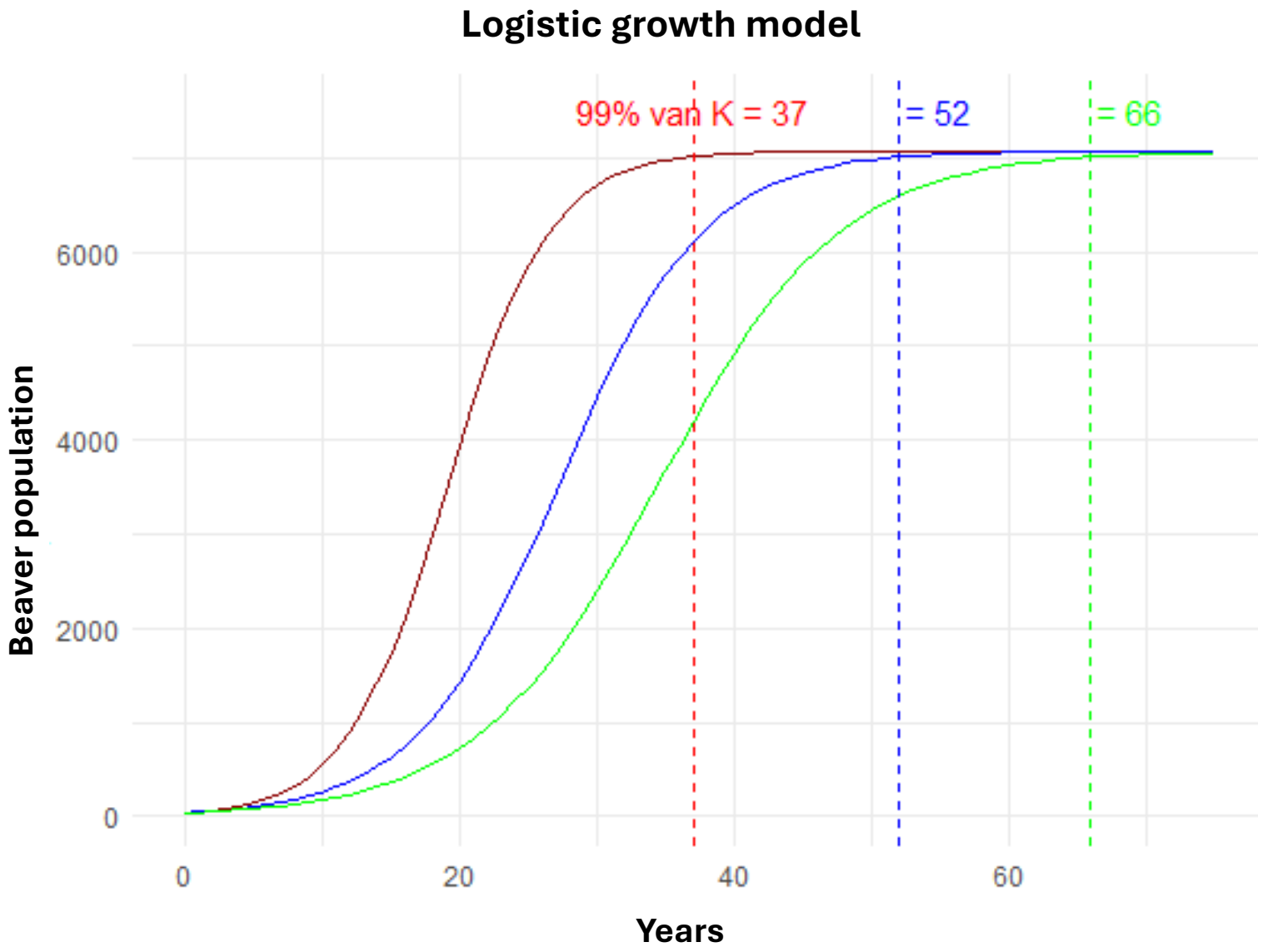
Population growth over time

Logistic growth model

- Carrying capacity (K) = 7070
- Maximum annual growth rate (r) =
  27% - red line
  19% - blue line
  15% - green line

- 3 different phases:

  1. Colonisation (slow start)
  2. Expansion (exponential growth)
  3. Stabilisation (saturation reached)



Management implications

Why this matters for policymakers

- Highly modified water systems may support high beaver densities
- High population numbers → High potential for conflicts
- Need for proactive management in areas with (potential) high densities

- *Next steps: Monitoring and surveys, Risk assessments, Management plans, …*

Thank you for your attention!

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Any Questions