Results of Telemetry of the West Pannonian Great Bustard population

Scientific Symposium: Progress in the Research and Conservation of the Great Bustard in Europe

LIFE Great Bustard - (LIFE15 NAT/AT/000834)　　　　Presenter: Soňa Nuhlíčková　　　　18-21 September 2023, Bratislava Slovakia

MODEL SPECIES

Great Bustard (*Otis tarda*)

- steppe bird species, strong dependent on the open landscape configuration

- occurs almost exclusively in agricultural land

- reduced mobility and limited flight manoeuvrability

- species with small binocular field and large blind areas in their visual field, thus being heavily threatened by collisions (e.g. Lóránt & Vadász 2014)

MODEL SPECIES

Great Bustard (*Otis tarda*)

- very sensitive reaction on human disturbance, habitat change and structures of human origin

- strong avoidance of vertical structures (natural as well as human origin)

- threatened bird species suffering frequent collisions with obstacles in the landscape

- Vulnerable (VU), with decreasing trend (IUCN Red List, 2017)

Major obstacles in the human altered landscape

(Ballasus & Sossinka 1996; Lane et al. 2001)

Wind parks

Power lines

Roads, highways

MODEL SPECIES

Great Bustard (*Otis tarda*)

- an urgent need to provide a detailed information of its behaviour to human made barriers

- only few studies have focused on the effects of the landscape configuration on habitat use of this threatened species (e.g. Lóránt & Vadász 2014)

QUESTIONS

a) What are the most important habitats in the landscape that are used by the Great Bustard?

- Is there any difference in the use of landscape elements such as natural or human altered habitats?
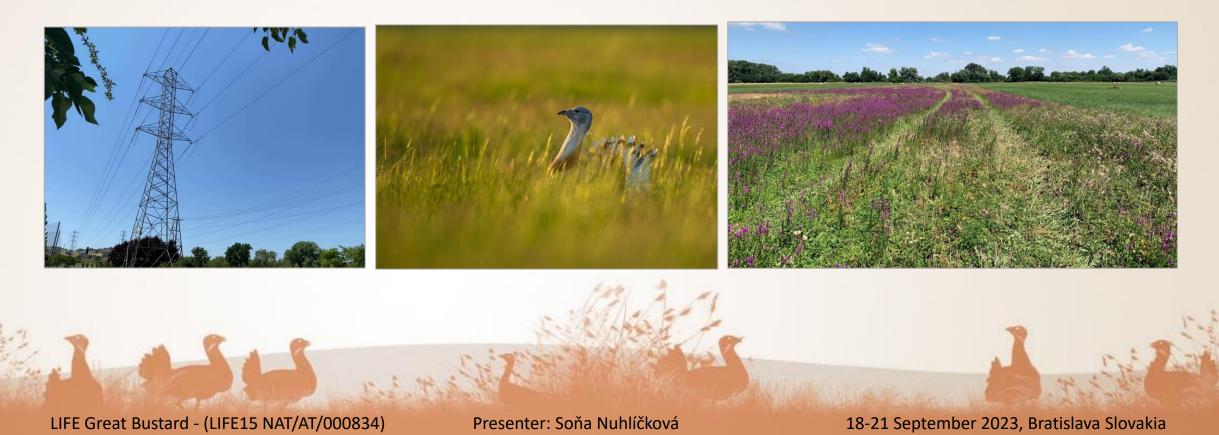
- Which one are avoided? Which one are used?

b) What is the change in the use of these habitats across the vegetation season?

- Are there any shifts in the use of the most important habitats for Great Bustards, e.g. during the year?

MAJOR OBJECTIVE

To identify the effect of human-altered environment on spatial behaviour of the West-Pannonian Great Bustard population in terms of avoidance behaviour and habitat use
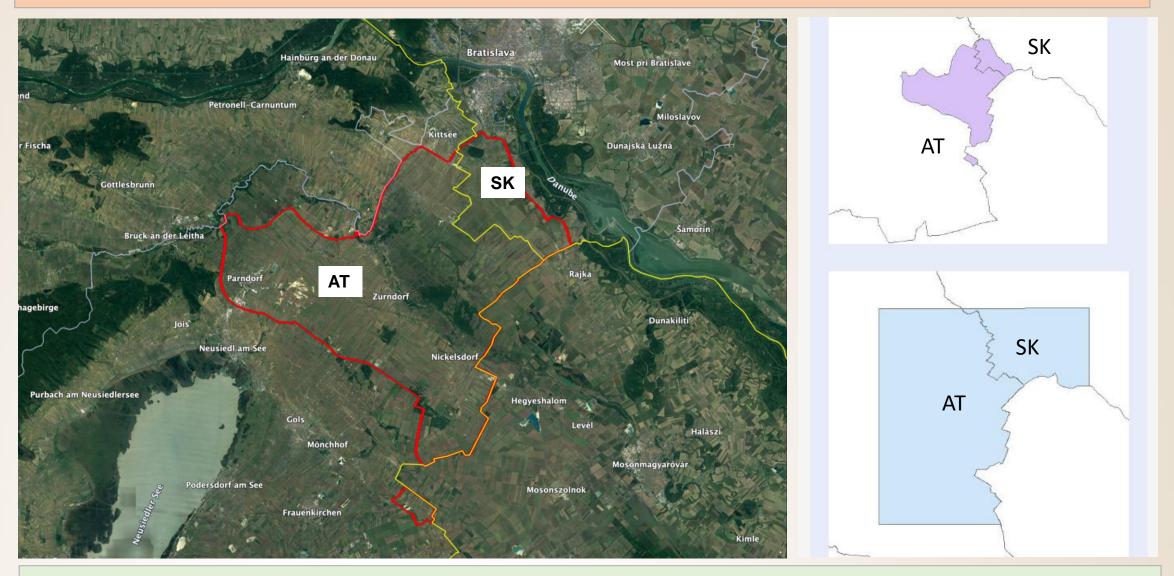
STUDY AIMS

- to identify the most important habitats in the landscape that are used by the Great Bustard

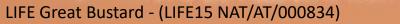- to identify the change in the use of these habitats across the vegetation season

STUDY SITE

Parndorfer Platte – Heideboden (AT) – Sysľovské polia (SK)

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METHODS

**Habitat use tracking
with the use of bird telemetry**

- Transmitter: OT-E50B-3GC (Ornitella)
- Weight: 50 g
- In average less than 0,73 % of the body mass
- Dimensions: 76×38×24 mm

- GPS logging intervals: 1 location point each 5 min
- Day & night sensing
- Operational temperature: from -20 to +70 °C
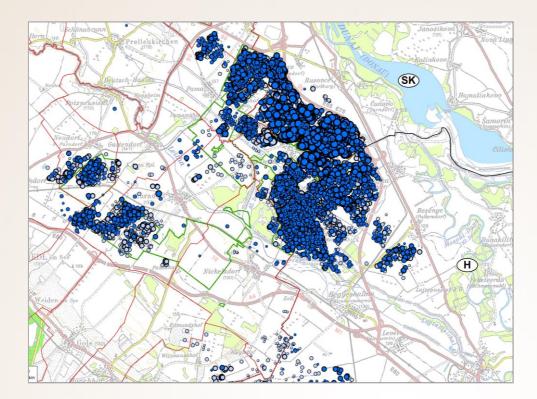- Data storage: nearly 2,000,000 records (https://www.ornitela.com)

METHODS

**Habitat use tracking
with the use of bird telemetry**

- Study period: 2020-2021

- No. of tagged birds: 9 individuals

- 4 individuals tracked in both years

- 3 M + 4 F + 2 ind. of unknown sex

- all individuals = young birds

METHODS

Tracking data:

- In total: **355 332 records** of exact bird locations
- Time scale: months (January-December)
- Optimal locs threshold: months with more than 750 locs

Habitat variables (20):

- human altered habitats (6)
- crop areas (8)
- nature close habitats (4)
- presence of top predator (2)

METHODS

Name	Explaination
high voltage powerlines	Lenght of high voltage powerline in the pixel
medium voltage powerlines	Lenght of medium voltage powerline in the pixel
roads	Lenght of road in the pixel
settlements	nearest distance to settlements in meter (negative inside the settlements)
density of settlements	percentage covered with settlements in 500 m circle (value 10000 = 100%, value 10 = 0.1%)
wind power stations	number of wind power stations in 1000m circle
allCropsDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
ext2FarmDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
fallowDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
maizeDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
rapeDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
soybeanDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
wineDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
winterGrainDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
treeDist10Ha-2018.tif	nearest distance to forests larger than 10 hectar in meter (negative inside the forests)
treeDens2500	percentage covered with forests in 2500 m circle (value 10000 = 100%, value 10 = 0.1%)
grassDens	percentage covered with **crop in name** in the pixel (value 1 = 100%, value 0.001 = 0.1%)
freshwaterDens	percentage covered with freshwater in the pixel (value 10000 = 100%, value 10 = 0.1%)
imperialEagle.tif	Result of brownian bridge analysis - equals time spend by telemetry imperial eagle
whiteTailedEagle.tif	Result of brownian bridge analysis - equals time spend by telemetry white tailed eagle

Human-altered habitats: examples

Wind power stations

Roads

Settlements

Crop areas: examples

Raps

Vineyards

Soya

Nature close habitats: examples

Fallows

Grasslands

Tree stands

Presence of top predators (2)

Imperial Eagle

© Franz Josef Kovacs

White Tailed Eagle

STATISTICAL ANALYSIS

distance from niche centre = marginality

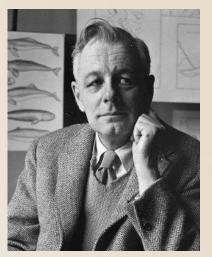...based on the concept of *ecological niche and PCA*

ENFA
Ecological **N**iche **F**actor **A**nalysis
marginality = defines whether the animal uses the given environmental factor or avoids it
- marginality (+) indicates habitat use (preference)
- marginality (-) indicates avoidance

DOMAIN algorithm

George Evelyn Hutchinson
(1903-1991)
"Father of modern ecology"

Karl Pearson
(1903-1991)
"God of correlations"

RESULTS

Habitat Suitability
&
Non-random Associations
with Environmental Components

Habitat suitability for *Otis tarda*

2020 / month no. – 1

DOMAIN

(suitability)

high

medium

low

selection / use

no reaction

avoidance

months

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain
wine
WPS
whiteTailedEagle
treeDist10Ha
treeDens
soybean
settlementDist
settlementDens500
road
rape
msp
maize
imperialEagle
hsp
grass
freshwater
fallow
ext2Farm
allCrops

Habitat suitability for *Otis tarda* — 2020 / month no. — 2

Habitat suitability for *Otis tarda*   2020 / month no. − 3

DOMAIN

(suitability)

high

medium

low

selection / use

no reaction

avoidance

months

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain
wine
WPS
whiteTailedEagle
treeDist10Ha
treeDens
soybean
settlementDist
settlementDens500
road
rape
msp
maize
imperialEagle
hsp
grass
freshwater
fallow
ext2Farm
allCrops

Habitat suitability for *Otis tarda*

2020 / month no. — 4

DOMAIN

(suitability)

high

medium

low

selection / use

no reaction

avoidance

months

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain
wine
WPS
whiteTailedEagle
treeDist10Ha
treeDens
soybean
settlementDist
settlementDens500
road
rape
msp
maize
imperialEagle
hsp
grass
freshwater
fallow
ext2Farm
allCrops

Habitat suitability for *Otis tarda* — 2020 / month no. — 5

DOMAIN (suitability)

high / medium / low

selection / use · no reaction · avoidance

months: I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain, wine, WPS, whiteTailedEagle, treeDist10Ha, treeDens, soybean, settlementDist, settlementDens500, road, rape, msp, maize, imperialEagle, hsp, grass, freshwater, fallow, ext2Farm, allCrops

Habitat suitability for *Otis tarda* — 2020 / month no. — 6

Habitat suitability for *Otis tarda*

2020 / month no. — 7

DOMAIN
(suitability)

high

medium

low

selection / use

no reaction

avoidance

months

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
wintergrain												
wine												
WPS												
whiteTailedEagle												
treeDist10Ha												
treeDens												
soybean												
settlementDist												
settlementDens500												
road												
rape												
msp												
maize												
imperialEagle												
hsp												
grass												
freshwater												
fallow												
ext2Farm												
allCrops												

Habitat suitability for *Otis tarda*

2020 / month no. – 8

DOMAIN
(suitability)

high

medium

low

selection / use

no reaction

avoidance

months

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain
wine
WPS
whiteTailedEagle
treeDist10Ha
treeDens
soybean
settlementDist
settlementDens500
road
rape
msp
maize
imperialEagle
hsp
grass
freshwater
fallow
ext2Farm
allCrops

Habitat suitability for *Otis tarda* — 2020 / month no. – 9

Habitat suitability for *Otis tarda* — 2020 / month no. — 11

Habitat suitability for *Otis tarda* — 2020 / month no. – 12
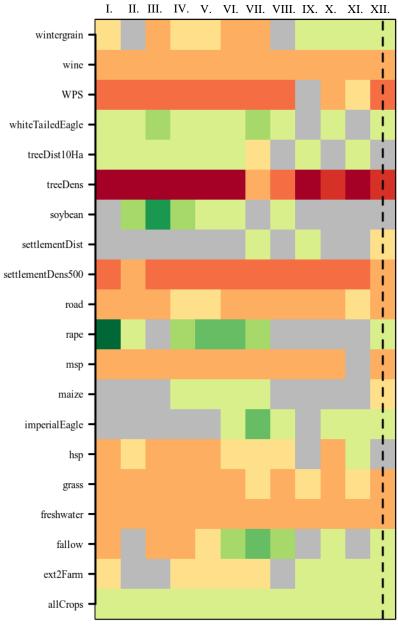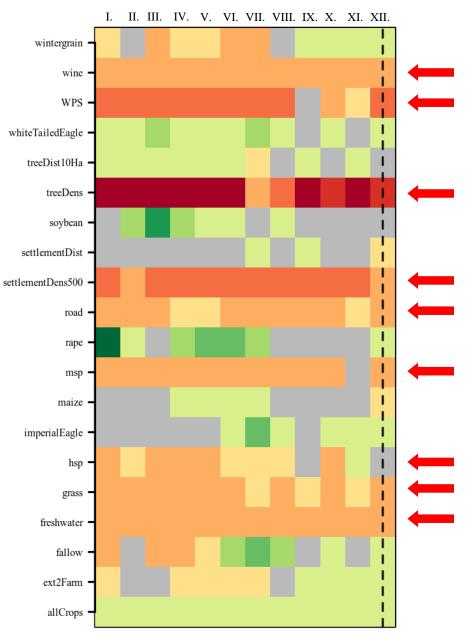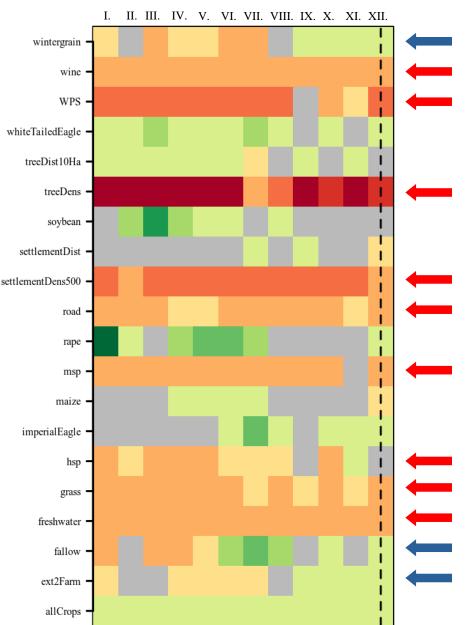
Negative marginality = avoidance

- **vineyards**
- **wind power stations**
- **dense tree stands**
- **dense settlements & roads**
- **medium & high voltage powerlines**
- **grasslands**
- **freshwaters**

Negative marginality = avoidance

- **vineyards**
- **wind power stations**
- **dense tree stands**
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- **grasslands**
- **freshwaters**

Alternating pattern (month specific)

- **winter grain**
- **fallows** (strong <u>positive affinity</u> especially in summer, autumn and winter months!)
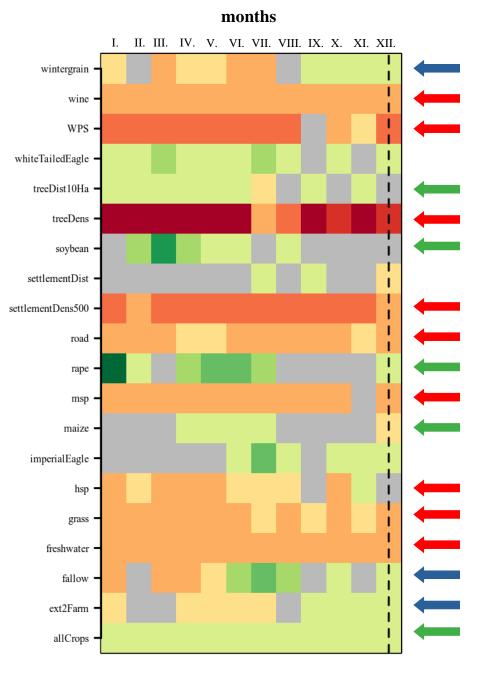- **extensive farming**

months

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain
wine
WPS
whiteTailedEagle
treeDist10Ha
treeDens
soybean
settlementDist
settlementDens500
road
rape
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maize
imperialEagle
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grass
freshwater
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allCrops

Negative marginality = avoidance
- **vineyards**
- **wind power stations**
- **dense tree stands**
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- **medium & high voltage powerlines**
- **grasslands**
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Alternating pattern (month specific)
- **winter grain**
- **fallows** (strong <u>positive affinity</u> especially in summer, then autumn and winter months!)
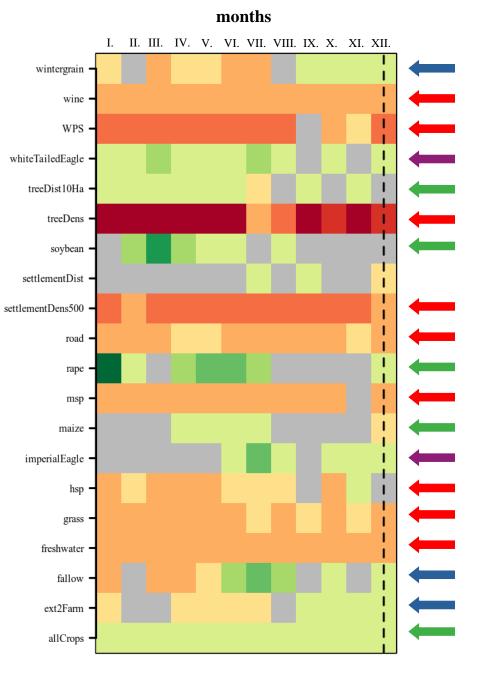- **extensive farming**

Positive marginality = selection
- **small forest stands** (but not dense forests!)
- **soybean & maize & crops**
- **rape** (important food source during winter months; **key habitat** in vegetation season (spring-summer)

months

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII.

wintergrain, wine, WPS, whiteTailedEagle, treeDist10Ha, treeDens, soybean, settlementDist, settlementDens500, road, rape, msp, maize, imperialEagle, hsp, grass, freshwater, fallow, ext2Farm, allCrops

Negative marginality = avoidance
- **vineyards**
- **wind power stations**
- **dense tree stands**
- **dense settlements & roads**
- **medium & high voltage powerlines**
- **grasslands**
- **freshwaters**

Alternating pattern (month specific)
- **winter grain**
- **fallows** (strong <u>positive affinity</u> especially in summer, then autumn and winter months!)
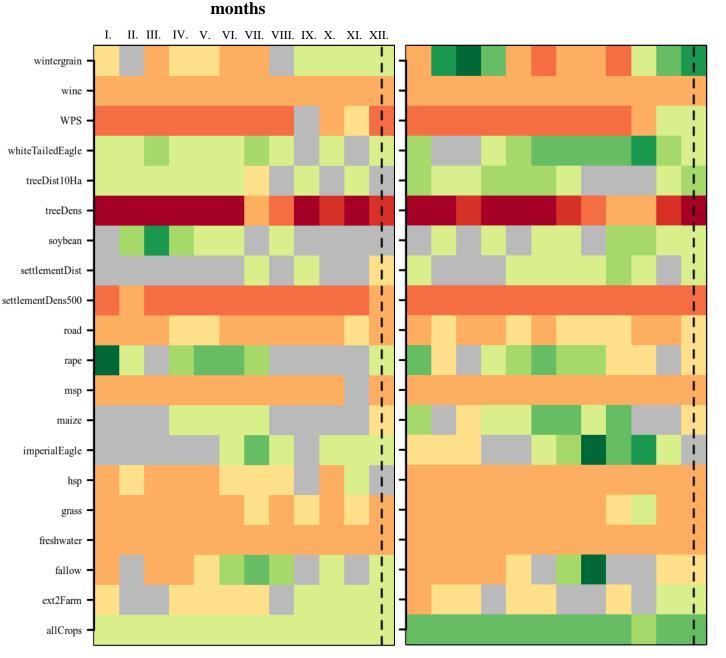- **extensive farming**

Positive marginality = selection
- **small forest stands** (but not dense forests!)
- **soyabean & maize & crops**
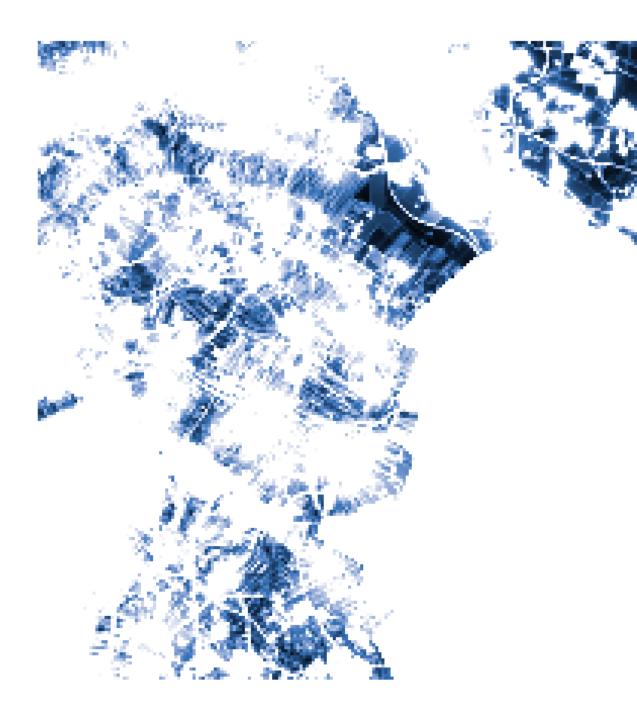- **rape** (important food source during winter months; **key habitat** in vegetation season (spring-summer)

+

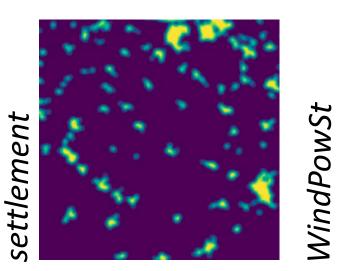**Non-random possitive associations with predators**
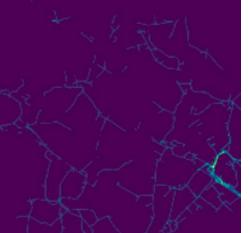- **White Tailed Eagle + Imperial Eagle**

Negative marginality = avoidance

- **vineyards**
- **wind power stations**
- **dense tree stands**
- **dense settlements & roads**
- **medium & high voltage powerlines**
- **grasslands**
- **freshwaters**

Mixed pattern (month specific)

- **winter grain**
- **fallows** (strong <u>positive affinity</u> especially in summer, then autumn and winter months!)
- **extensive farming**

Positive marginality = selection

- **small forest stands** (but not dense forests!)
- **soyabean & maize & crops**
- **rape** (important food source during winter months; **key habitat** in vegetation season (spring-summer)

+

Non-random possitive associations with predators

- **White Tailed Eagle + Imperial Eagle**

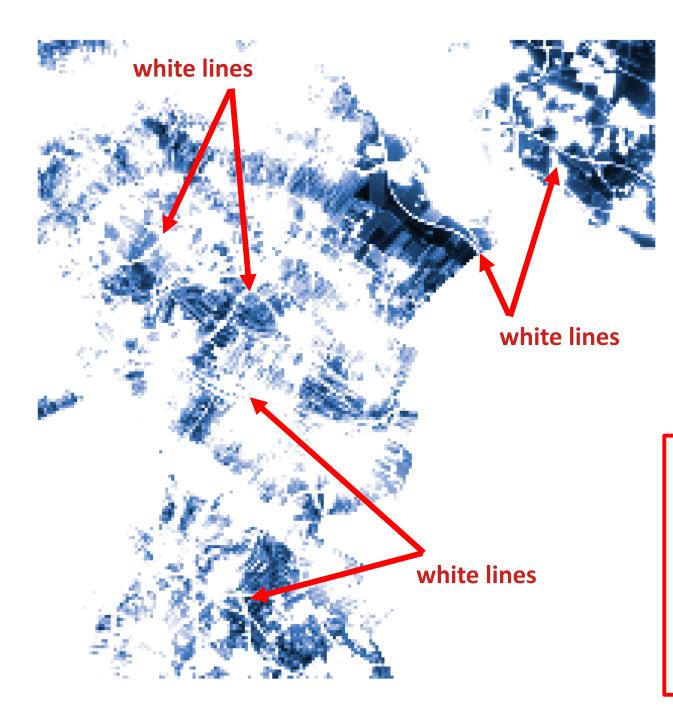*"See barriers in the landscape through the eyes of the Great Bustard!"*

settlement

WindPowSt

medium-voltage
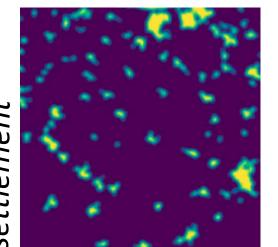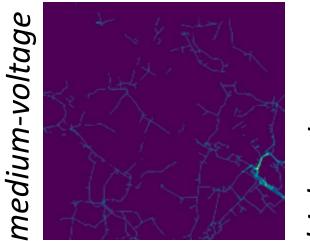
high-voltage

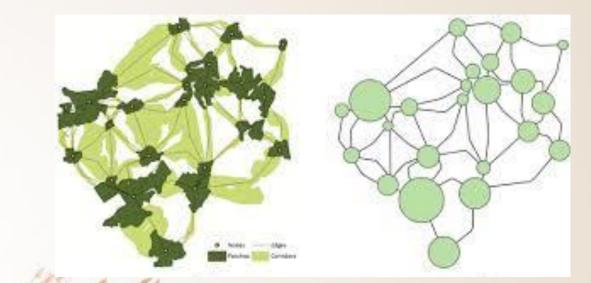*"See barriers in the landscape through the eyes of the Great Bustard!"*

Future Research

We are strategizing on **enhancing the connectivity between suitable habitat fragments**.

Our goal is to optimally link these patches of landscape into a **unified free-roam area**.

Major conclusions

- First detailed information about the habitat use based on robust telemetry data

- Identification of priority elements, suggesting a preference by target species

- Avoidant behaviour especially confirmed in terms of vertical human-made objects

- Change in vegetation season and crop management suggest different habitat use in target species

- Avoidant behaviour was not confirmed in the presence of predators

- Key information for conservation strategy of the threatened West Pannonian Great Bustard population

Thank you for your attention!