



# Modeling global change impacts on breeding habitat quality of four meadow bird species

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## Introduction

### What?

Assessing the impact of global change on meadow bird populations in the lowland peat district in The Netherlands

### Why?

- Dutch peat meadows are a stronghold for meadow birds in Europe
- Populations are in strong decline
- Current conservation strategies are not effective
- Strong effects of global change are expected on peat meadows
- Specifically a switch to bioenergy crops may prove very detrimental to meadow birds

### How?

- Developing habitat models for 4 meadow bird species: Black-tailed Godwit (*Limosa limosa*), Common Redshank (*Tringa totanus*), Eurasian Oystercatcher (*Haematopus ostraelagus*) and Northern Lapwing (*Vanellus vanellus*).
- Modelling of future groundwater levels, land use and landscape openness
- Modelling the impact of global change effects on future meadow bird densities

## Methods

Habitat models were created using an information theoretic approach. Nationwide GIS maps of groundwater level, land use, landscape openness and relative bird densities were used as input.

We assessed the impact of global change on habitat characteristics for two scenarios up to 2200:

- 1) Extrapolation of current trends (peat subsidence and consequent adjustments of water level management);
- 2) Similar, but now accounting for climate change.

We applied these scenarios to a case study area in the Dutch peat meadow district. Currently, the main land use type is dairy farming. Using empirical models, we modeled groundwater level changes due to peat subsidence, land use changes in response to yield losses due to groundwater level change and the resulting changes in landscape openness.

## Results

### Groundwater levels (Fig. 1)

Higher groundwater levels are expected for both scenarios, due to peat subsidence and increased difficulties to adjust water level management. Differential effects are expected due to local differences in soil type and water management. Water level changes are slightly smaller for the climate change scenario.

### Land use (Fig. 2)

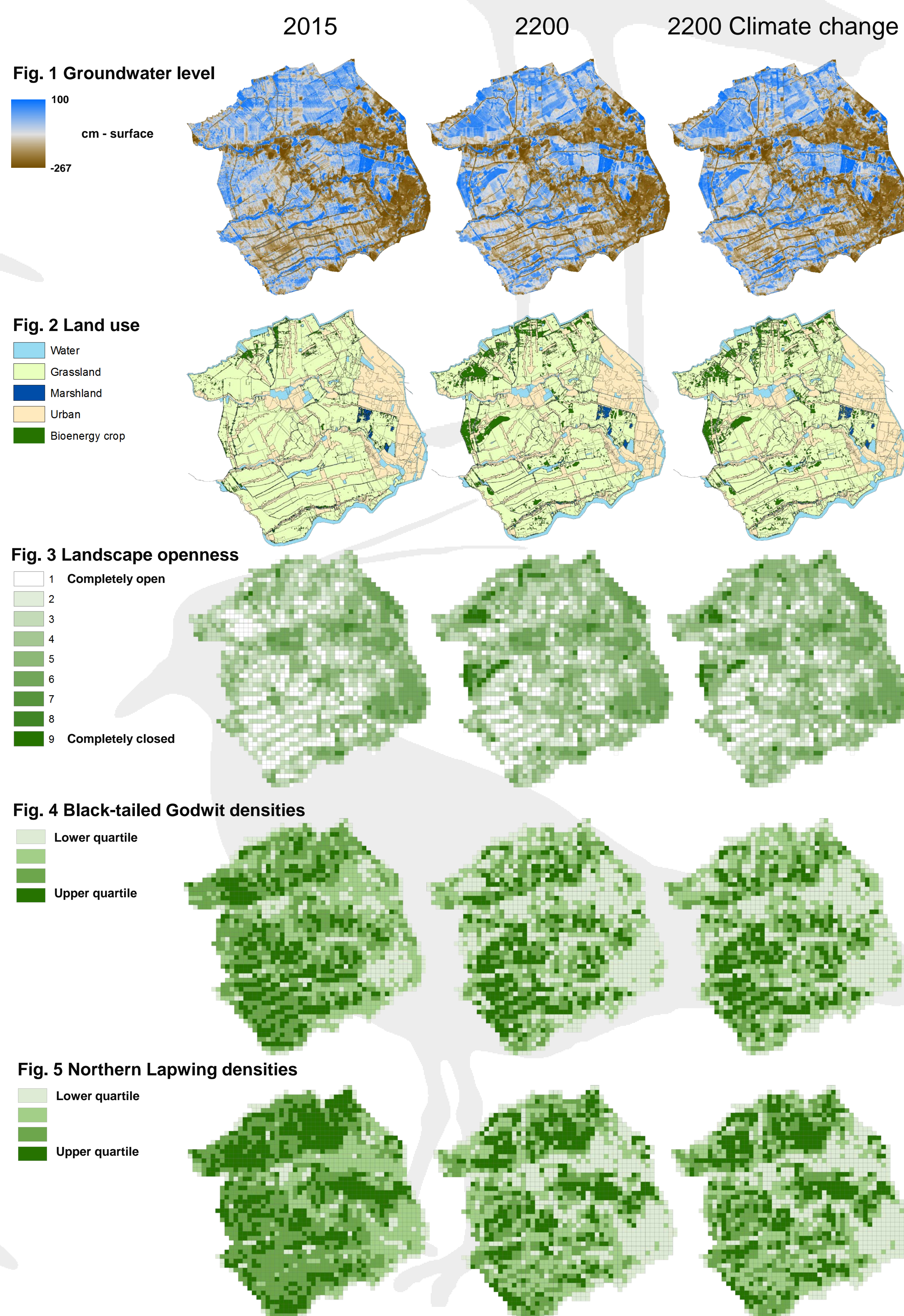
Grass yield reductions are expected due to higher groundwater levels. Beyond yield reductions of 40%, we expected that dairy farming is no longer possible. The only economically viable alternative is growing bioenergy crops (reed or willow coppice). Land use change to bioenergy crops is expected in the wetter Northeastern part of the area. Bioenergy crops are unsuitable as breeding habitat for meadow birds.

### Landscape openness (Fig. 3)

The peat meadow district currently has a very open landscape, with the exception of urban areas. With large areas being planted with bioenergy crops in both global change scenarios, landscape openness is strongly reduced because of the height of these crops.

### Meadow bird densities (Figs. 4&5)

Despite positive effects of higher groundwater levels, habitat loss and reduction of landscape openness due to a switch to bioenergy crops strongly reduced habitat quality for meadow birds. Common redshank and Eurasian Oystercatcher showed similar responses as Black-tailed Godwit: strong population reductions are expected under both scenarios (Fig. 4). The response of Northern Lapwing to global change was less strong (Fig. 5)



## Conclusions

- Landscape characteristics have a strong influence on meadow bird densities
- Climate change can have a considerable influence on meadow bird populations by affecting the landscape
- Human adaptation to climate change (i.e. land use change) appears to be more decisive than climate change itself
- The impact of global change effects differ between different species within the group of meadow birds

## Policy recommendations

For effective and future-proof meadow bird conservation ...

- ... landscape management and spatial planning must be included in meadow bird conservation strategies
- ... conservation strategies for meadow birds should take species specific responses to global change into account
- ... climate adaptation plans must anticipate unwanted effects on meadow bird populations