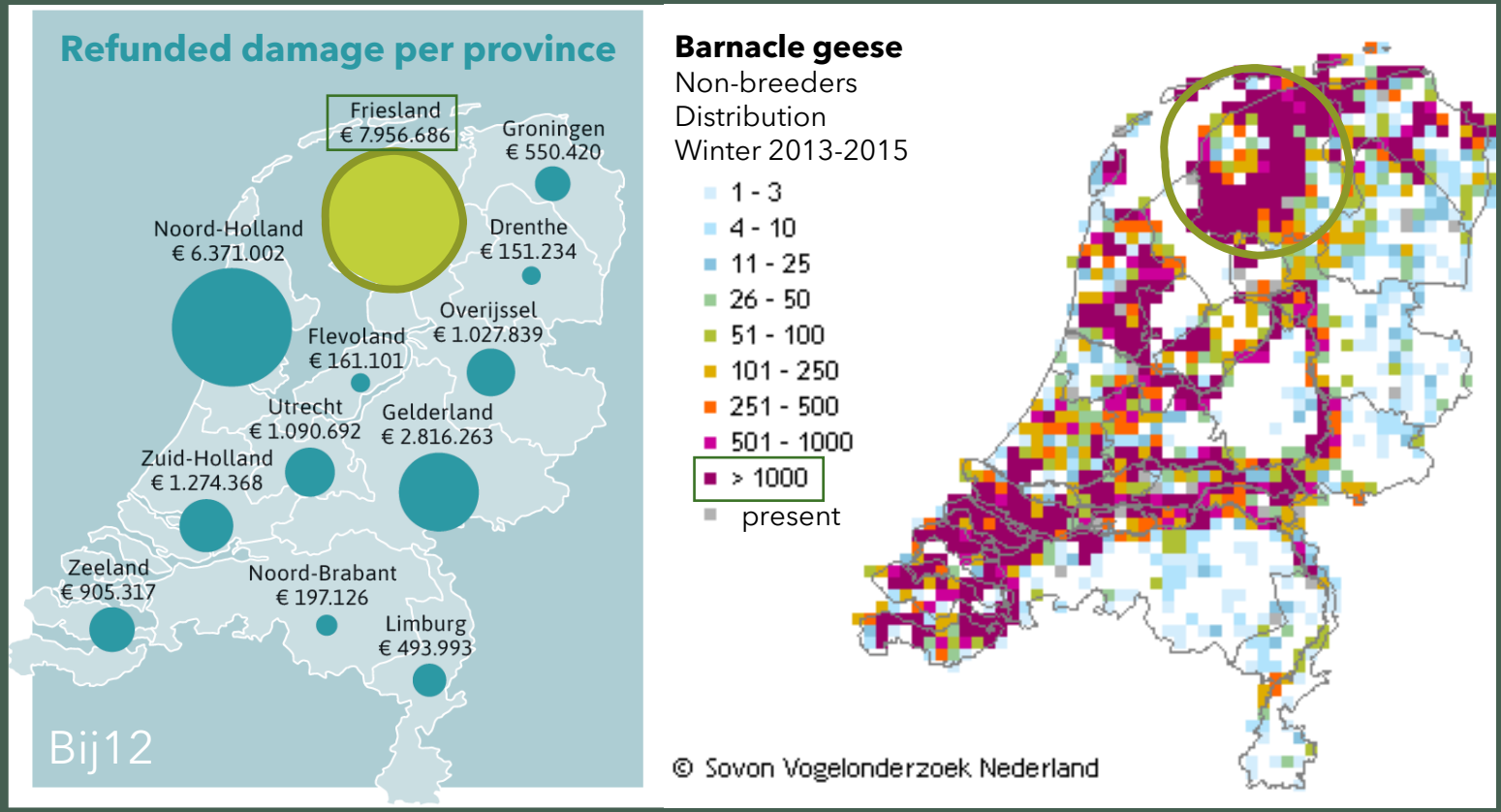
Status of the impact models: barnacle geese foraging in Friesland

Monique de Jager, Nelleke Buitendijk

Hans Baveco, Bart Nolet

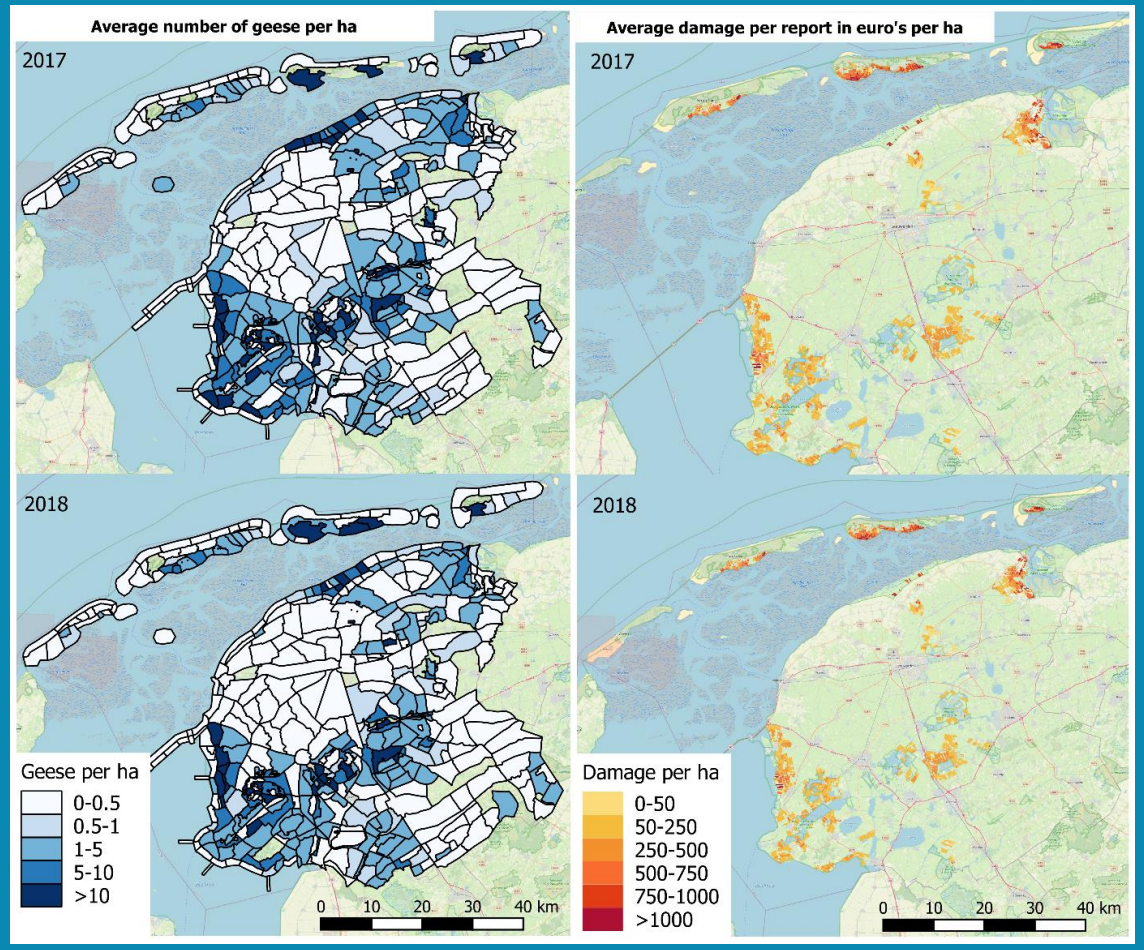
Friesland's farmer-goose conflict



2 main questions:

- How do goose numbers relate to goose-induced damages?

- What are the effects of management on farmer-goose conflicts?

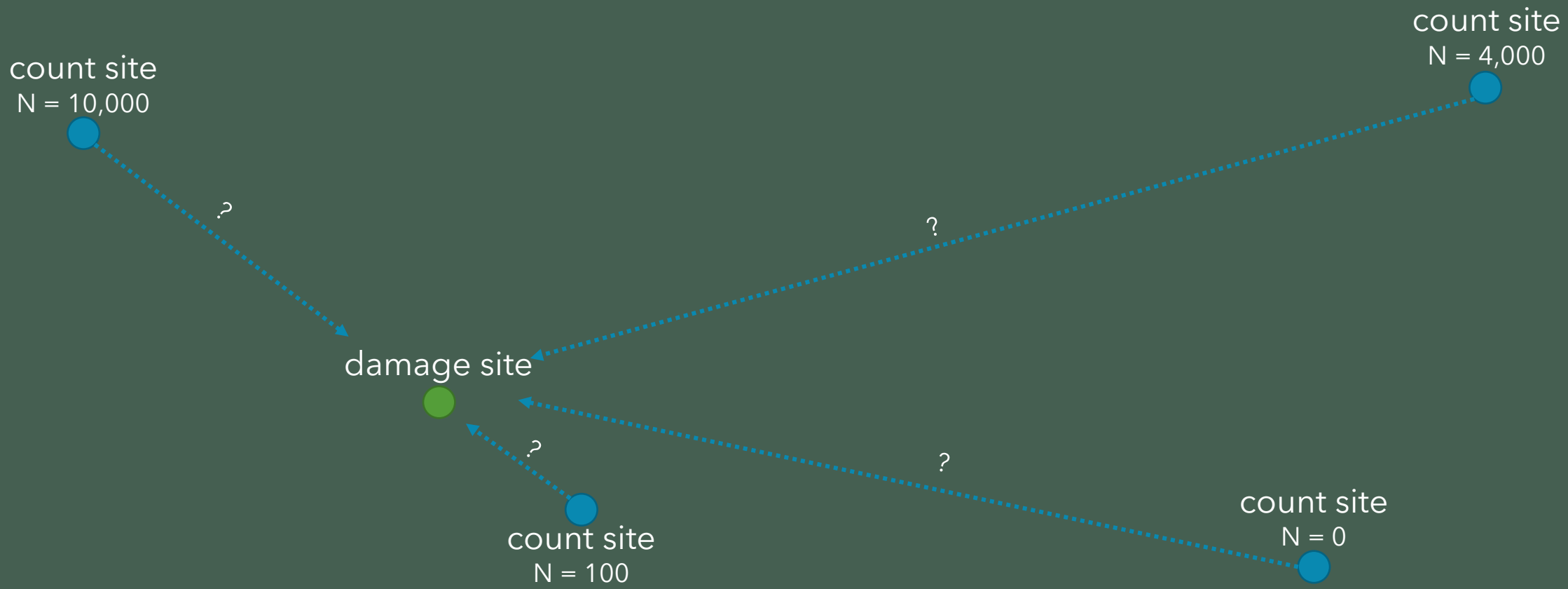


How do goose numbers relate to goose-induced damages?

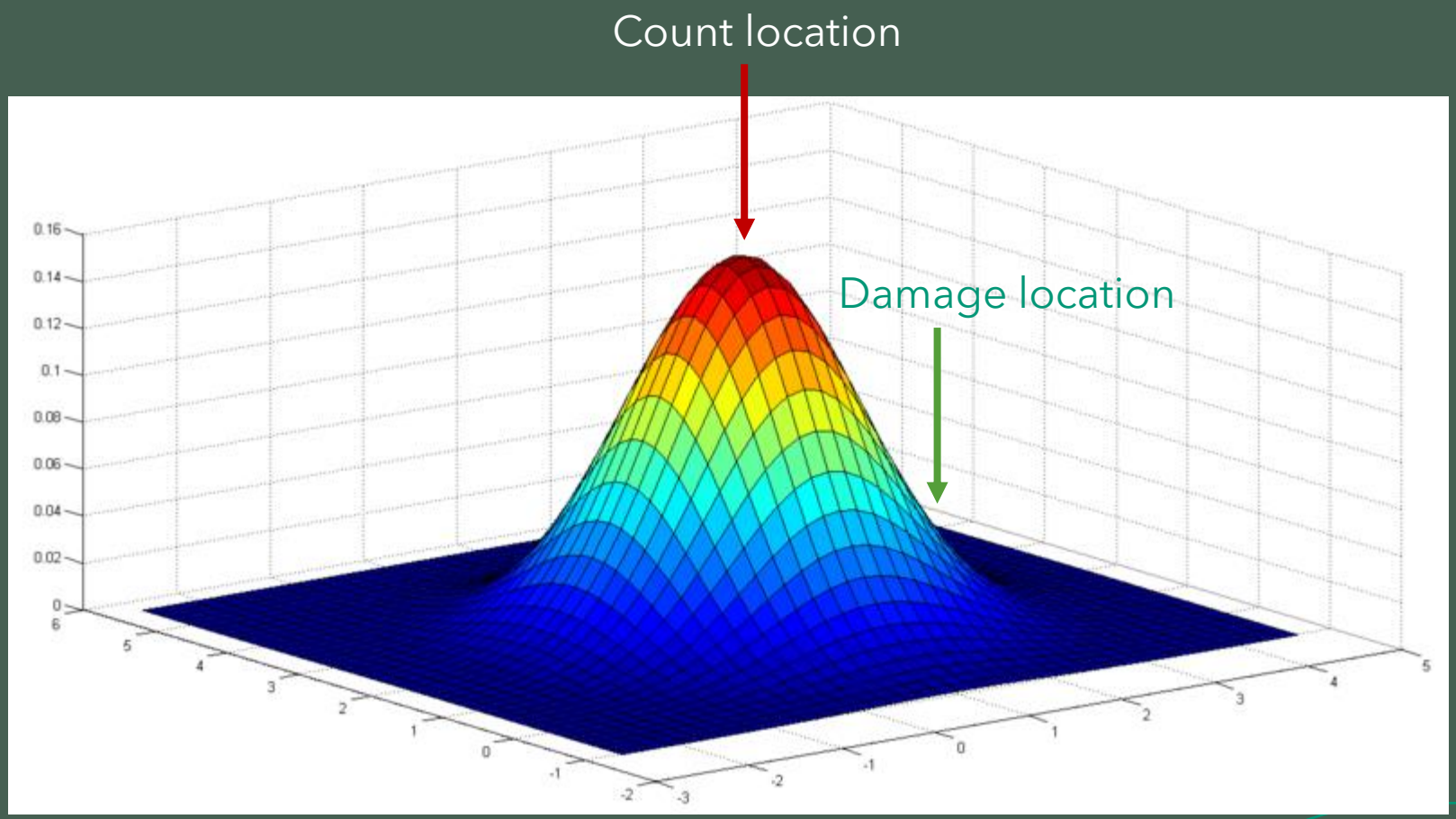
Relating damage to the abundance of geese using damage assessments (at farmer level) and goose counts (at count-site level)

Buitendijk *et al.* (in prep.)

How many geese have visited a damage site?



A spatial probability density function tells us
the probability that a goose was at location x,y at time t



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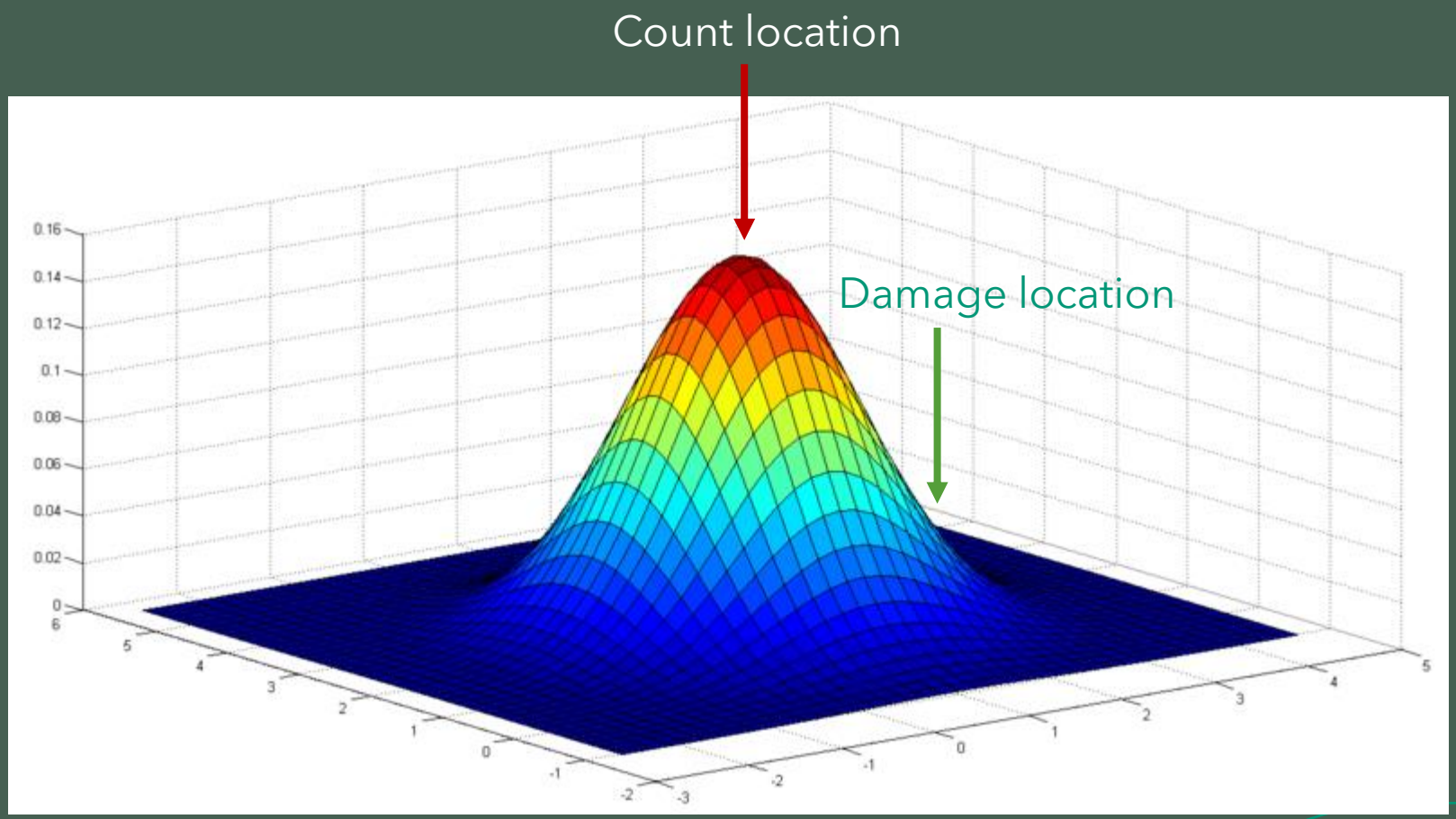
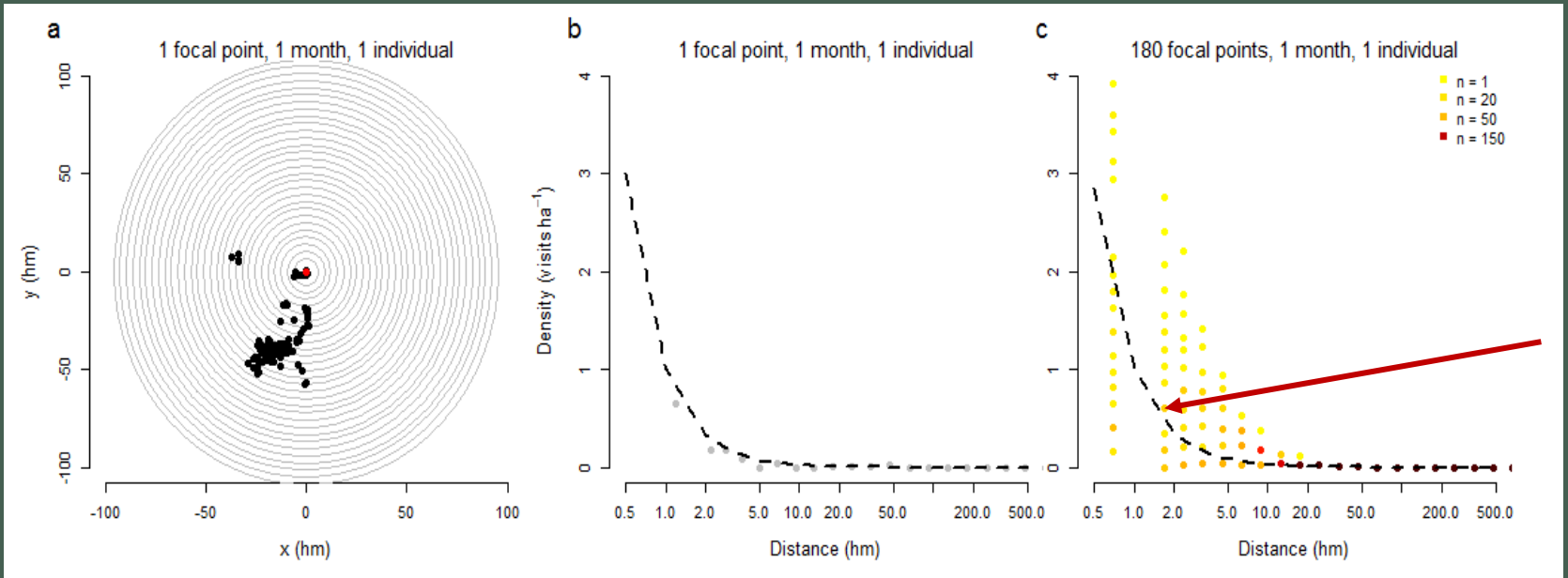


We need to know the 'slope' of this pdf…

Use of GPS-tracks!

Per individual and per month,
we estimated the exponent λ of the spatial probability density distribution



$$p_r = e^{\lambda \ln(r)}$$

Buitendijk *et al.* (in prep.)

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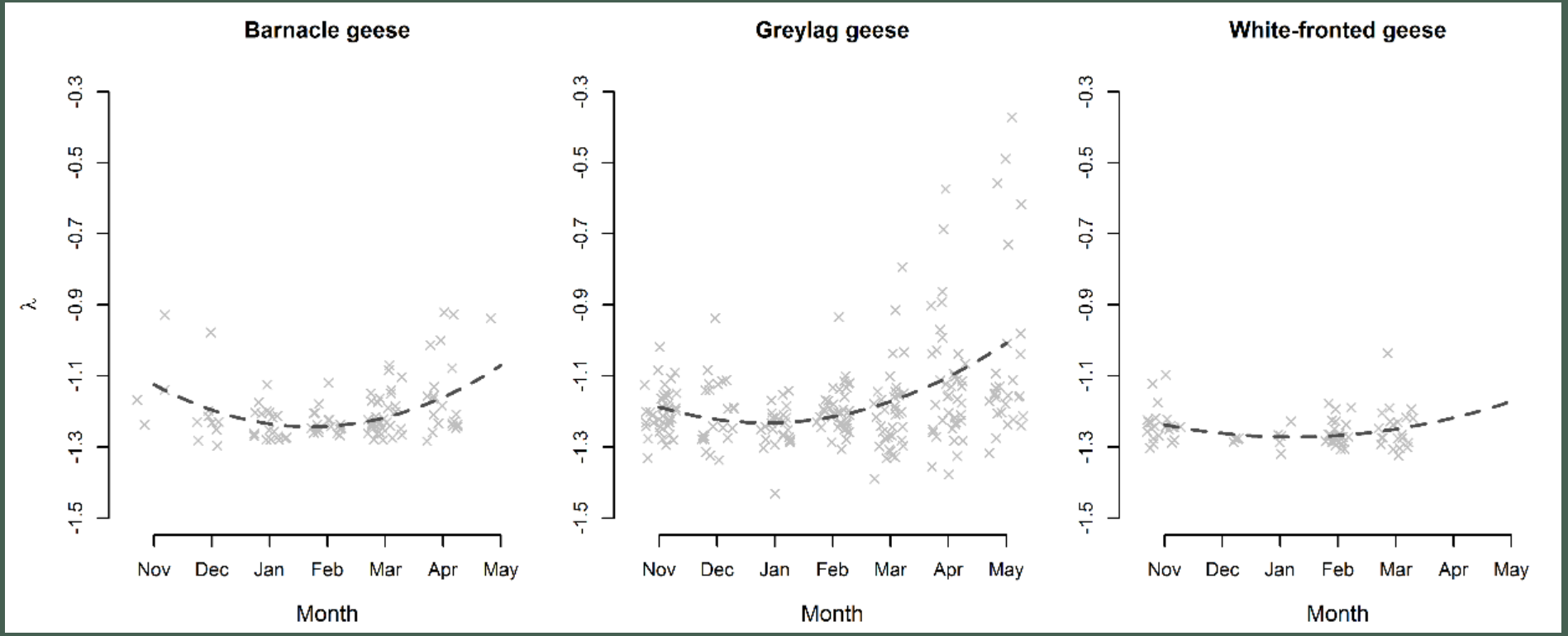

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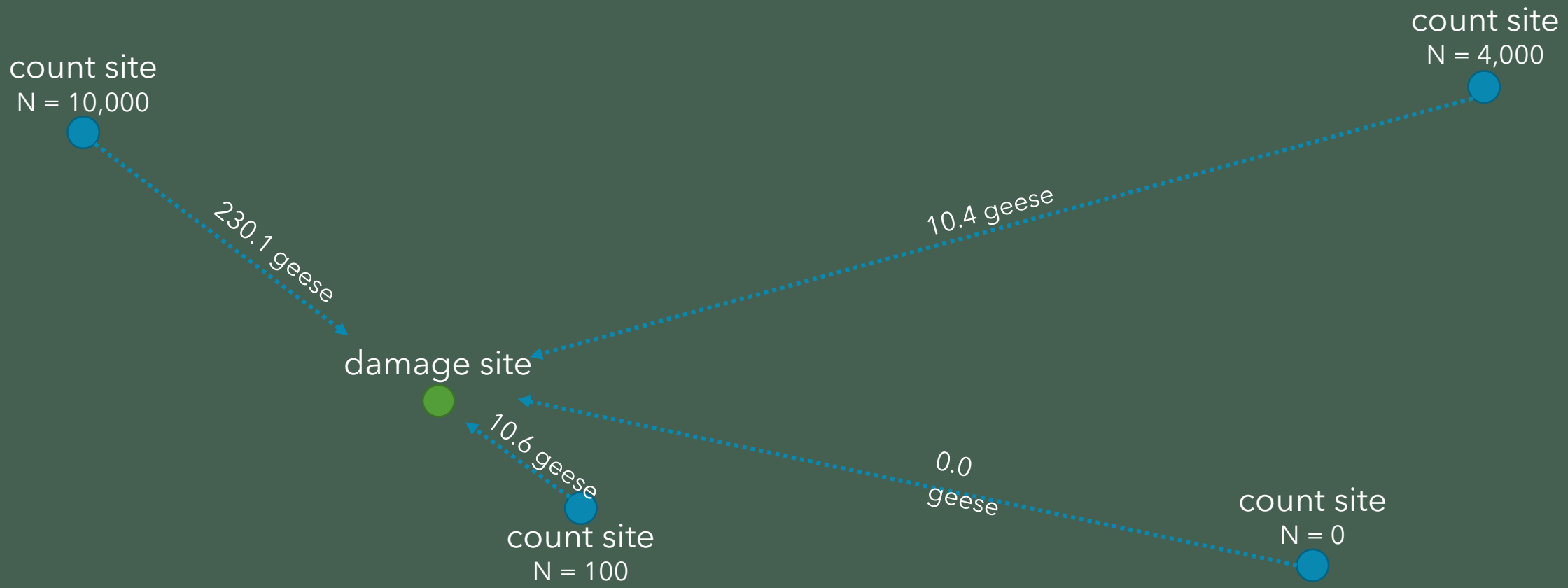
Using the estimated λ per species and month, we estimated the number of geese per damage site:



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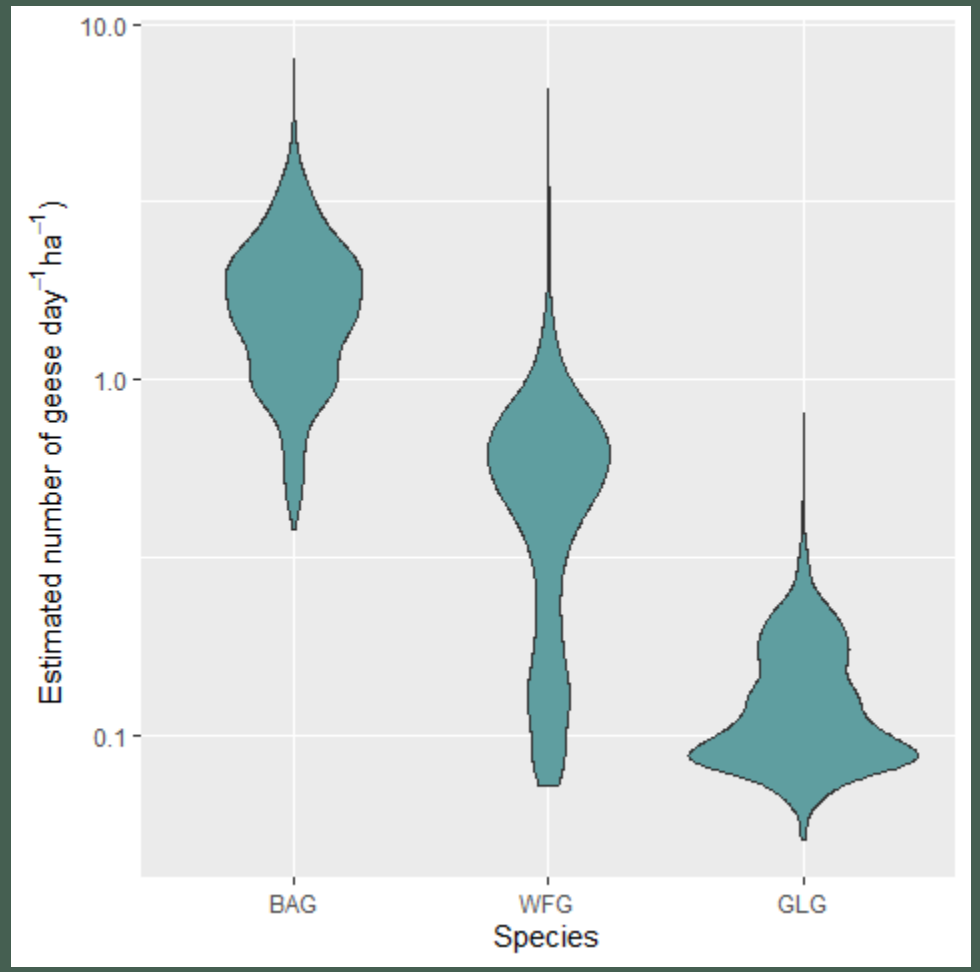
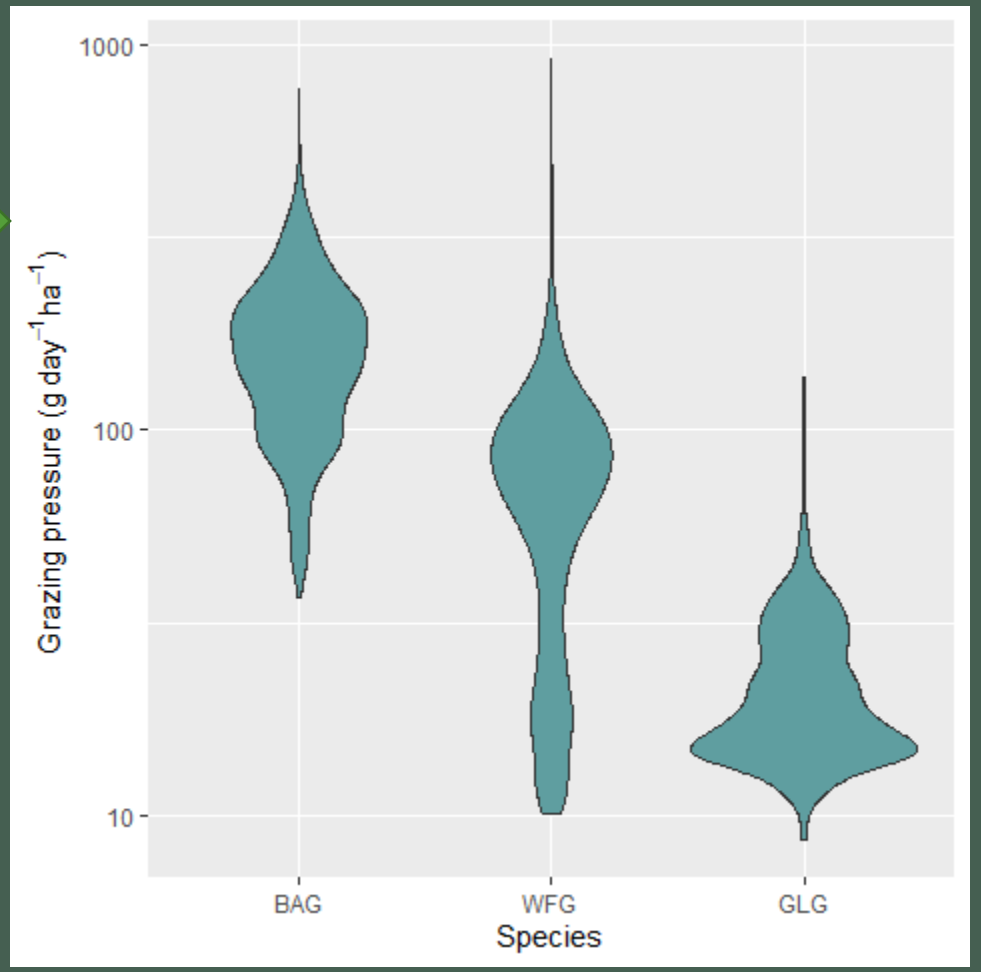


Intake rates differ between species…

Calculate grazing pressure per ha per damage report



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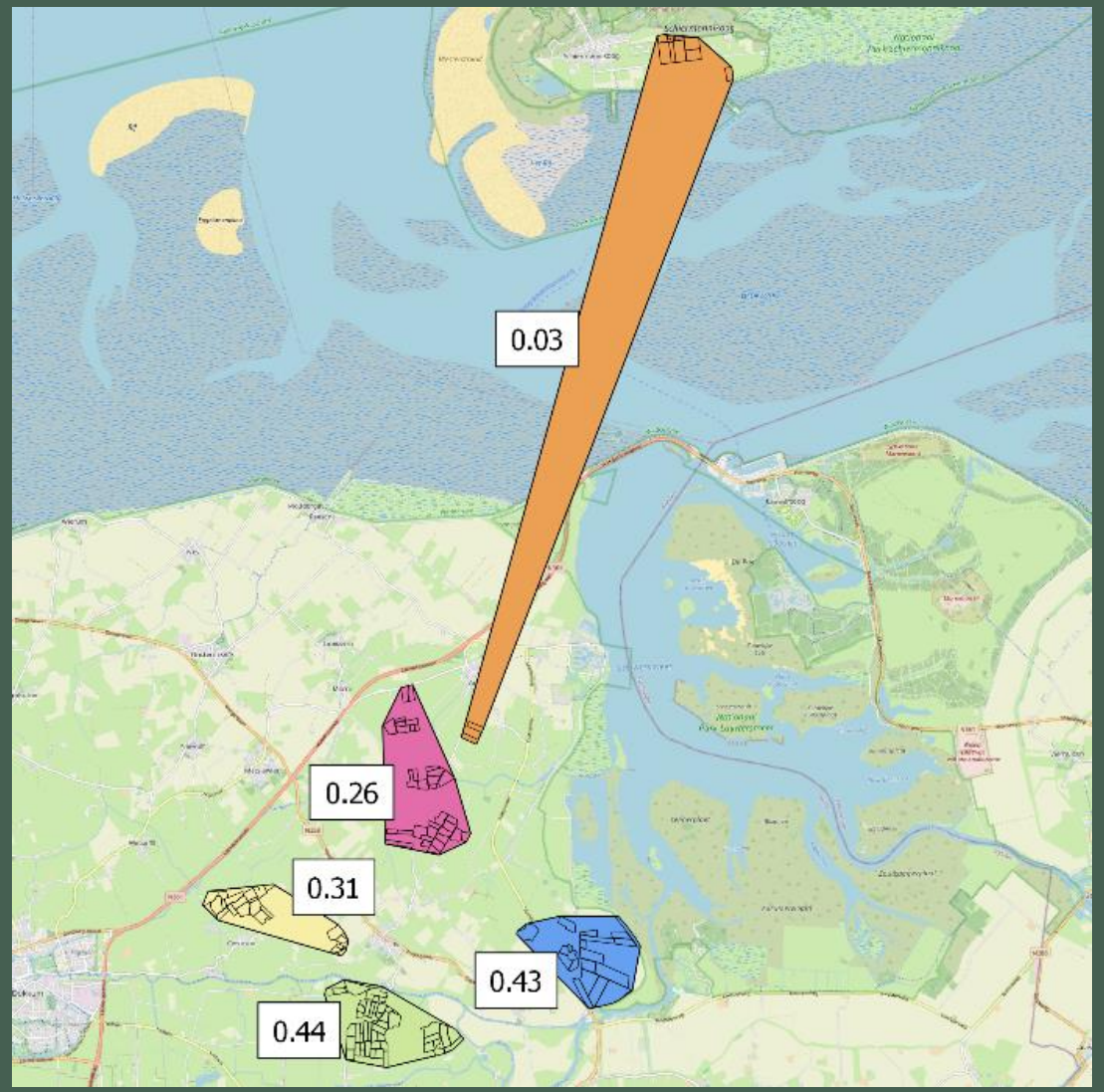
To make it a little more complicated:

Multiple fields per damage report,
Some further apart than others…

→ Weighing factor
→ Locations used per field

Another weighing factor to account for the % of damaged ha within a report



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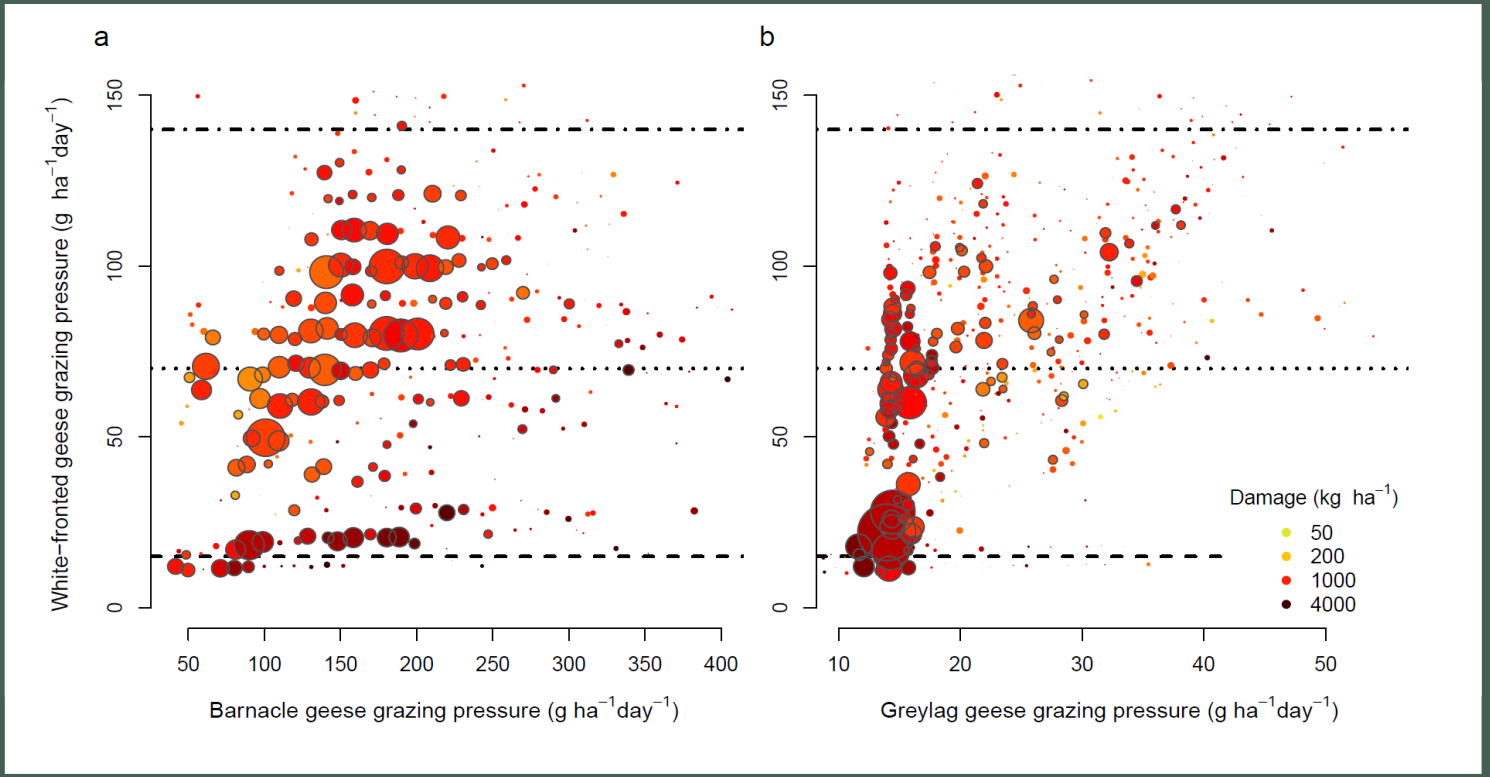
Interactions between goose species affect relation with damage!



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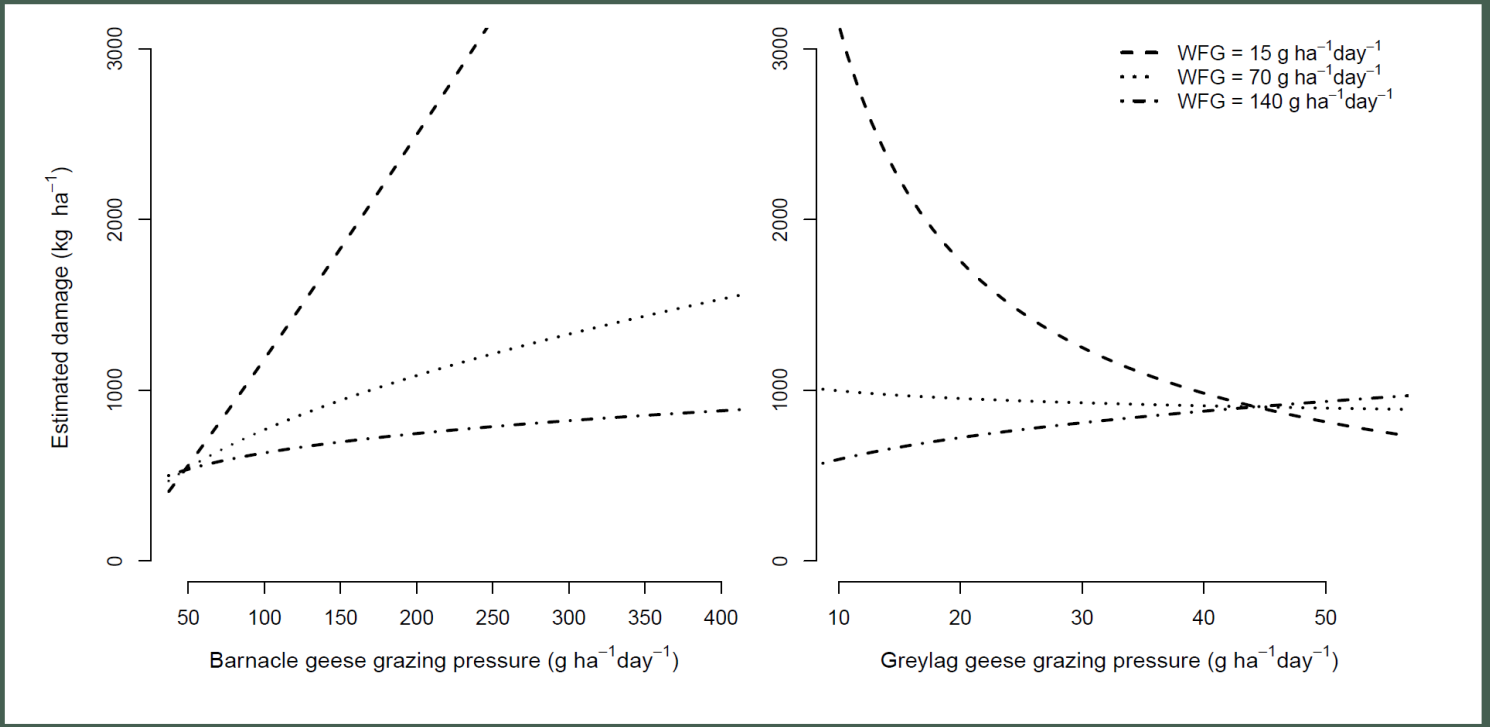

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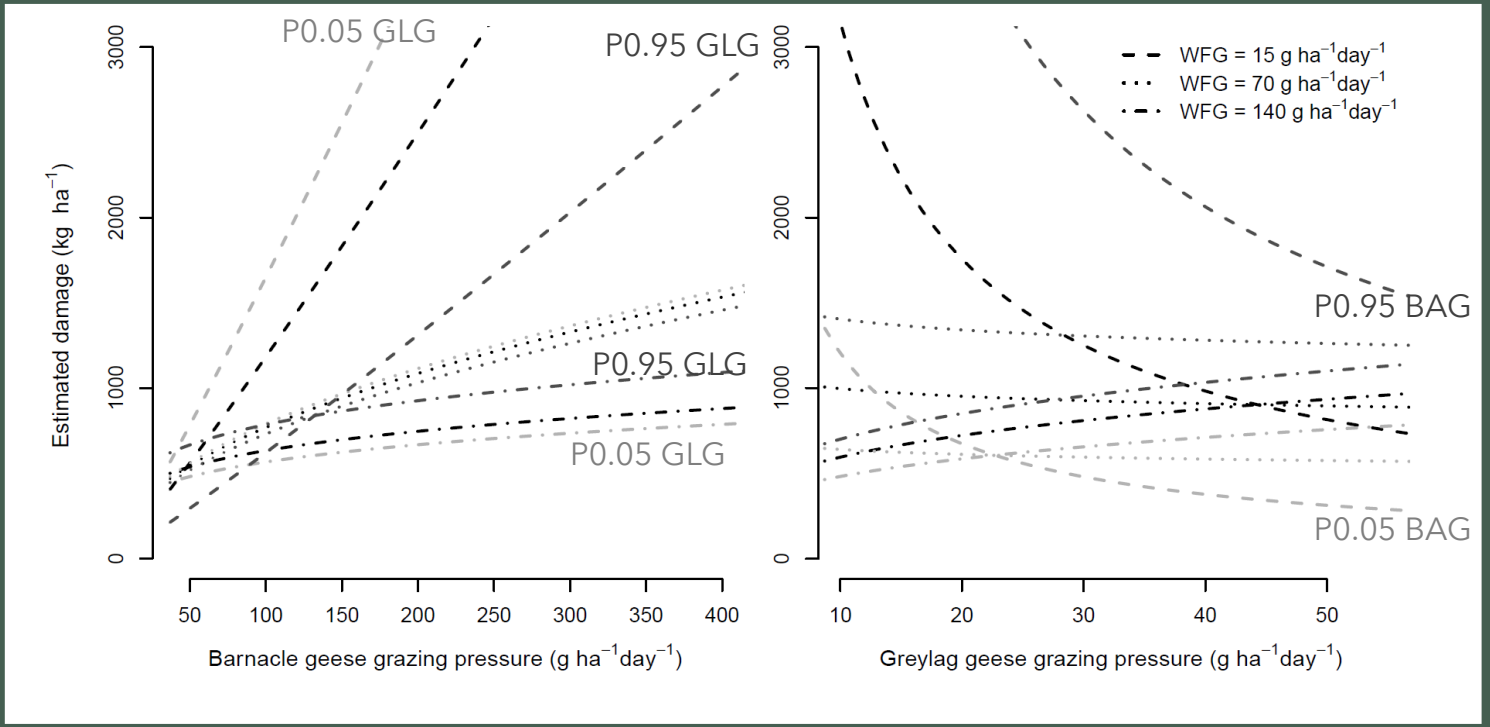

How do goose numbers relate to damages?

- **Barnacle geese: positive log-linear relation** many BAG on few fields produce less damage than the same number of BAG spread across many fields
- **White-fronted and graylag geese: negative log-linear relation** WFG and GLG may avoid heavily grazed fields, as they forage on taller grass than BAG

Model assumes non-biased, random foraging behavior!!

2 main questions:

- How do goose numbers relate to goose-induced damages?

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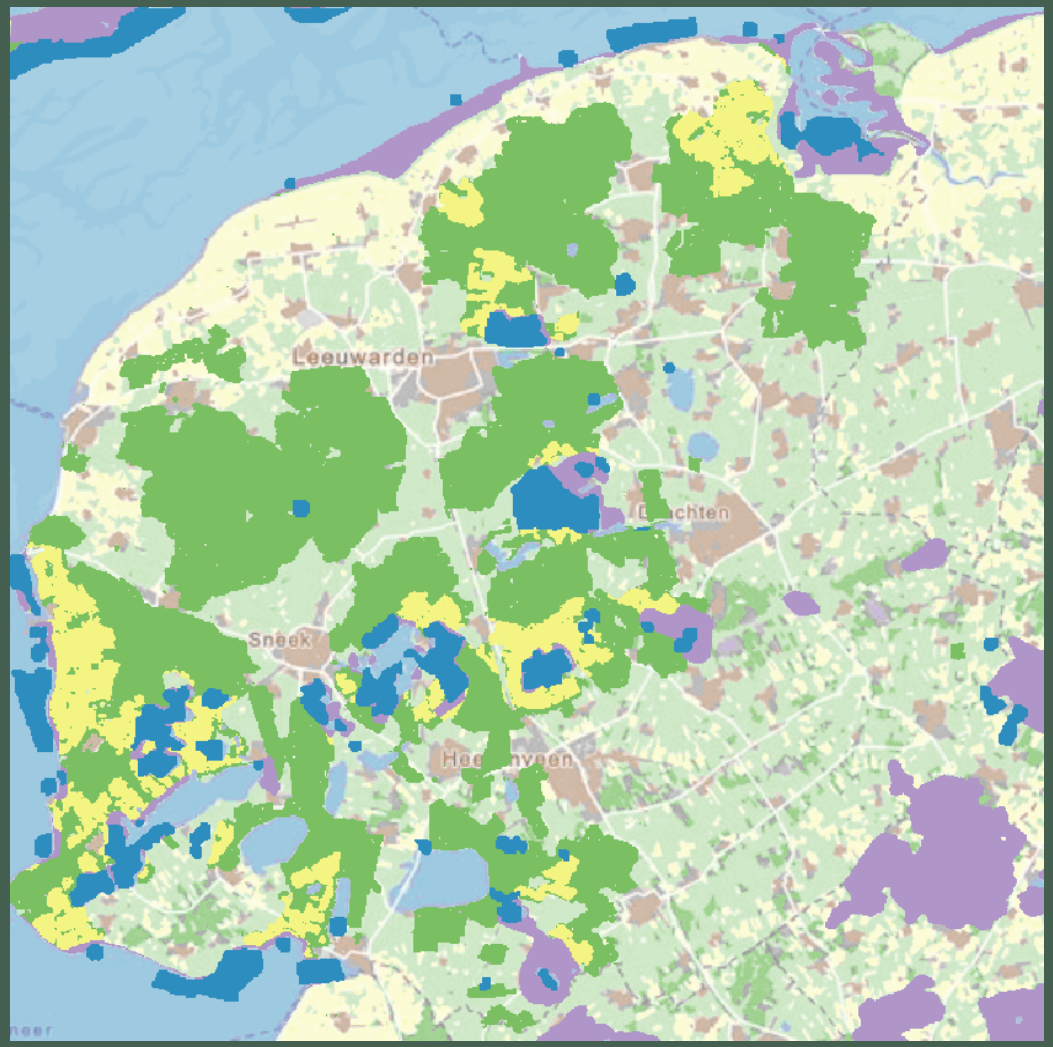
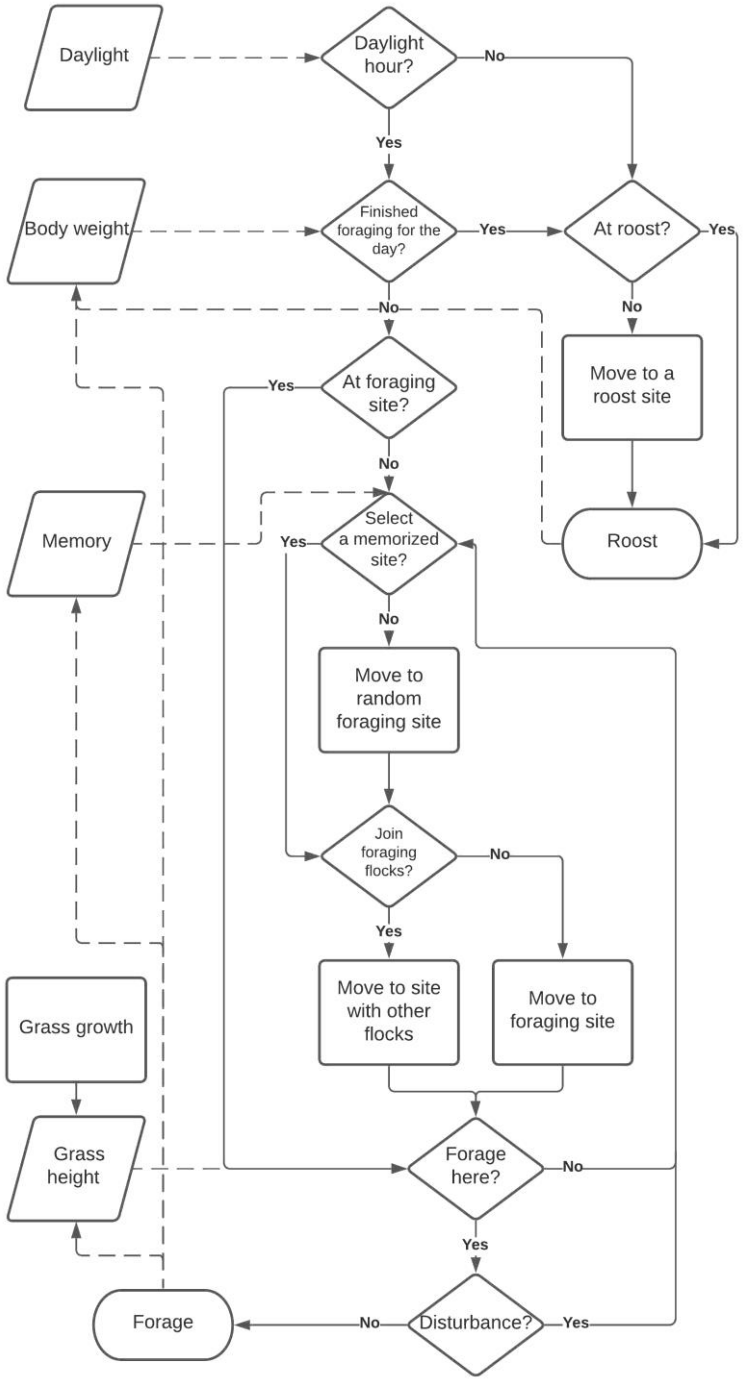
- How do goose numbers relate to goose-induced damages?

- What are the effects of management on farmer-goose conflicts?
  - Management options:
    - Increase/decrease scaring activities
    - Increase/decrease accommodation areas



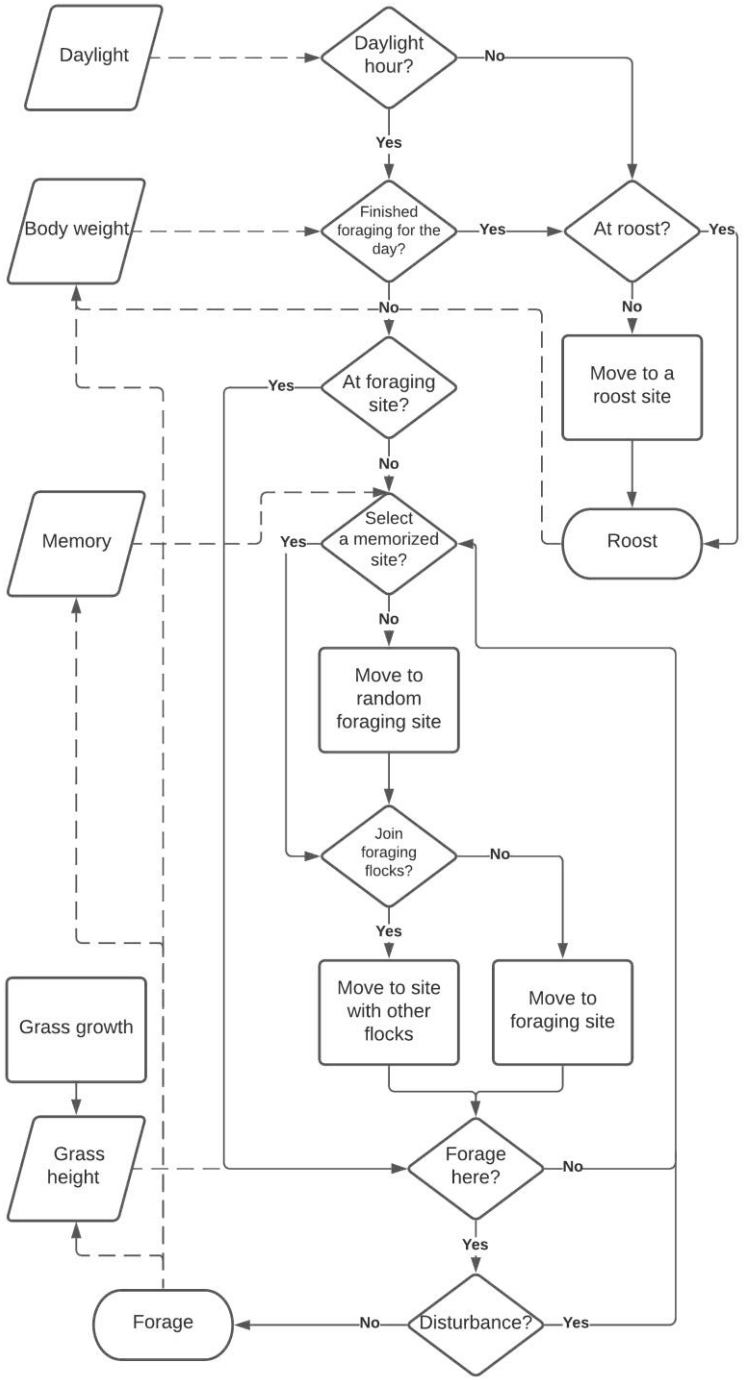
- 700 x 700 grid cells of 1 ha each
  - Regular agricultural grassland (green)
  - Accommodation area (yellow)
  - Nature area (purple)
  - Roost sites (dark blue)
- November – half may (4680 timesteps of 1 hour)
- 600,000 barnacle geese in flocks of 1,000 individuals

The model



- Landscape is initialized
- Geese are initialized at roost sites (weighted random selection following the 2019 roost count)
- Per timestep: is it a daylight hour?
  - Either roost or forage
  - Make several decisions based on
    - Body weight
    - Memory
    - Grass height
    - Foraging flocks
    - Disturbances

The model



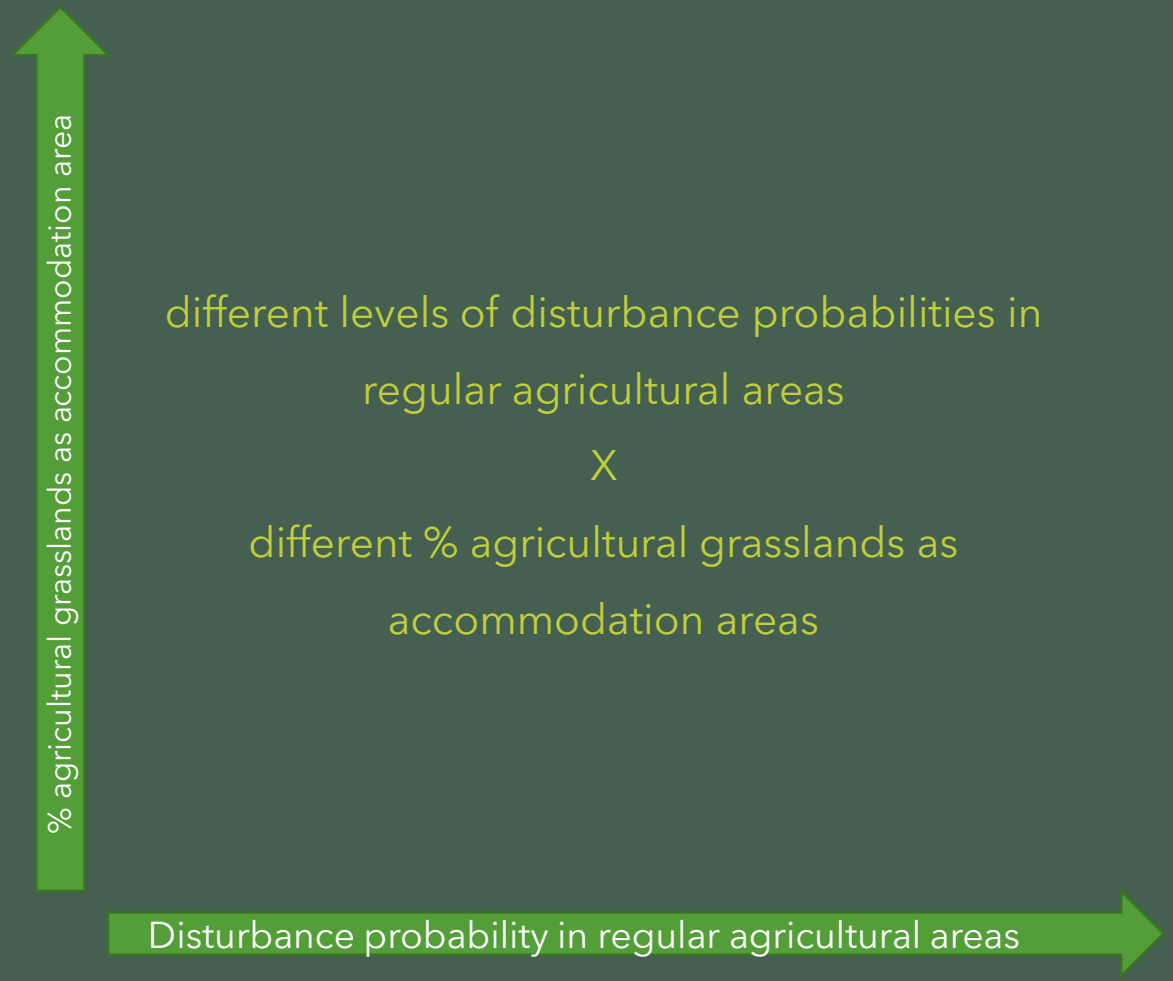
Status of the model:

- Currently: calibrating 7 parameters using one-at-a-time analyses, Badness-of-fit to GPS data
- Next: validation with the chosen parameter value combination, badness-of-fit to goose numbers distributions

The model

The model

Model simulations: with the calibrated and validated model, we run a range of management scenarios:



different levels of disturbance probabilities in regular agricultural areas

X

different % agricultural grasslands as accommodation areas

Effects on:

- Damage?
- Grass height?
- Average goose pressure?
- Fraction of patches affected?

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