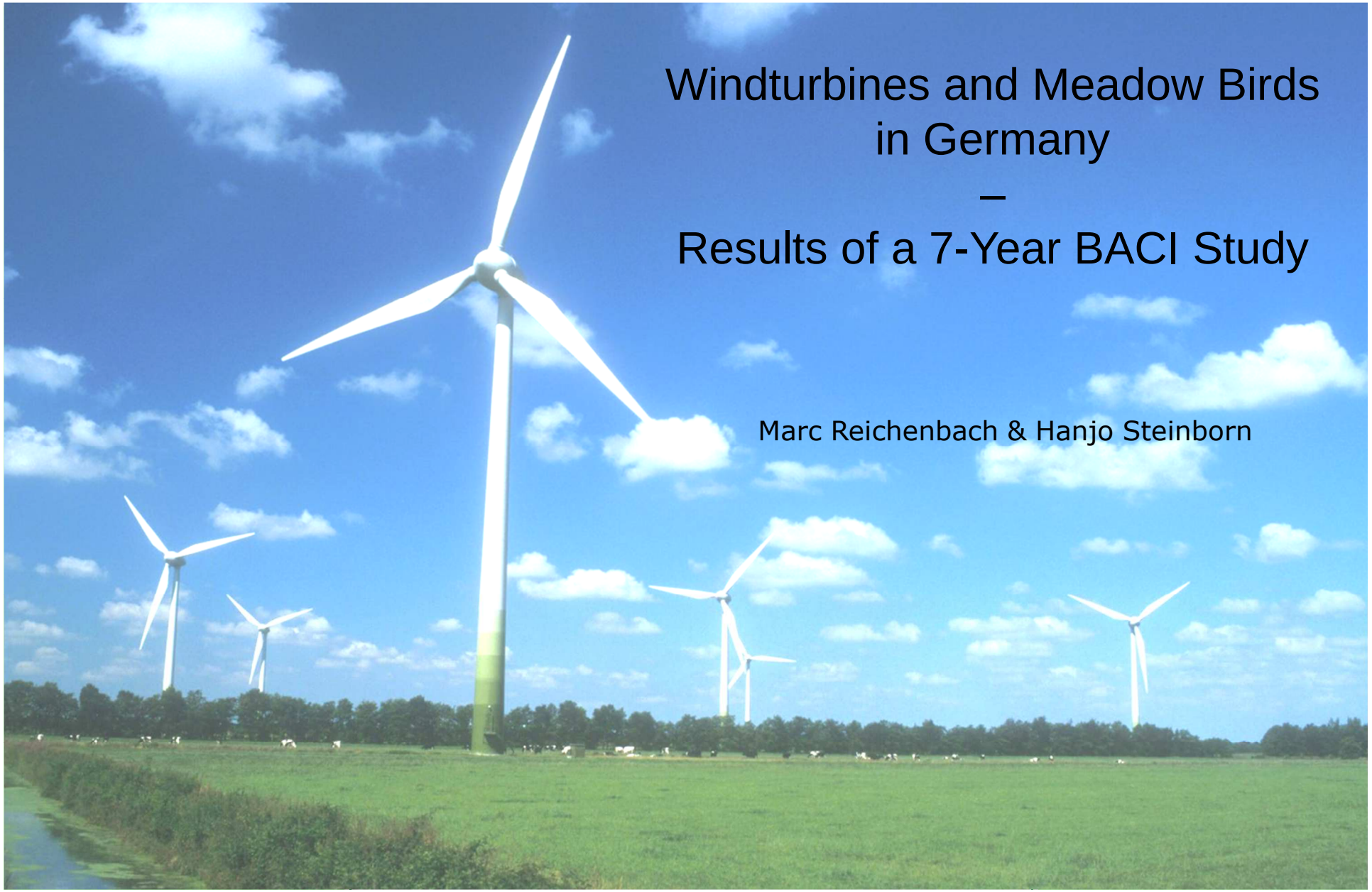


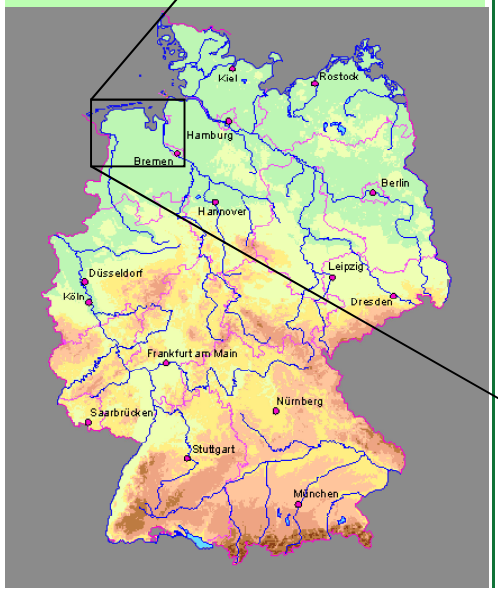
Windturbines and Meadow Birds in Germany
–
Results of a 7-Year BACI Study

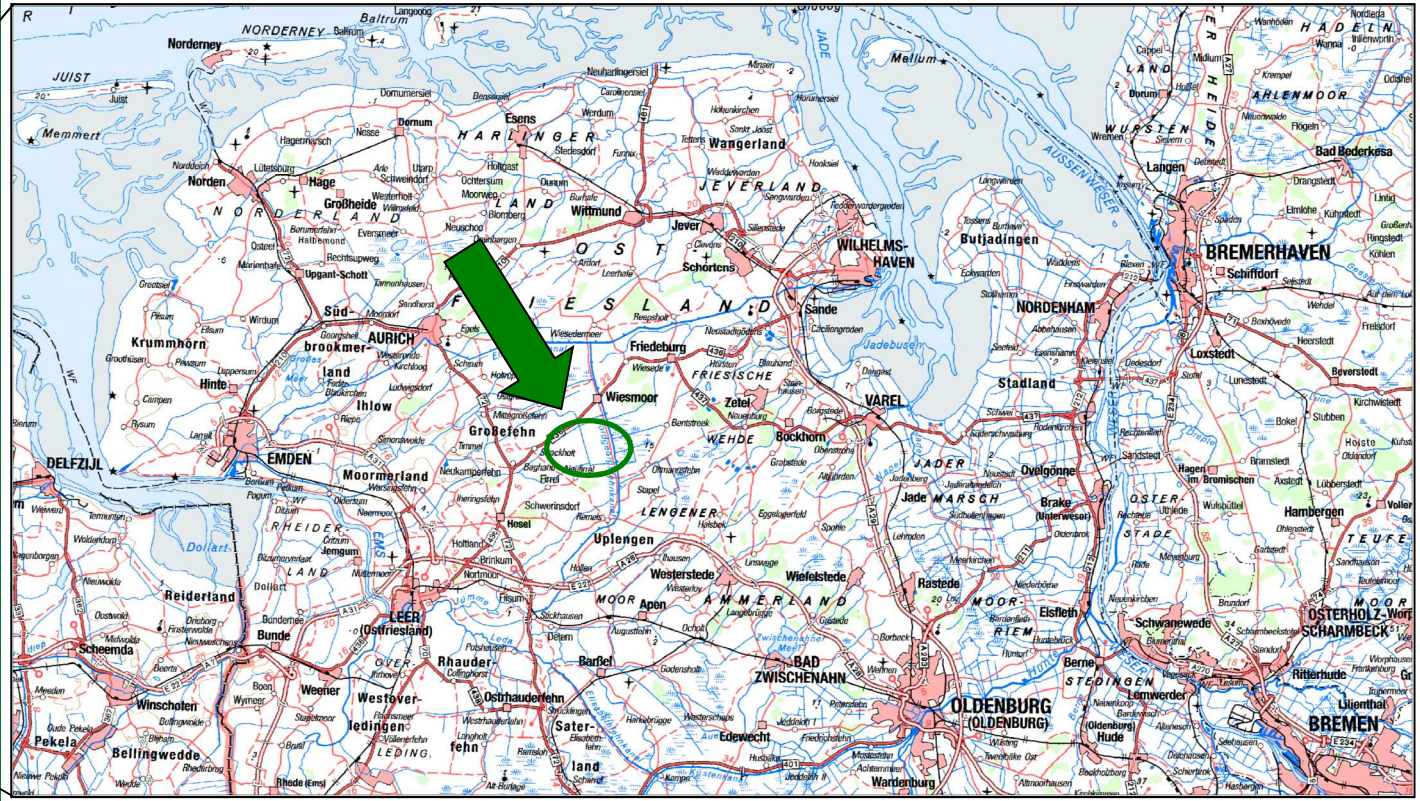
Marc Reichenbach & Hanjo Steinborn

Methods

Study area

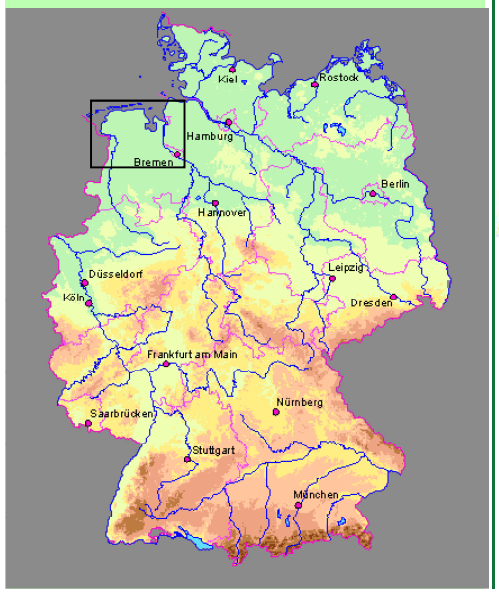
Location of the study area:

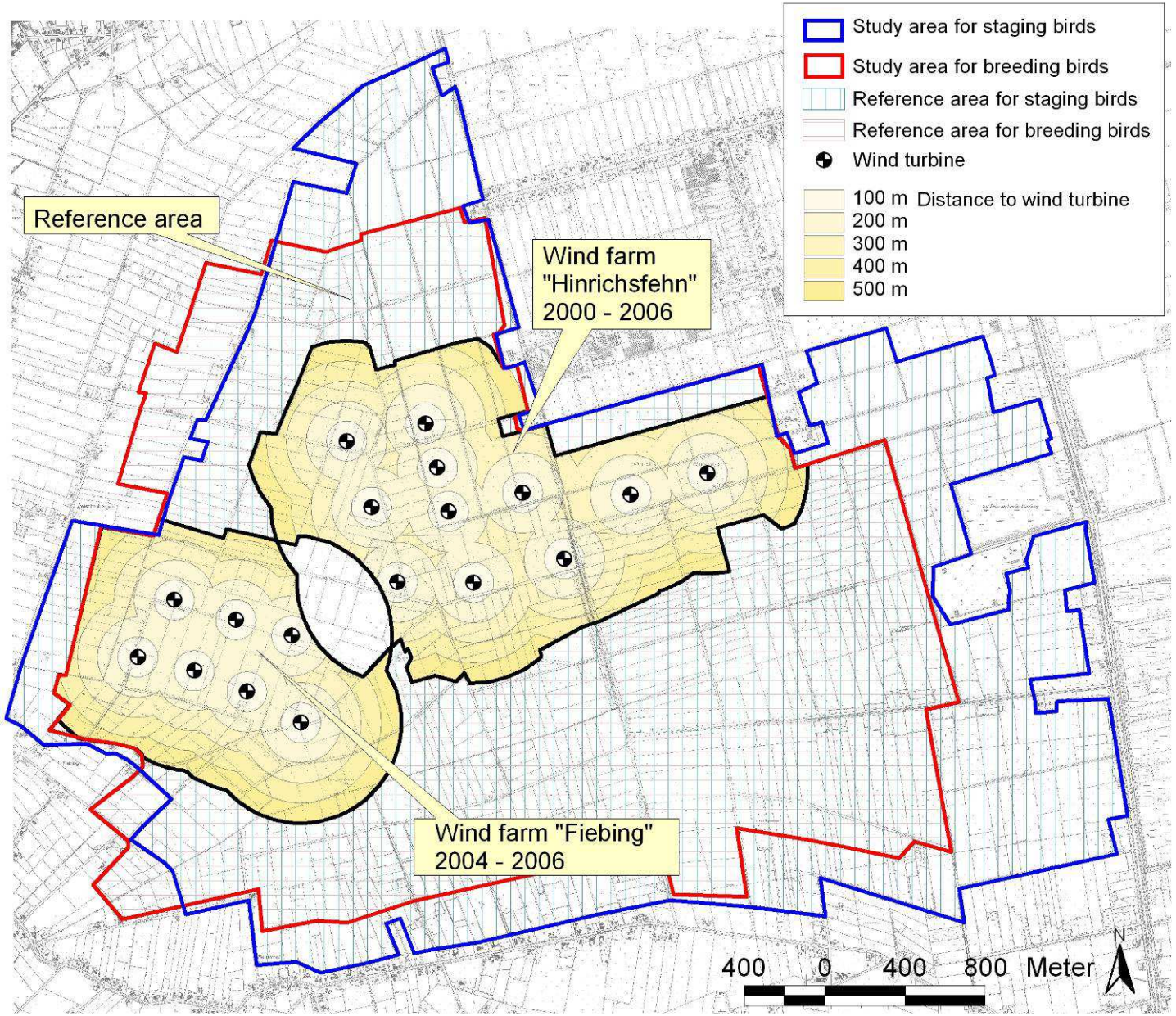




Methods

Study area

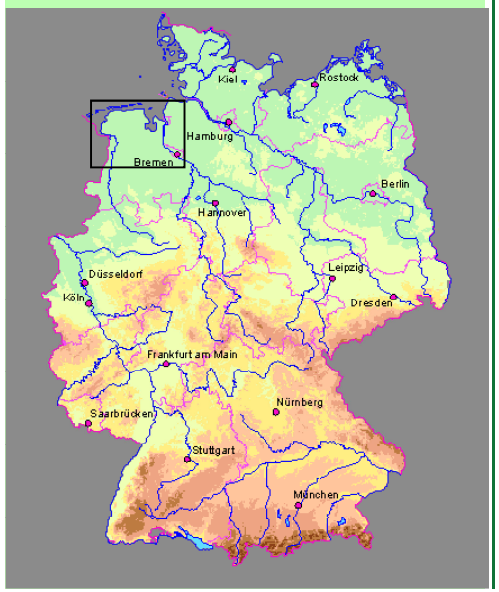


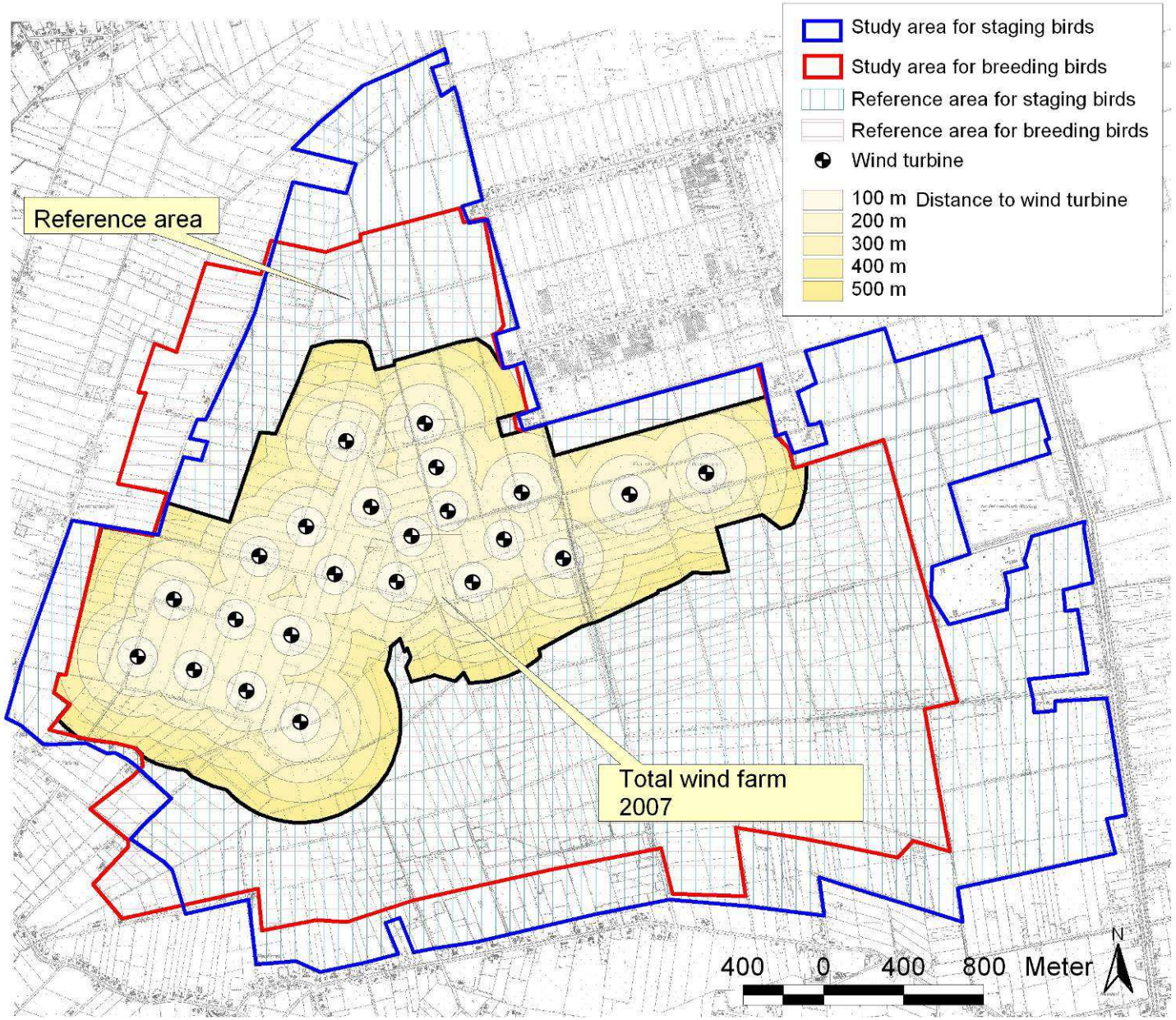


Windturbines and meadow birds in Germany
Results of a 7 year BACI-study and a literature review

Methods

Study area





Methods

Study design

Study design Sept. 2000 – Dec. 2007:

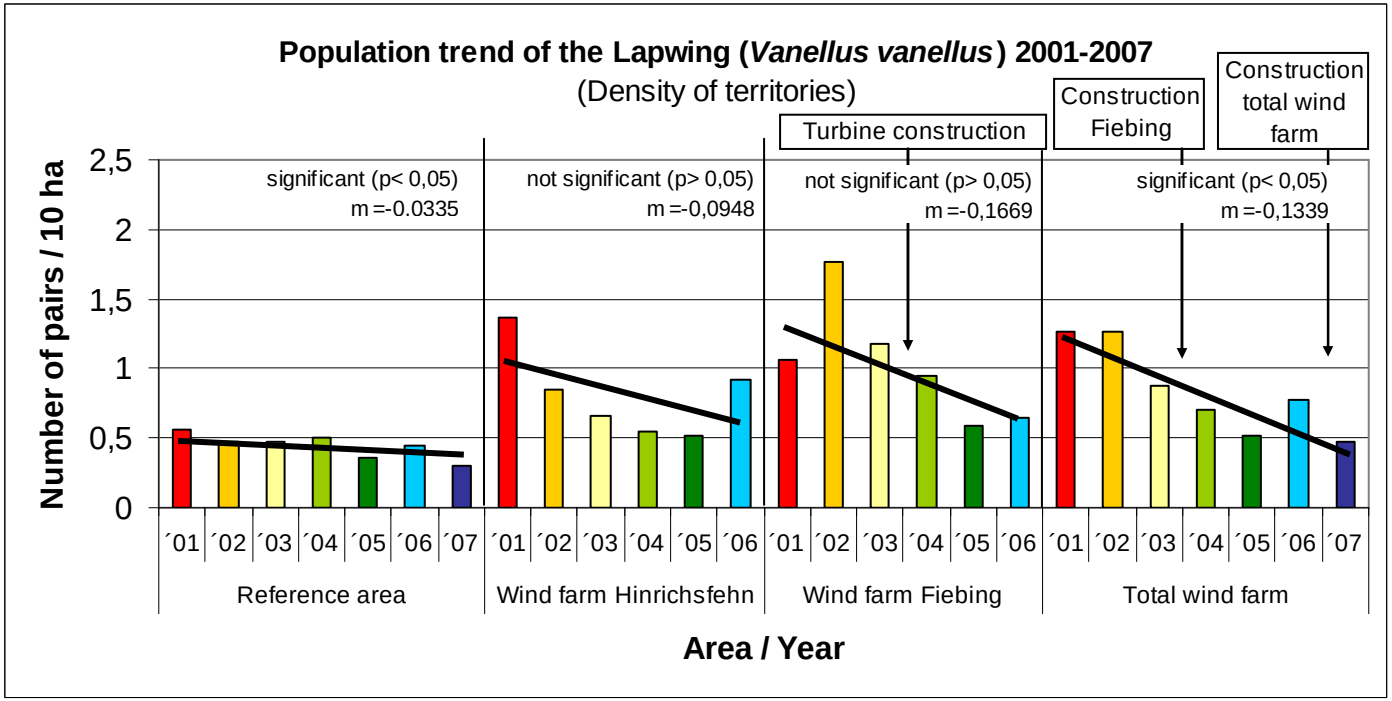
- Breeding bird survey
  (10 excursions per year)
- Control of breeding success
- Staging bird survey
  (every 10-14 days,
  in total 233 excursions)
- Mapping of land usage
- Habitat modelling 2003/2006
- Behaviour recording (2001-2003)

Results

Population trends

Lapwing:
Breeding population

Population trends in the wind farms and reference area



Results

Population trends

Population trends in the wind farms and reference area

<u>Negative effects</u> on the population trend for:

Lapwing (*Vanellus vanellus*)

<u>No negative effects</u> on the population trend for:

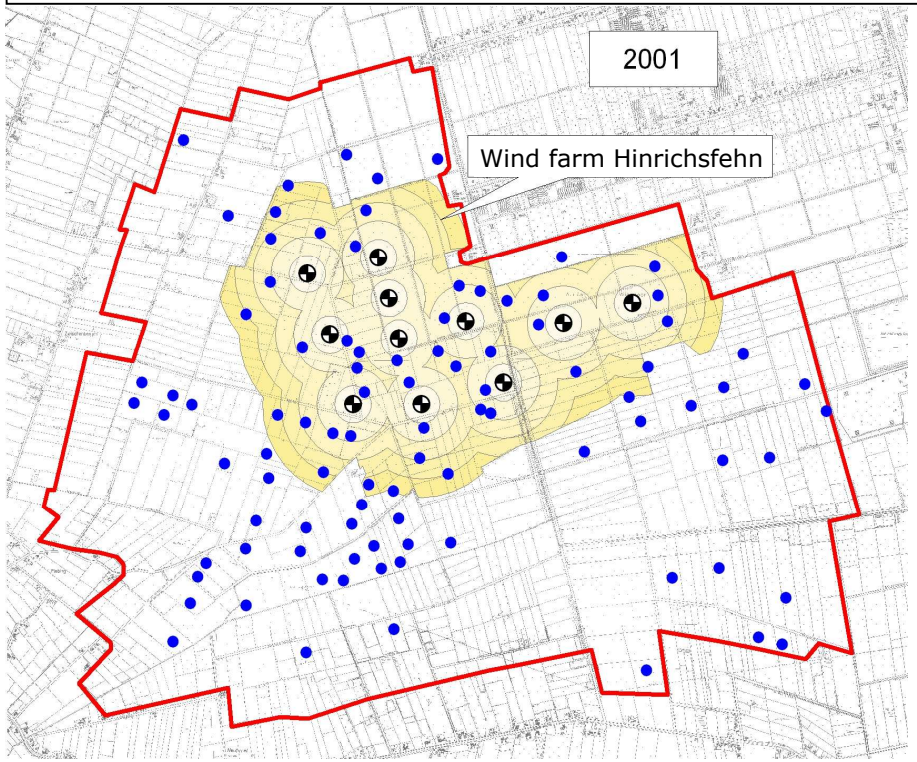
Curlew (*Numenius arquata*)
Black-tailed Godwit (*Limosa limosa*)
Meadow Pipit (*Anthus pratensis*)
Skylark (*Alauda arvensis*)
Stonechat (*Saxicola rubicola*)
Partridge (Perdix perdix)
Pheasant (*Phasianus colchicus*)

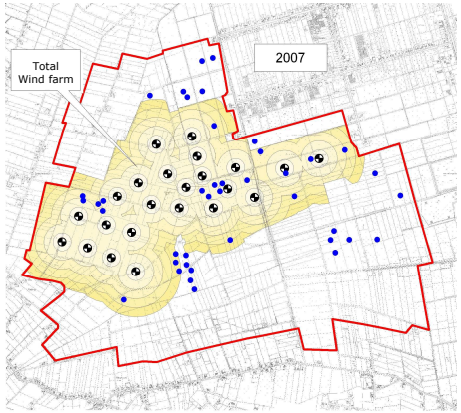
Results

Impact gradient

Lapwing:
Breeding population

Breeding birds: Territory centres and wind turbines
Impact – Gradient – Design (IG)



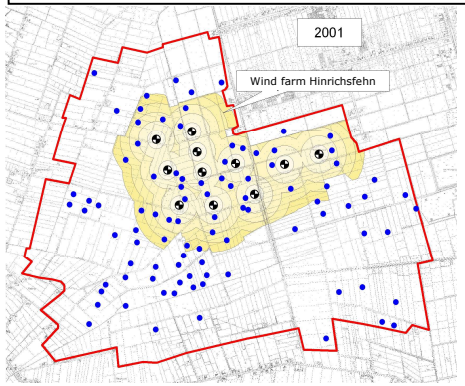


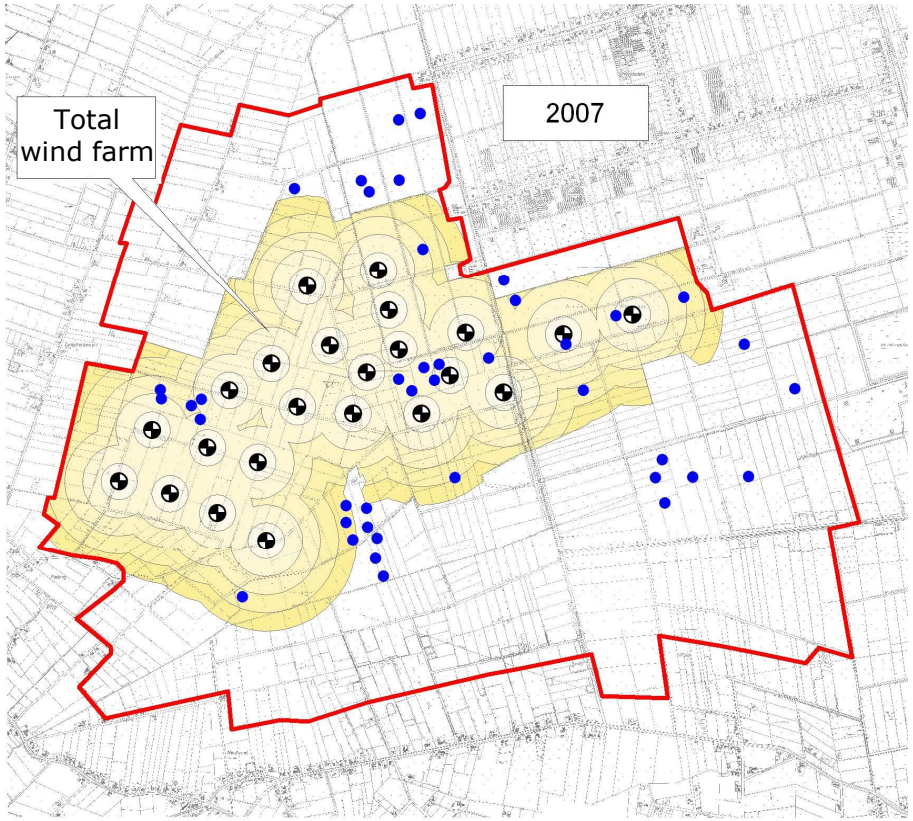
Results

Impact gradient

Lapwing:
Breeding population

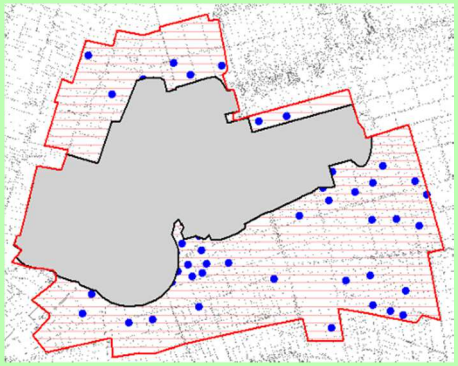
Breeding birds: Territory centres and wind turbines
Impact – Gradient – Design (IG)

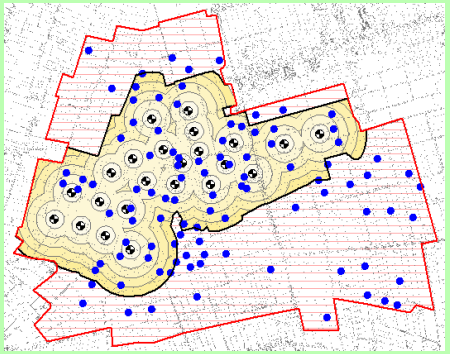




Results

Impact gradient





Breeding birds: Territory centres and wind turbines Impact – Gradient – Design (IG)

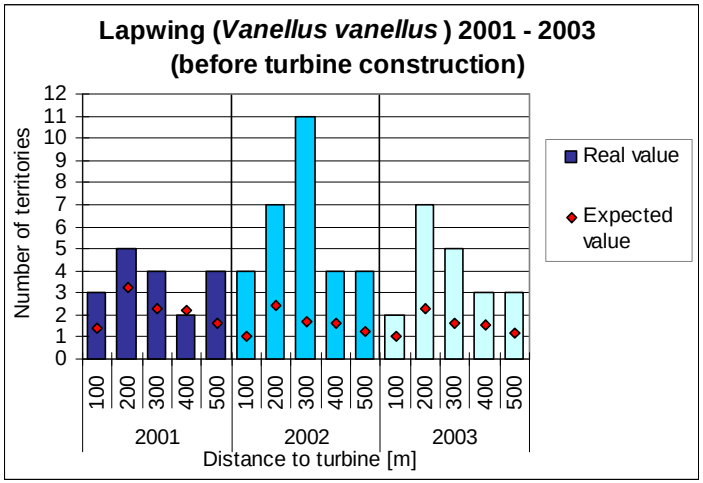
Expected values:

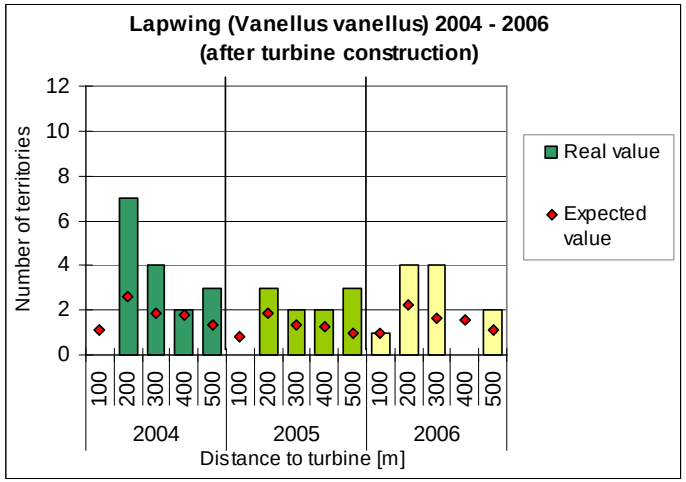
1. Determination of the density in the reference area
2. Calculation of the expected number of pairs in every distance class based on the reference density
3. Comparison of the real and the expected values

Results

BACI / IG

Before-After-Control-Impact (BACI) combined with Impact Gradient (IG)





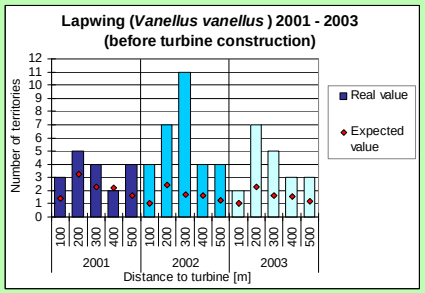
Lapwing:
Breeding population

Results of the Mann-Whitney U-Test for breeding Lapwings 2001 - 2007

Lapwing	Distance class		
	100	**200**	**300**
Real value	8	79	42
Expected value	17	40	31
Significance	**p < 0,05**	**p < 0,01**	p > 0,05

Results

BACI / IG



Before-After-Control-Impact (BACI) combined with Impact Gradient (IG)

<u>Significant displacement</u> (100 m):

Lapwing (*Vanellus vanellus*)

Meadow Pipit (*Anthus pratensis*)

<u>Displacement</u> (100 m, not significant):

Black-tailed Godwit (*Limosa limosa*)

Curlew (*Numenius arquata*)

Skylark (*Alauda arvensis*)

<u>No displacement</u>:

Stonechat (*Saxicola rubicola*)

Partridge (*Perdix perdix*)

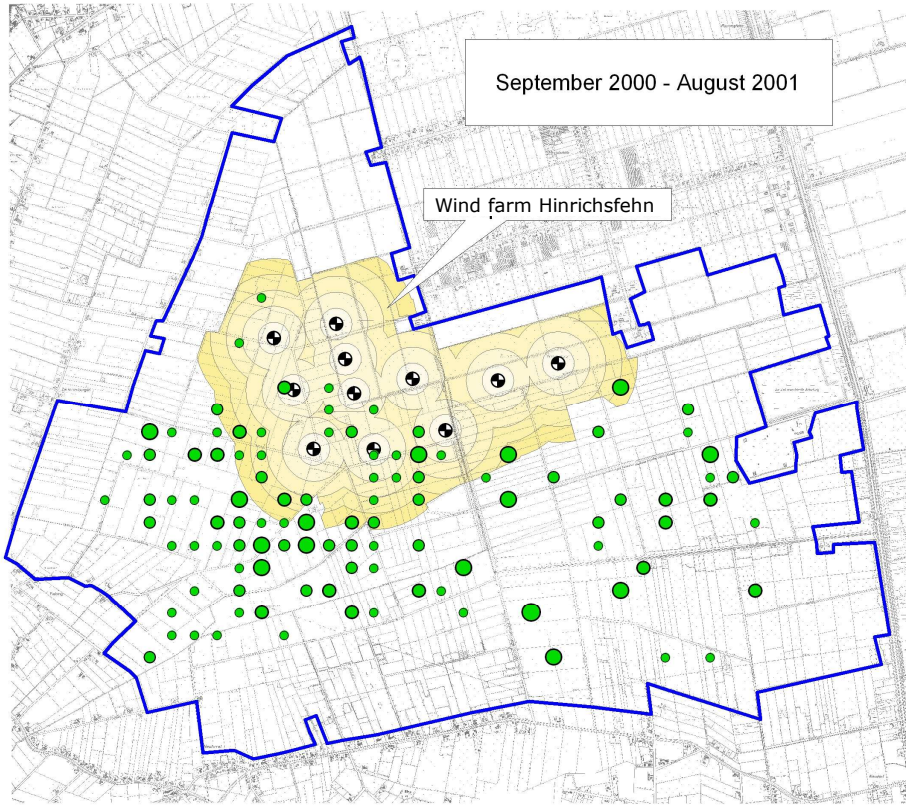
Pheasant (*Phasianus colchicus*)

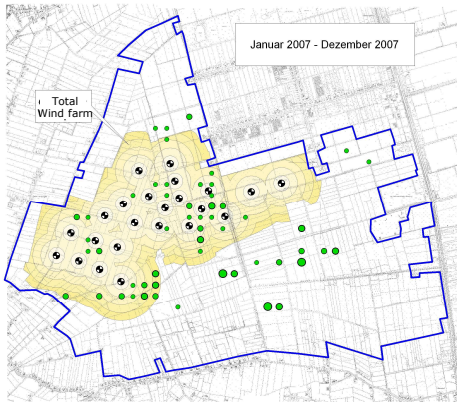
Results

Impact gradient

Lapwing:
Staging birds

Staging birds: Individuals and wind turbines
Impact – Gradient – Design (IG)



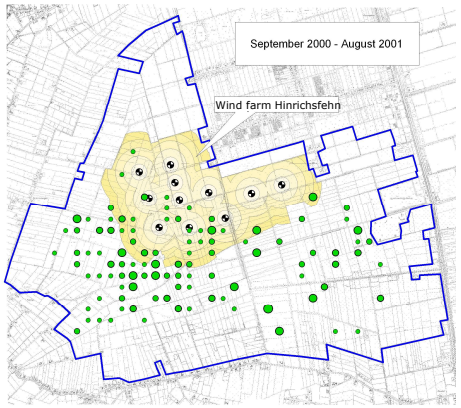


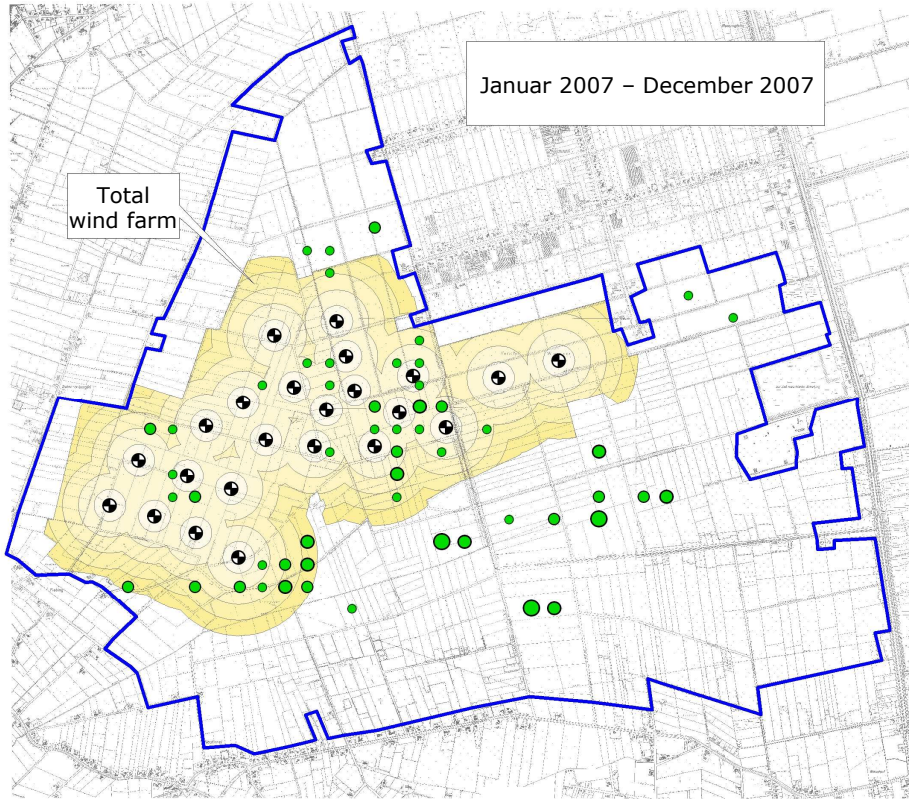
Results

Impact gradient

Lapwing:
Staging birds

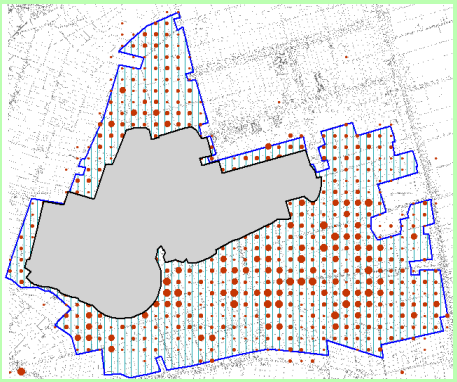
Staging birds: Individuals and wind turbines
Impact – Gradient – Design (IG)

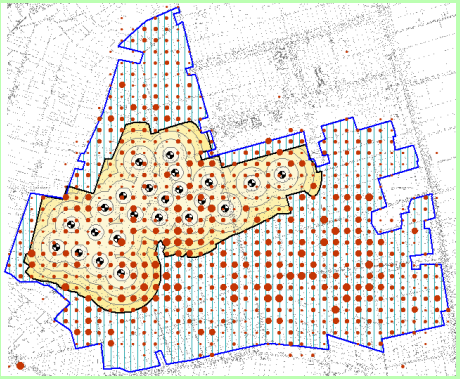




Results

BACI / IG





Before-After-Control-Impact (BACI) combined with Impact Gradient (IG)

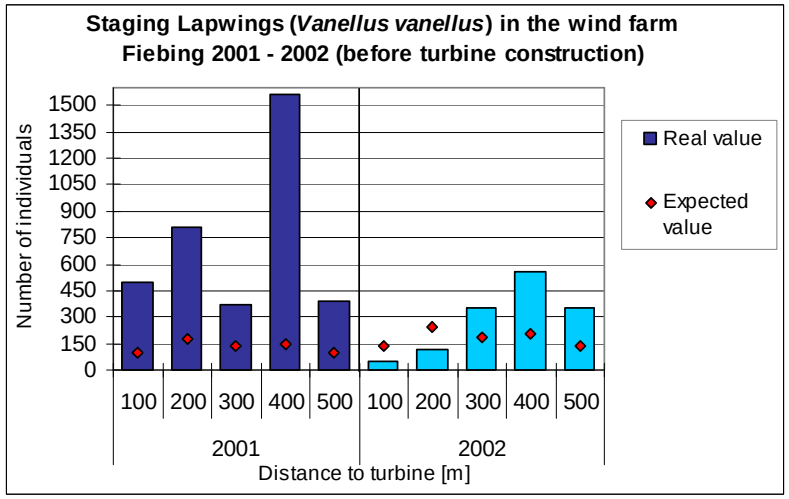
Expected values:

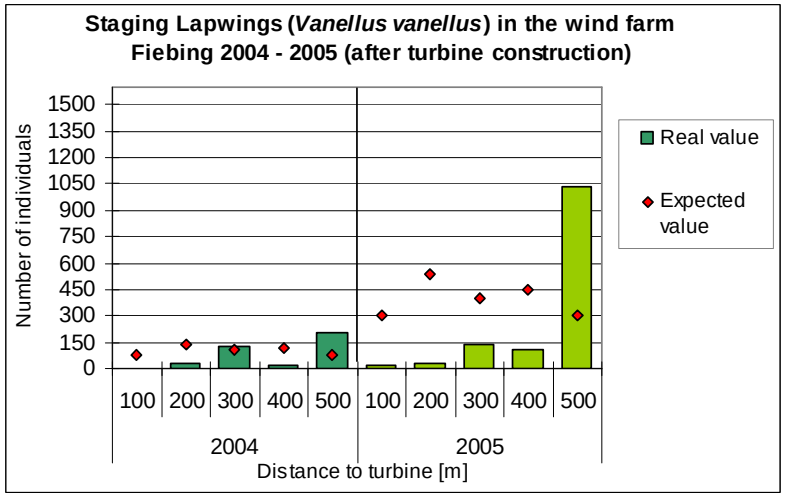
1. Determination of the density of individuals in the reference area
2. Calculation of the expected number of individuals in every distance class based on the reference density
3. Comparison of the real and expected values

Results

BACI / IG

Before-After-Control-Impact (BACI) combined with Impact Gradient (IG)





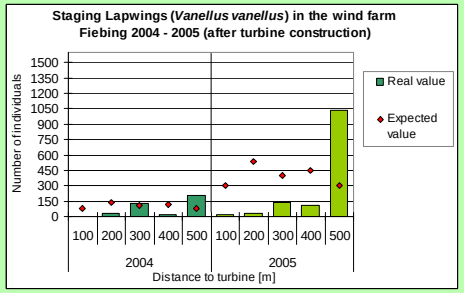
Lapwing: Staging birds

Results of the Mann-Whitney U-Test for staging Lapwings 2001 - 2007

Lapwing	Distance class		
	100	**200**	**300**
Real value	216	1863	2069
Expected value	1266	3370	2638
Significance	**p < 0,01**	**p < 0,05**	p > 0,05

Results

BACI / IG



Before-After-Control-Impact (BACI) combined with Impact Gradient (IG)

<u>Significant displacement</u>

(200 m, in single years up to 400 m):

Lapwing (*Vanellus vanellus*)

<u>Significant displacement</u> (100 m):

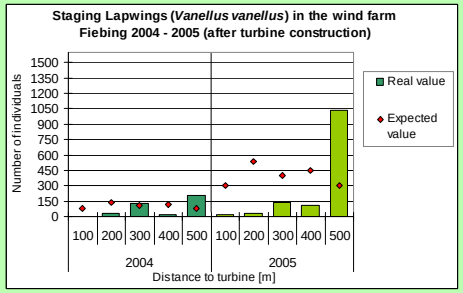
Fieldfare (*Turdus pilaris*)
Starling (*Sturnus vulgaris*)
Chaffinch (*Fringilla coelebs*)
Common Wood Pigeon
(*Columba palumbus*)

<u>Displacement</u> (100 m, not significant):

Jackdaw (*Corvus monedula*)
Black-headed Gull
(*Larus ridibundus*)

Results

BACI / IG



Before-After-Control-Impact (BACI) combined with Impact Gradient (IG)

No displacement:

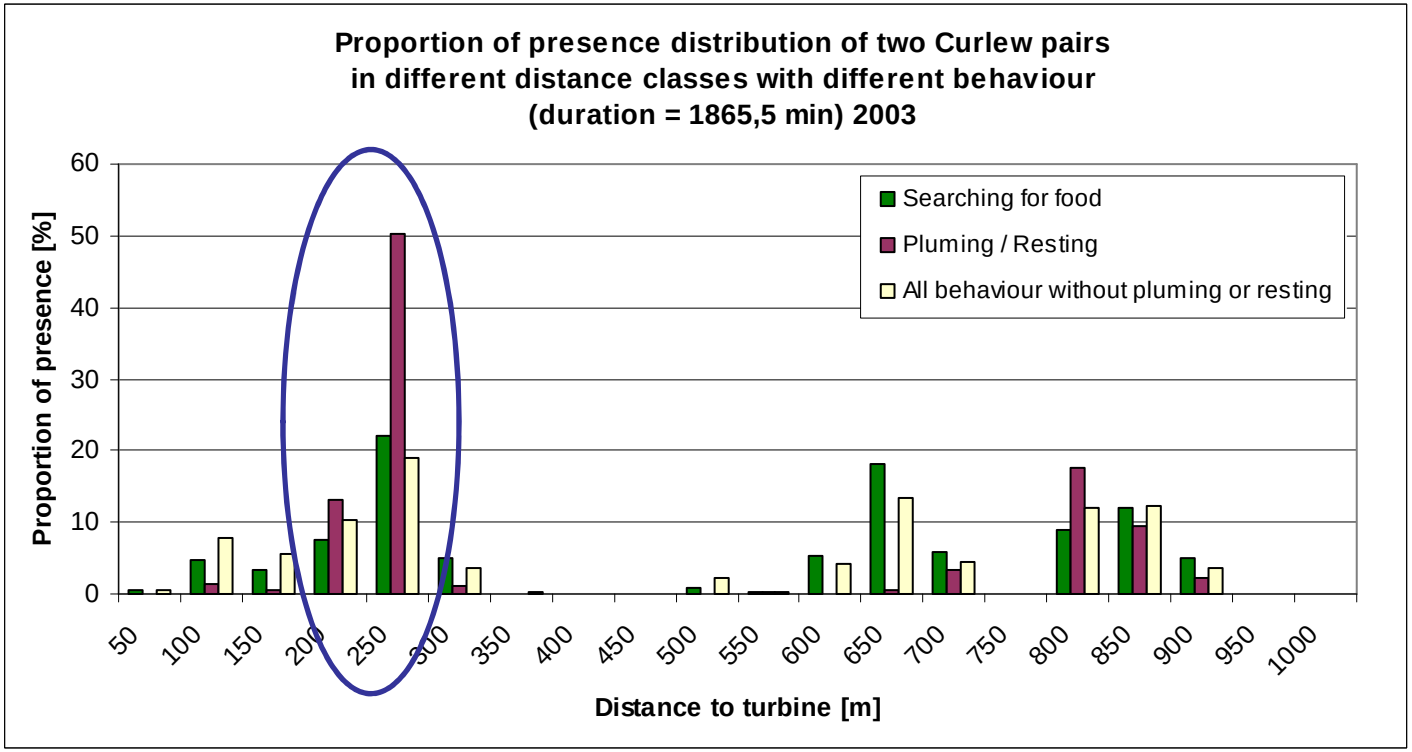
- Meadow pipit (*Anthus pratensis*)
- Carrion Crow (*Corvus corone*)
- Common Buzzard (*Buteo buteo*)
- Common Kestrel (*Falco tinnunculus*)
- Grey Heron (*Ardea cinerea*)
- Common Gull (*Larus canus*)

Results

Behaviour recording

Curlew
(*Numenius arquatus*)

Behaviour recording Curlew



Pair 1

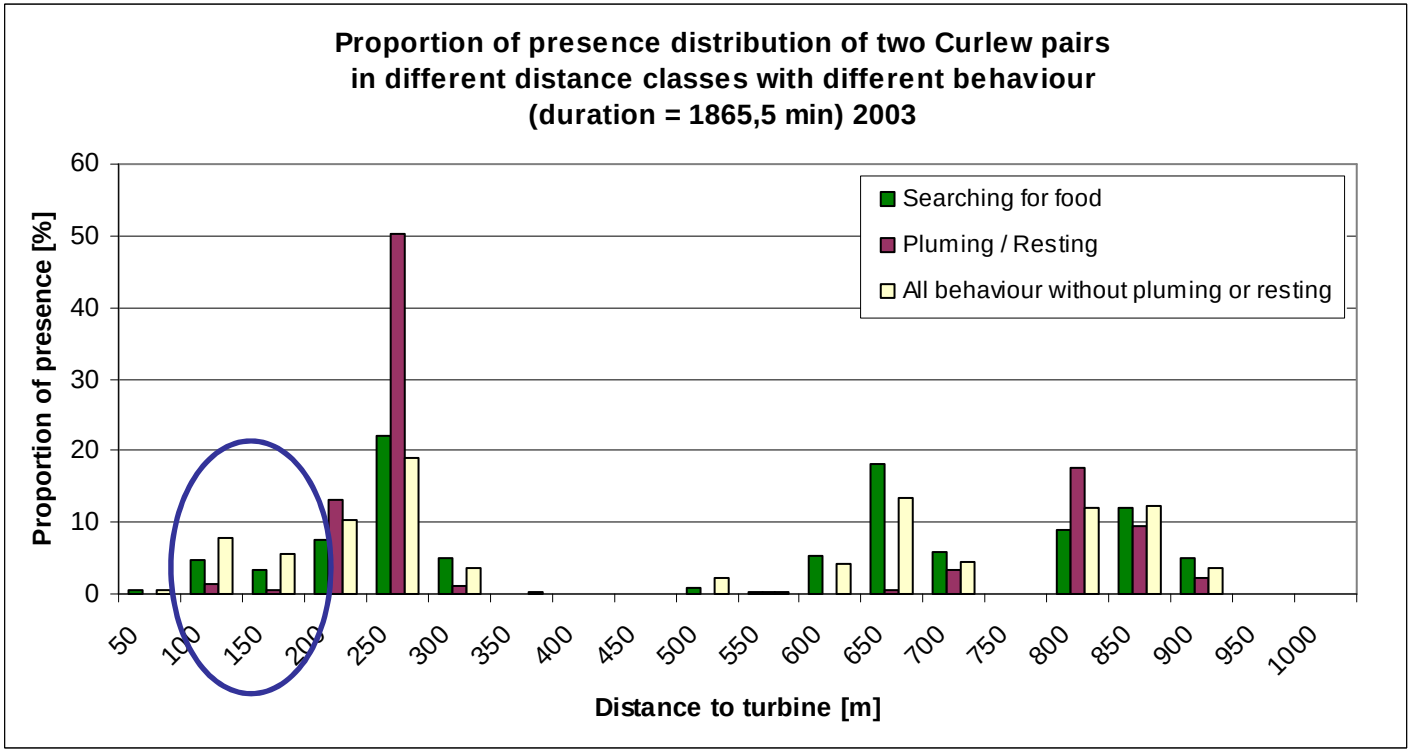
Pair 2

Results

Behaviour recording

Curlew
(*Numenius arquatus*)

Behaviour recording Curlew



Pair 1

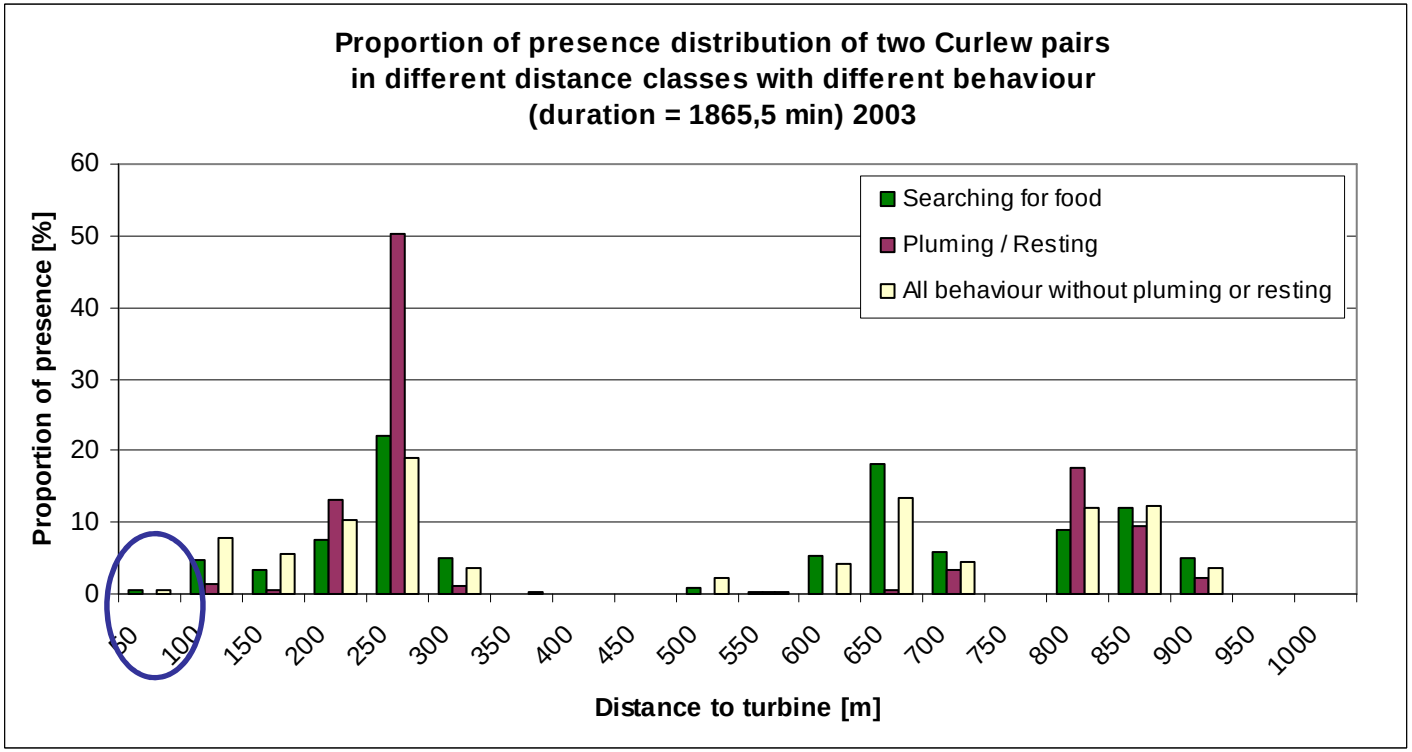
Pair 2

Results

Behaviour recording

Curlew
(*Numenius arquatus*)

Behaviour recording Curlew



Pair 1

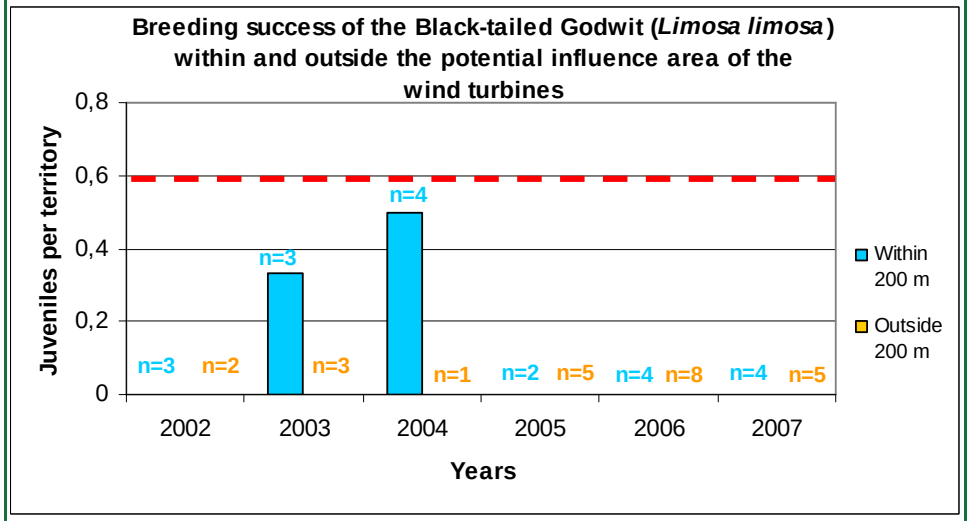
Pair 2

Results

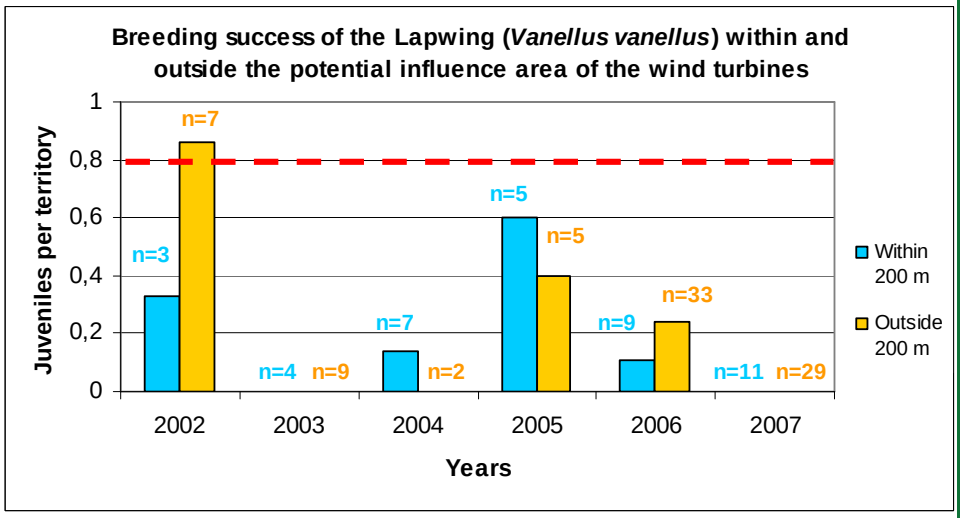
Breeding success

Breeding success 2002-2007

Black-tailed Godwit (*Limosa limosa*)



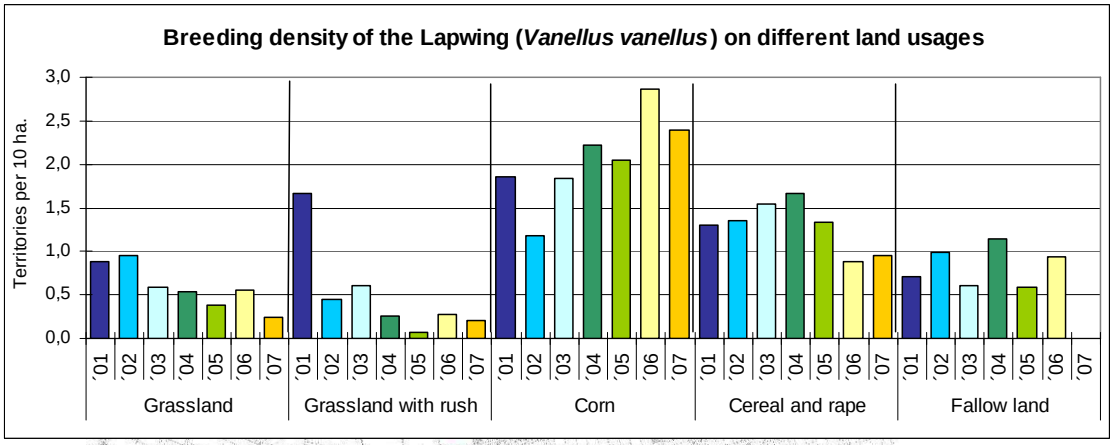
Lapwing (*Vanellus vanellus*)

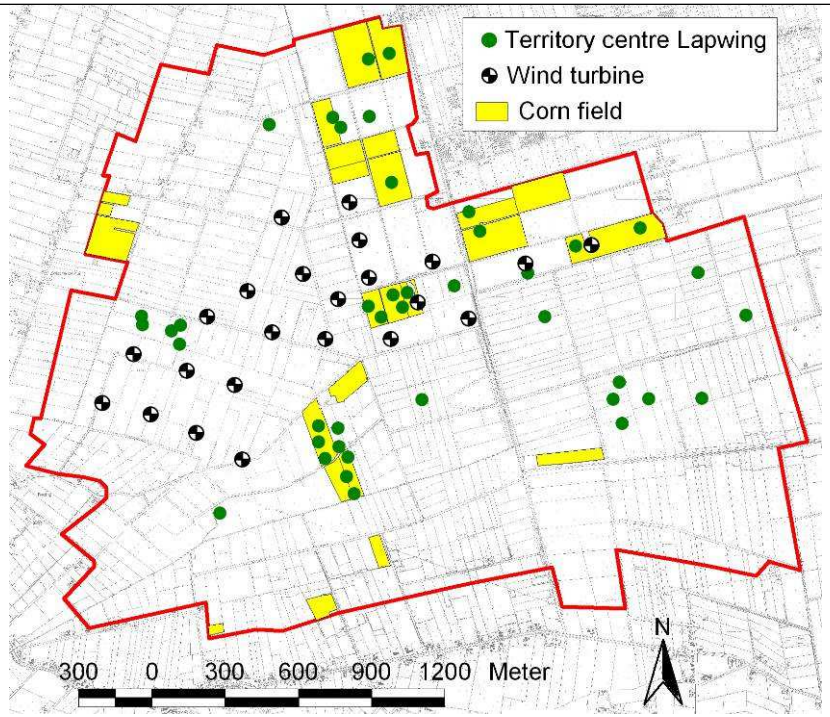


Breeding Lapwing: Preference for corn

Results

Land usage





Distribution of the Lapwing (*Vanellus vanellus*) territory centres and corn fields

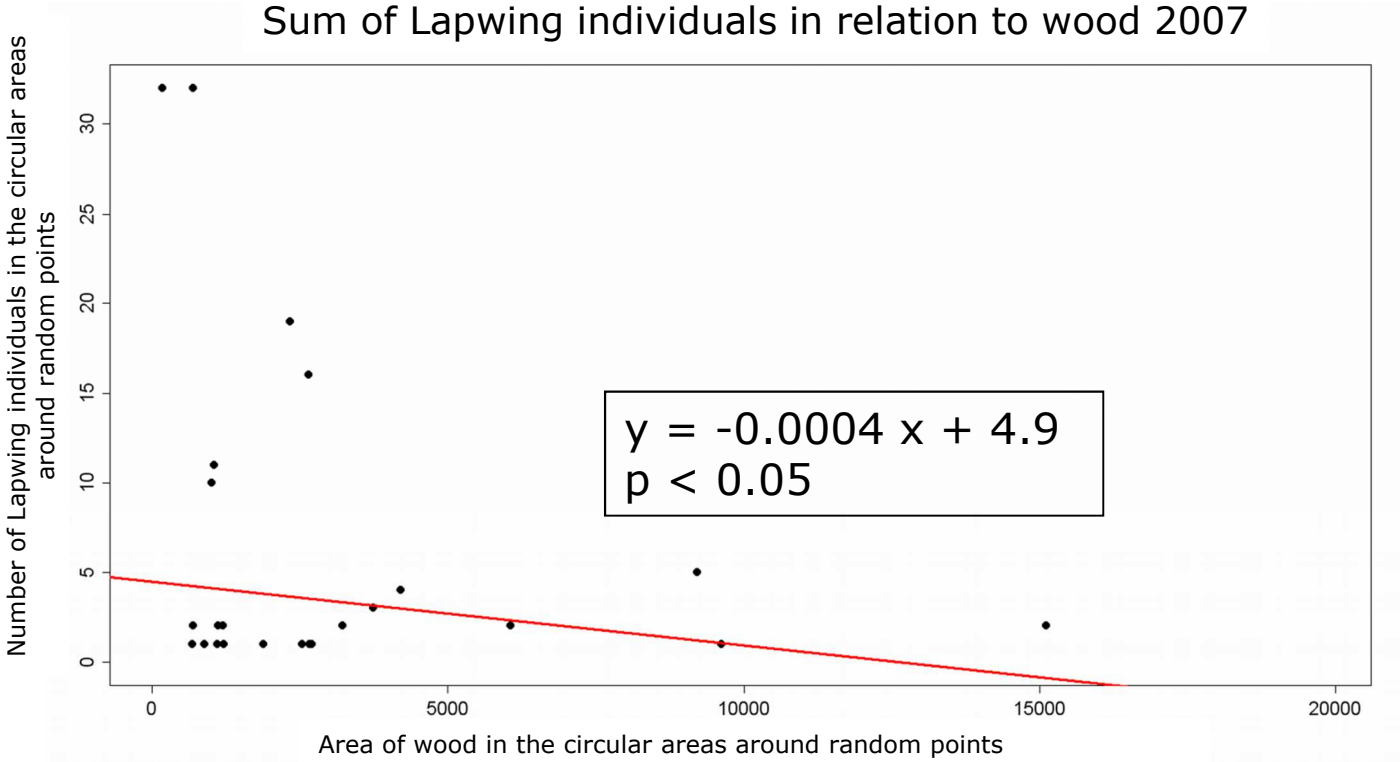
Lapwing
Breeding birds

Results

Land usage

Lapwing
Breeding birds

Breeding Lapwing: Avoidance of woods and hedges



→ No significant linear regression between the number of breeding Lapwing individuals and the distance to the next wind turbine.

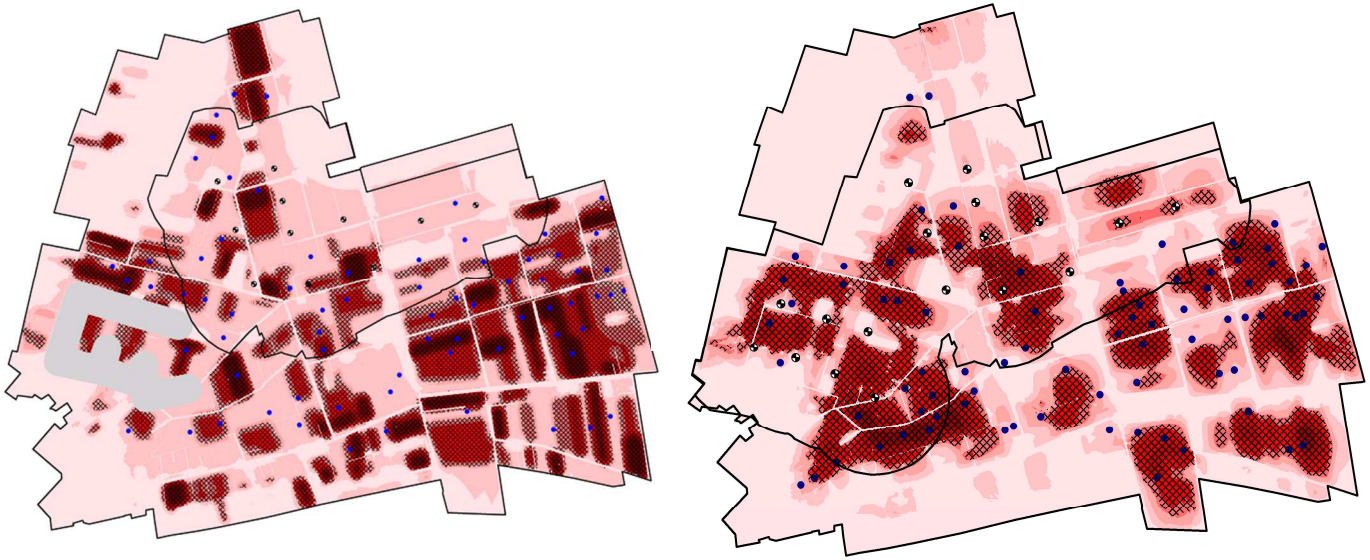
Results

Habitat modelling

2003 - 2006

Skylark
Breeding birds

Determination of habitat quality with multiple habitat models (logistic regression) - **Skylark**



Density 2003:
Wind farm area:
0,35 Territories
per ha of good habitat
Reference area:
0,17 Territories
per ha of good habitat

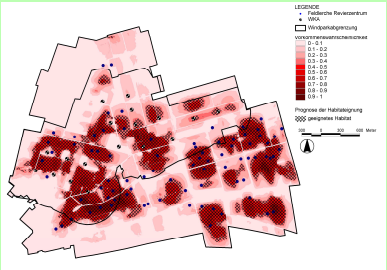
– →

+ →

Density 2006:
Wind farm area:
0,21 Territories
per ha of good habitat
Reference area:
0,35 Territories
per ha of good habitat

Results

Habitat modelling



Results of the habitat modelling:

- Breeding density in good habitat in the wind farm area equal or higher than in the reference area
  → no influence of the wind farm

  Lapwing, Black-tailed Godwit, Meadow Pipit, Stonechat, Pheasant (2006)

- Higher breeding density in the good habitat of the wind farm area in 2003, lower density in the good habitat of the wind farm area in 2006
  → decrease in wind farm & increase in reference area

  Skylark → Long term effect?

Literature review

Curlew
(*Numenius arquatus*)

Results of the literature review for the Curlew:

- Only 4 studies (all IG – design)
- In Germany little or no impact
- In Scotland up to 800 m

  → Different habitats

  → Agricultural areas with more disturbance in Germany

Literature review

Skylark
(*Alauda arvensis*)

Results of the literature review for the Skylark:

- 16 studies
- 2 with BACI
- No long term study
- Mostly „no impact"
- Again in Scotland an impact up to 200 m

Windturbines and meadow birds in Germany
Results of a 7 year BACI-study and a literature review

Conclusion


Photo: Daniel Pettersson


Journal of Applied Ecology

The distribution of breeding birds around upland wind farms

James W. Pearce-Higgins[1]*, Leigh Stephen[2], Rowena H. W. Langston[3], Ian P. Bainbridge[1,4] and Rhys Bullman[5]

[1]RSPB, Dunedin House, 25 Ravelston Terrace, Edinburgh EH4 3TP, UK; [2]RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL, UK; [3]Rural and Environment Research and Analysis Directorate, Scottish Government, Victoria Quay, Edinburgh EH6 6QQ, UK; [4]Scottish Natural Heritage, Silvan House, 3rd Floor East, 231 Corstorphine Road, Edinburgh EH12 7AT, UK; and [5]Scottish Natural Heritage, Biela Centre, Innovation Park, University of Stirling, Stirling FK9 4NF, UK

Summary

1. There is an urgent need for climate change mitigation, of which the promotion of renewable energy, such as from wind farms, is an important component. Birds are expected to be sensitive to wind farms, although effects vary between sites and species. Using data from 12 upland wind farms in the UK, we examine whether there is reduced occurrence of breeding birds close to wind farm infrastructure (turbines, access tracks and overhead transmission lines). To our knowledge, this is the first such multi-site comparison examining wind farm effects on the distribution of breeding birds.
2. Bird distribution was assessed using regular surveys during the breeding season. We took a conservative analytical approach, with bird occurrence modelled as a function of habitat, before examining the additional effects of wind farm proximity.

- Staging birds are more sensitive than breeding birds
- Statistically significant displacement (breeding birds) only up to 100 m for Lapwing and Meadow Pipit
- Long term effects for skylark possible (displacement 100 m)
- Habitat parameters have more influence on distribution of breeding birds
- Most sensitive staging bird: Lapwing (displacement 200-400m)
- Results from other studies in other habitats can deviate

vs.


Photo: Andreas Trepte

Thank you very much for your attention!

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