XXIX International Hamster
Workgroup Meeting

Hamster Distribution Model: a case study in Alsace, France

Oksana Grente

Work in collaboration with Aurélien Besnard (EPHE), Guillaume Souchay (OFB), Charlotte Kourkgy (OFB), Julien Eidenschenk (OFB) and Vincent Rocheteau (OFB)

© Julian Rad

Contents

Context in Alsace

Species Monitoring

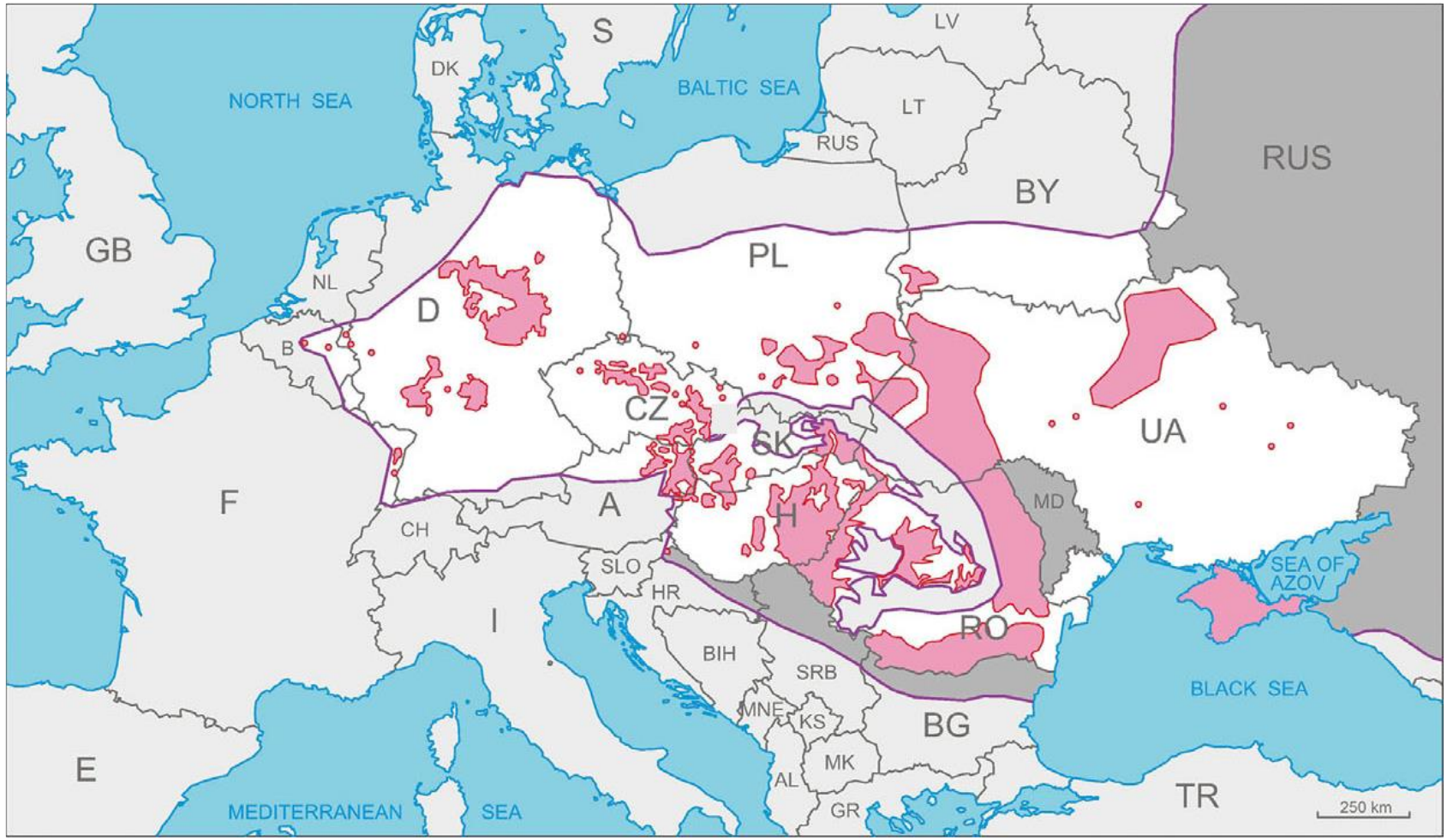
Distribution Modelling

Part I

Context in Alsace

Context in Alsace

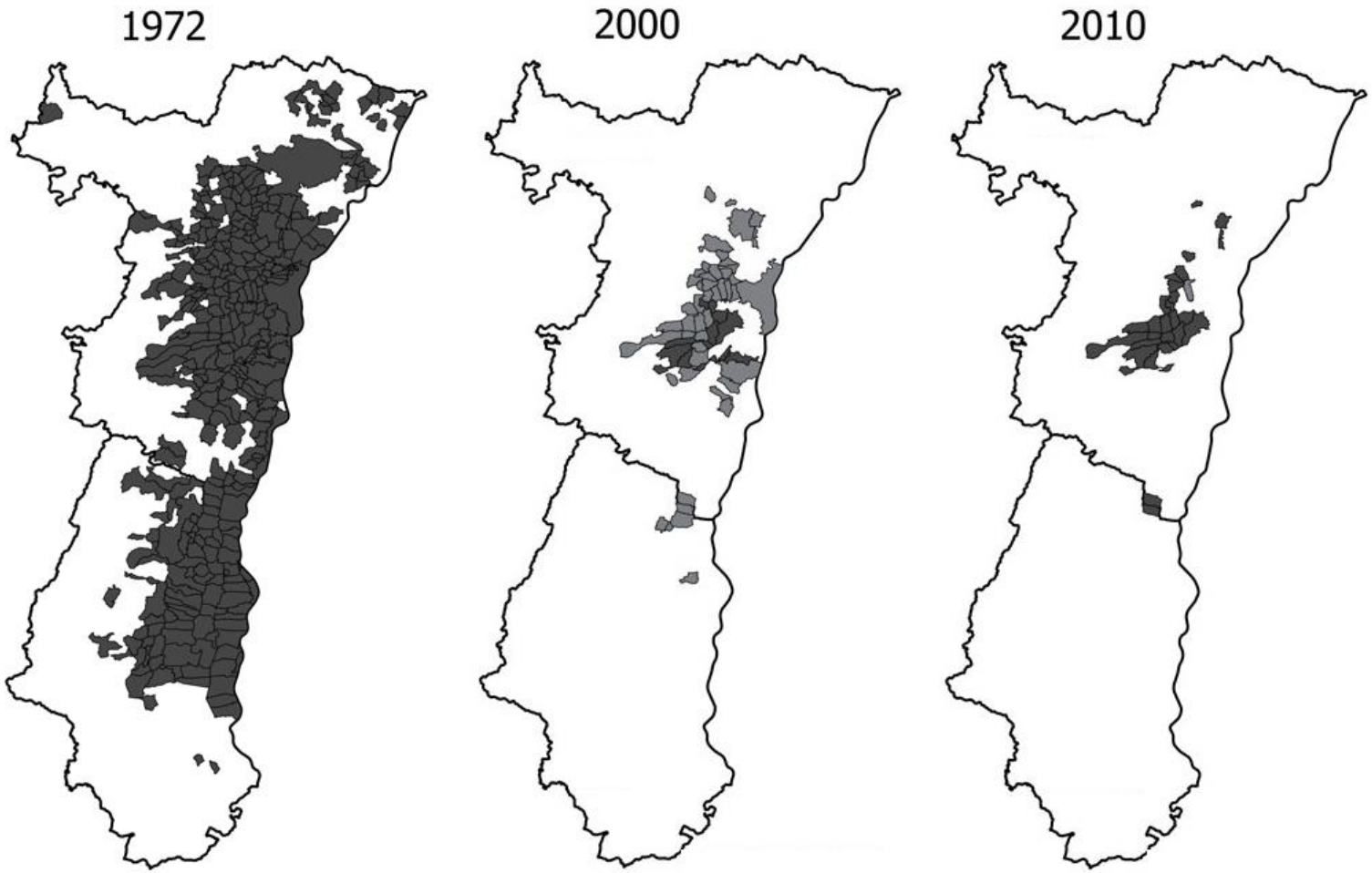
The western limit of the range



Distribution of the common hamster in 2015 (pink) and before 1982 (dark grey and violet borders) in Europe. Figure from Surov et al., 2016

Context in Alsace

A recent and clear decline

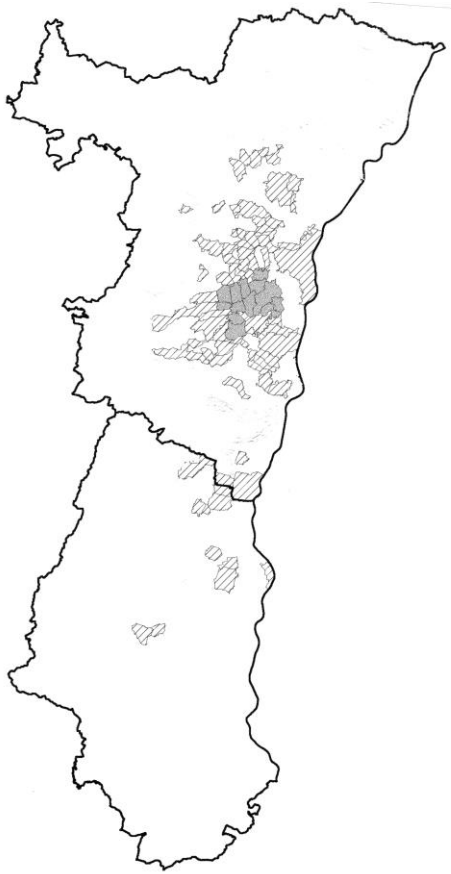


Towns of effective (black) or probable (grey) presence of the common hamster in Alsace. Figure from Virion and Thouvenot, 2019.

Context in Alsace

2000-2004

Legal protection in France



Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)

First National Plan (2004-2006)

Various conservation measures:

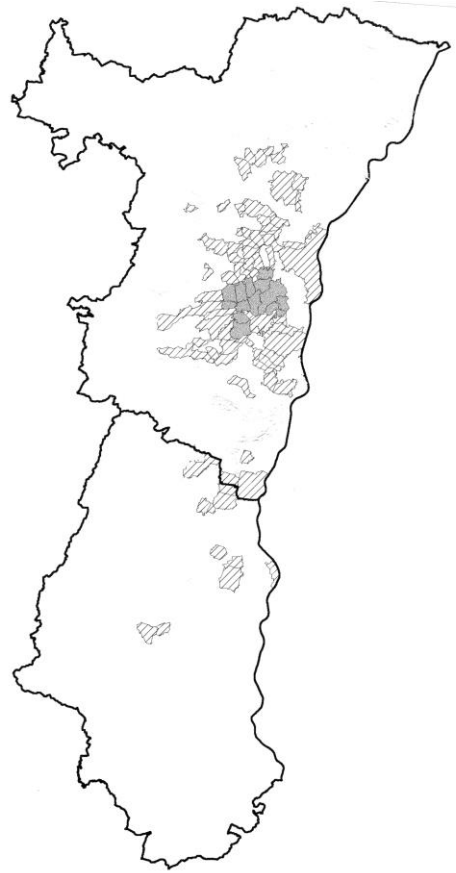
- monitoring,
- scientific research,
- releases,
- agri-environmental measures,
- awareness campaign…

but without strict protection of the habitat.

Context in Alsace

Legal protection in France

2000-2004 2007



Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)

First National Plan (2004-2006)

Various conservation measures:

- monitoring,
- scientific research,
- releases,
- agri-environmental measures,
- awareness campaign…

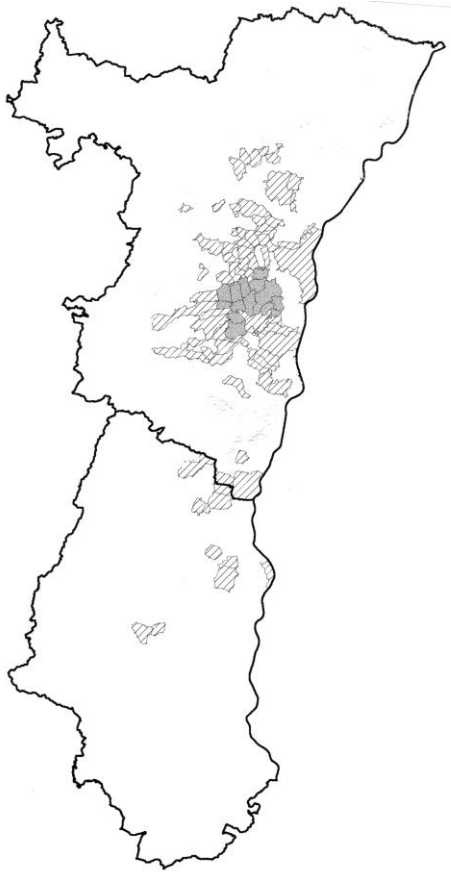
but without strict protection of the habitat.

Lawsuit of the European Commission against France in 2007

Context in Alsace

Legal protection in France

2000-2004 2007 2007-2012



Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)

Conservation areas for 2007-2012, w/ conservation areas (black) & occupancy areas (brown) (O'Brien, 2015)

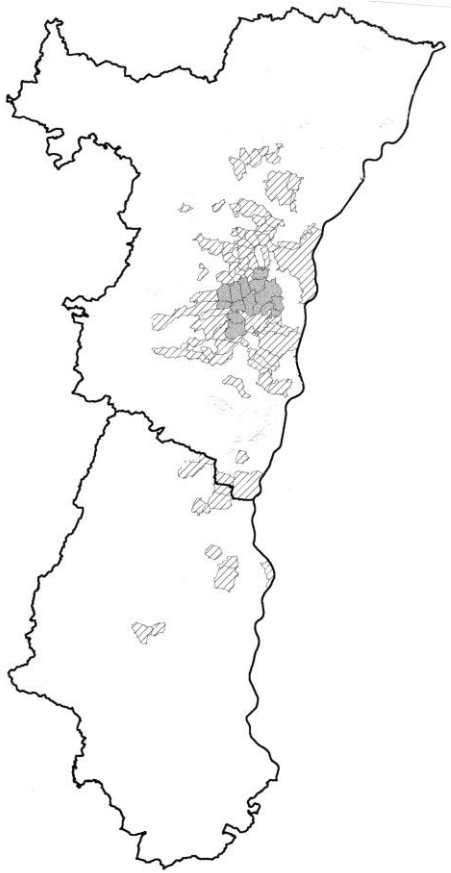
Second National Plan (2007-2012)

A stricter protection of the habitat

… but over a small area: 2% of the 1972 distribution

Context in Alsace

Legal protection in France



Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)

Conservation areas for 2007-2012, w/ conservation areas (black) & occupancy areas (brown) (O'Brien, 2015)

Second National Plan (2007-2012)

CVRIA sentenced France in 2011

A stricter protection of the habitat

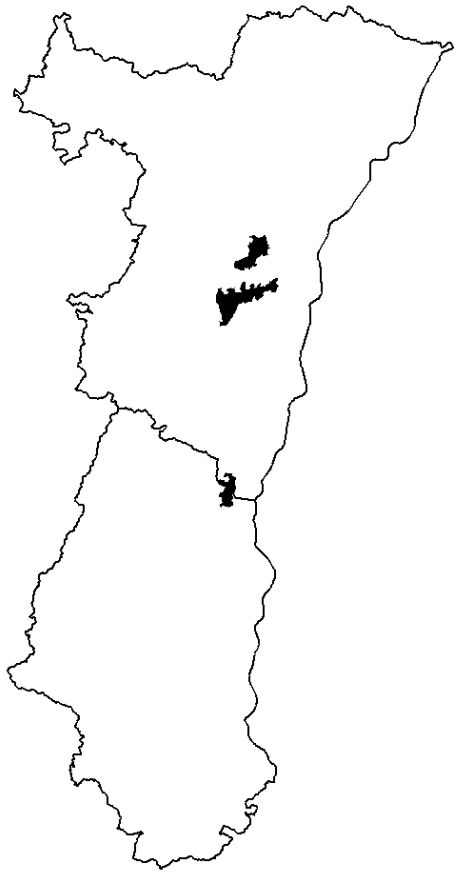
⚠ … but over a small area: 2% of the 1972 distribution

Context in Alsace

Legal protection in France

Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)

Conservation areas for 2007-2012, w/ conservation areas (black) & occupancy areas (brown) (O'Brien, 2015)



Conservation areas for 2012-2016

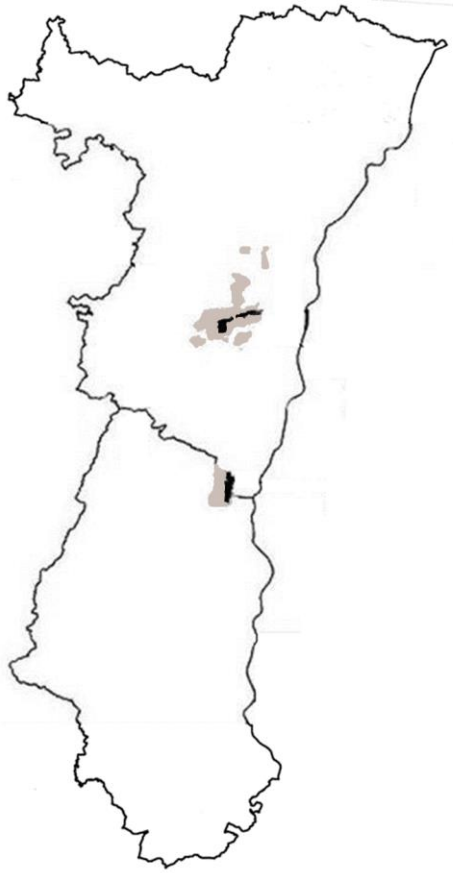
Third National Plan (2012-2016)

- The whole known distribution (2010-2012) is under strict protection
- Derogations for urbanisation are better defined
- Compensations are required in case of derogations (*i.e.* releases)
- The decrease of the population seems to stop

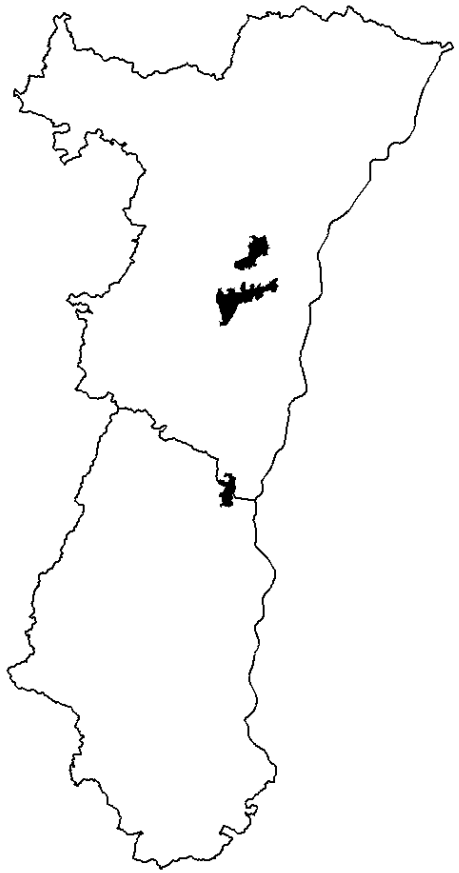
Context in Alsace

Legal protection in France

Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)



Conservation areas for 2007-2012, w/ conservation areas (black) & occupancy areas (brown) (O'Brien, 2015)



Conservation areas for 2012-2016

Third National Plan (2012-2016)

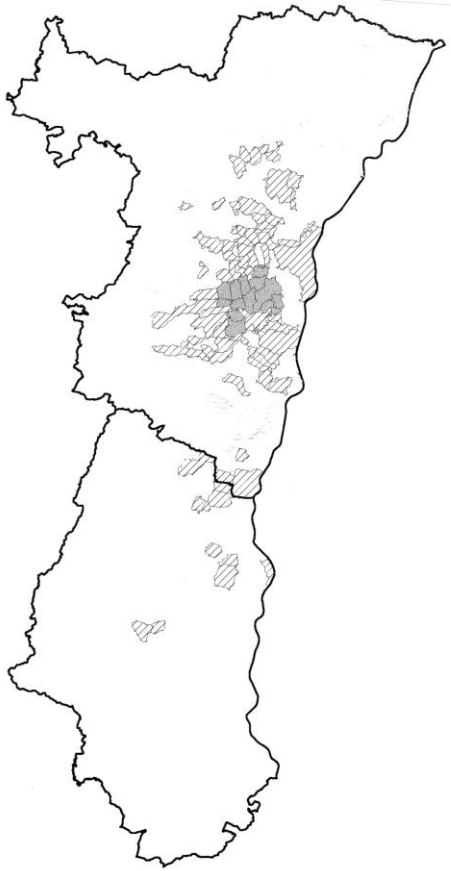
- The whole known distribution (2010-2012) is under strict protection
- Derogations for urbanisation are better defined
- Compensations are required in case of derogations (*i.e.* releases)
- The decrease of the population seems to stop

CVRIA

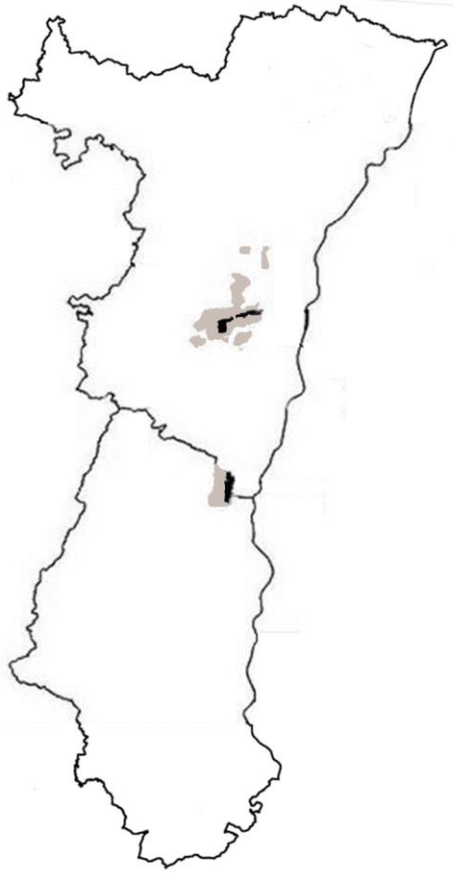
suspended the procedure against France in 2017

Context in Alsace

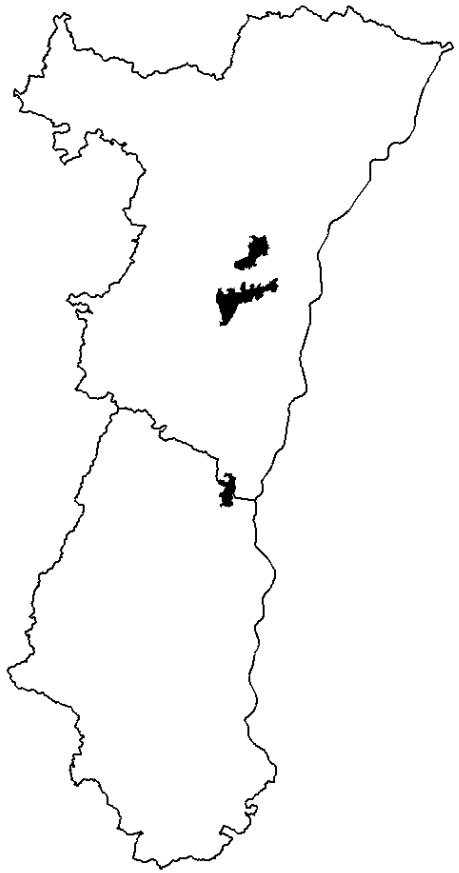
Legal protection in France



Conservation areas for 2000-2004, w/ priority areas (grey) & secondary areas (hatched) (Wencel, 1999)



Conservation areas for 2007-2012, w/ conservation areas (black) & occupancy areas (brown) (O'Brien, 2015)



Conservation areas for 2012-2016

Third National Plan (2012-2016)

- The whole known distribution (2010-2012) is under strict protection
- Derogations for urbanisation are better defined
- Compensations are required in case of derogations (*i.e.* releases)
- The decrease of the population seems to stop

CVRIA

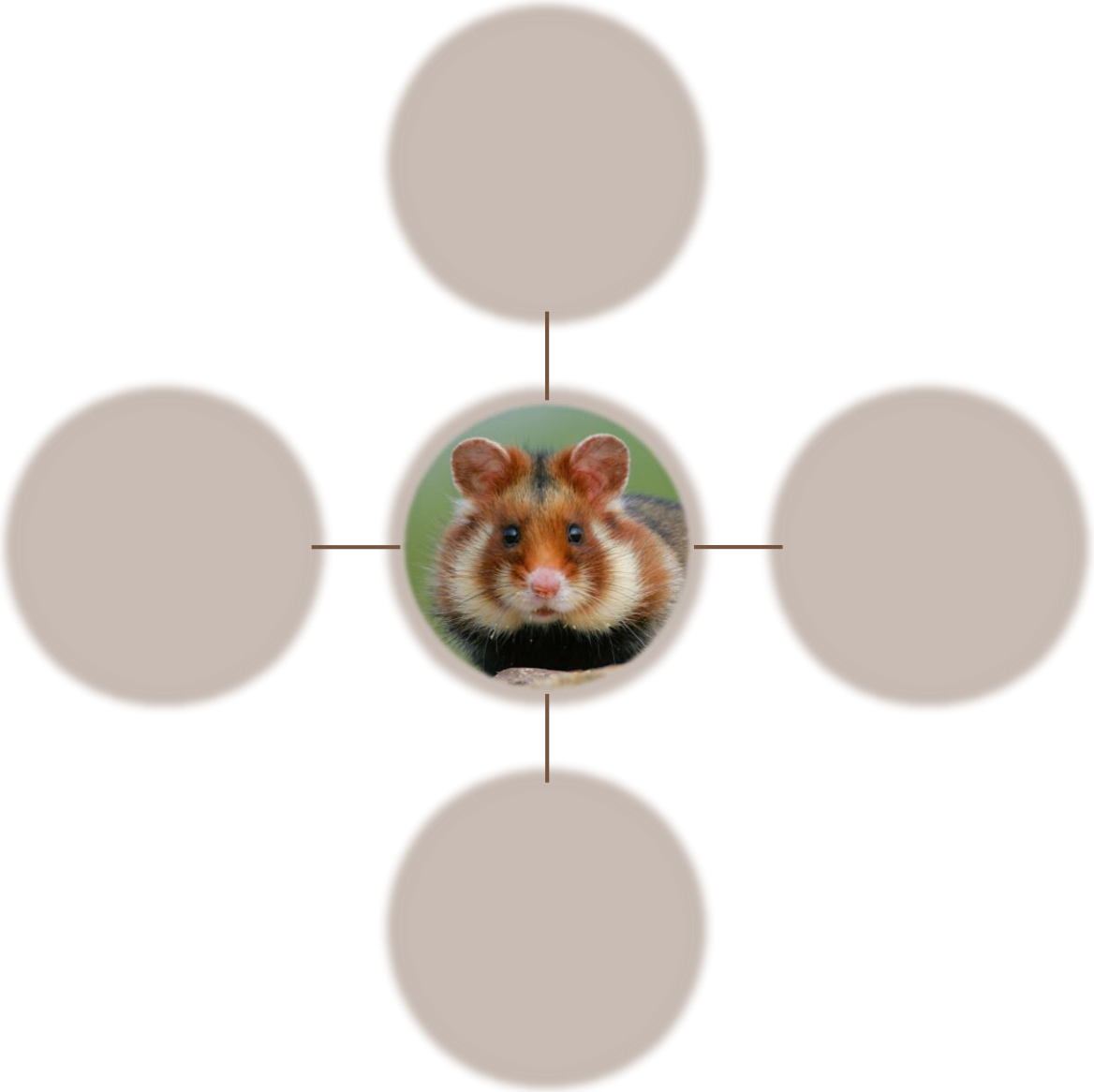
suspended the procedure against France in 2017

Part II

Species Monitoring

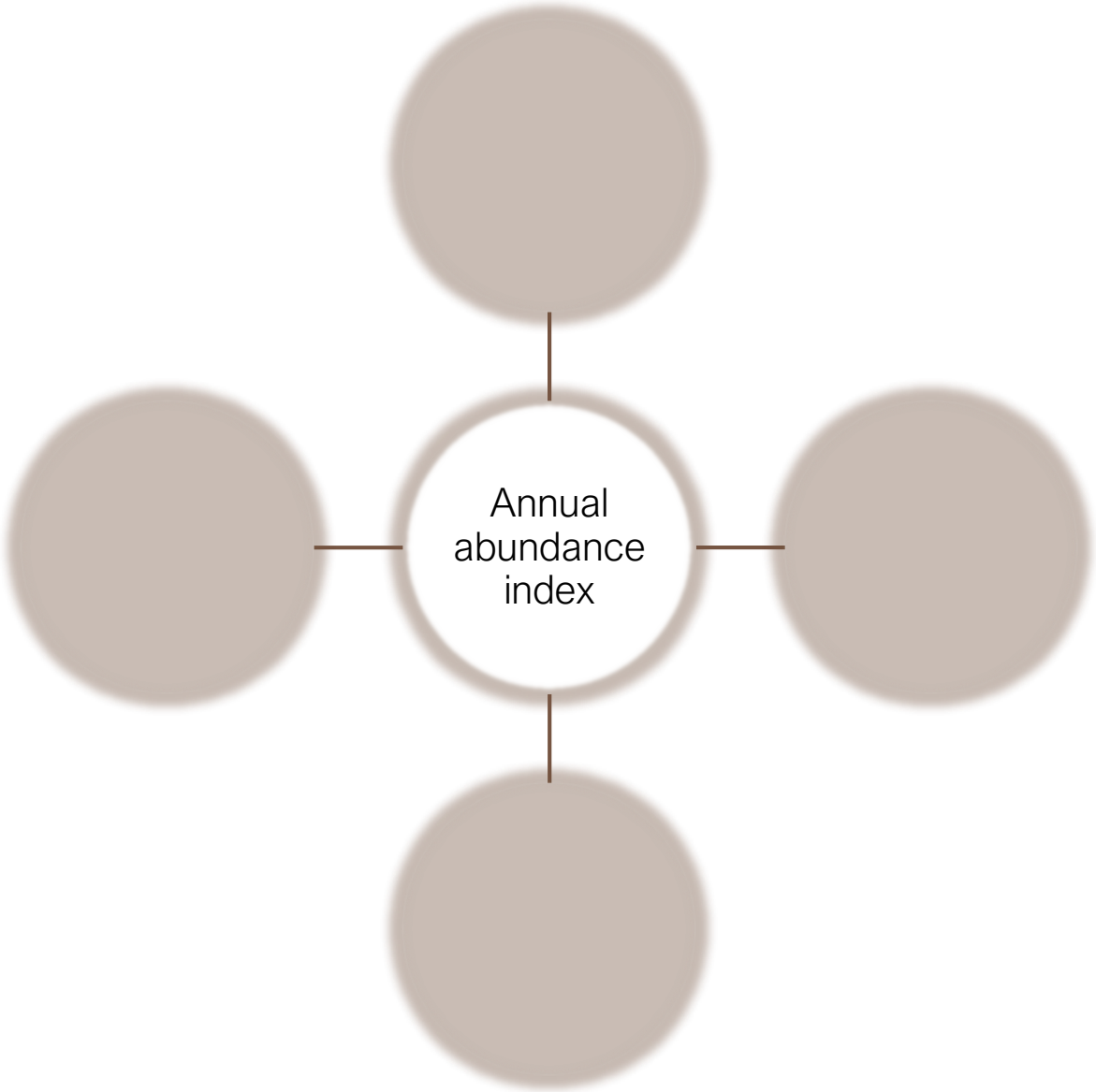
Species Monitoring

The objective



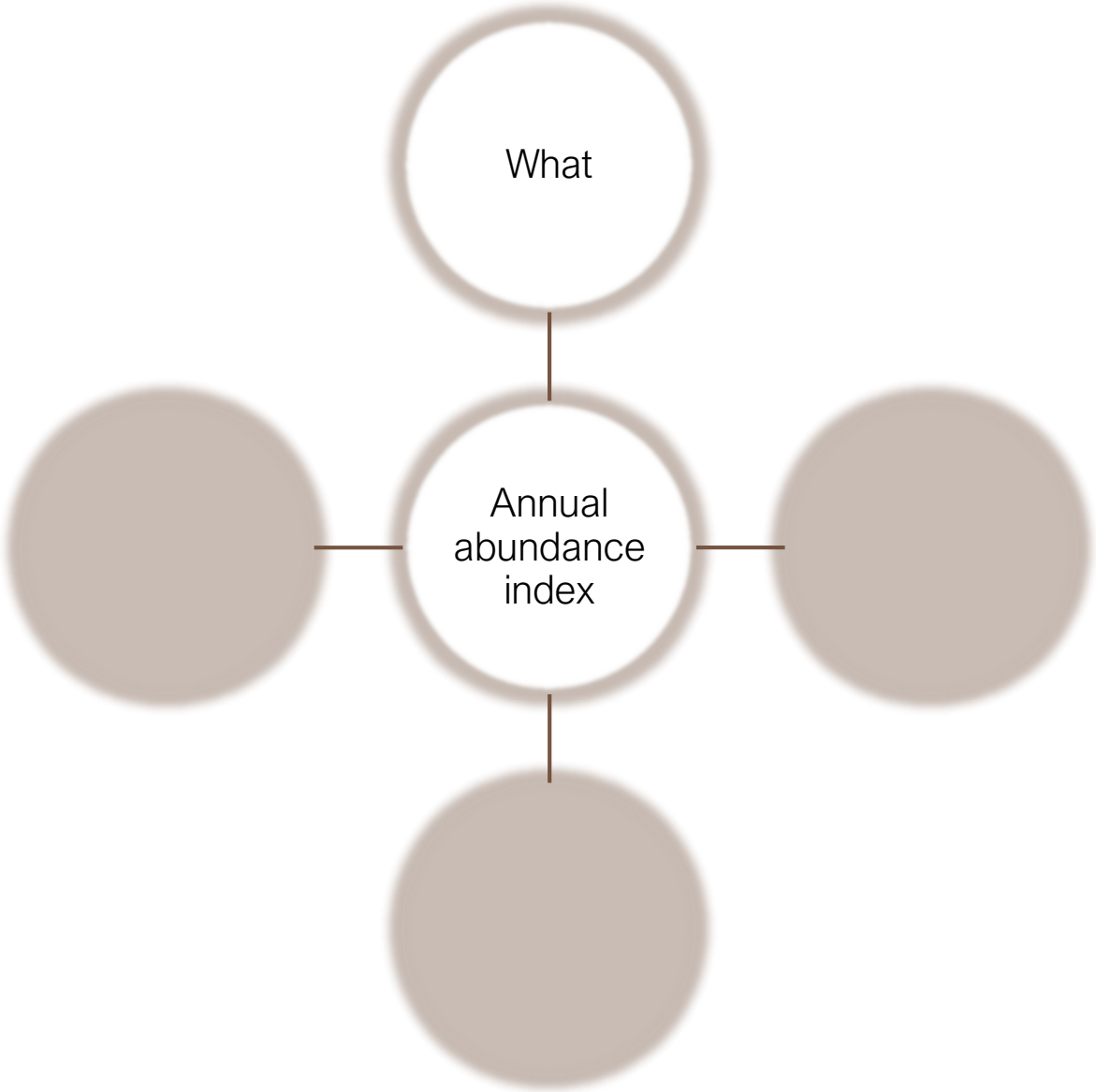
Species Monitoring

The objective



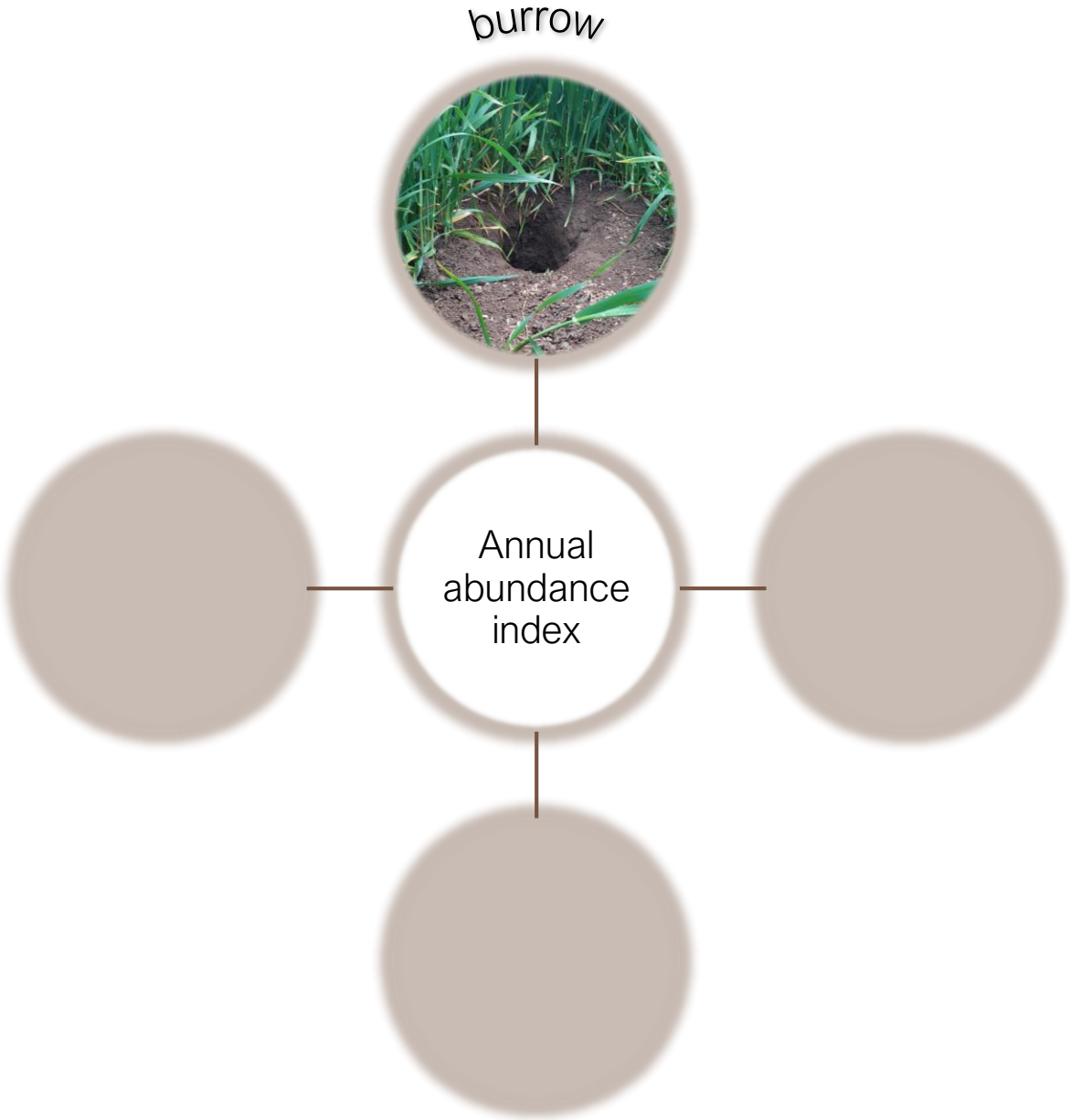
Species Monitoring

The protocol



Species Monitoring

The protocol



Species Monitoring

The protocol

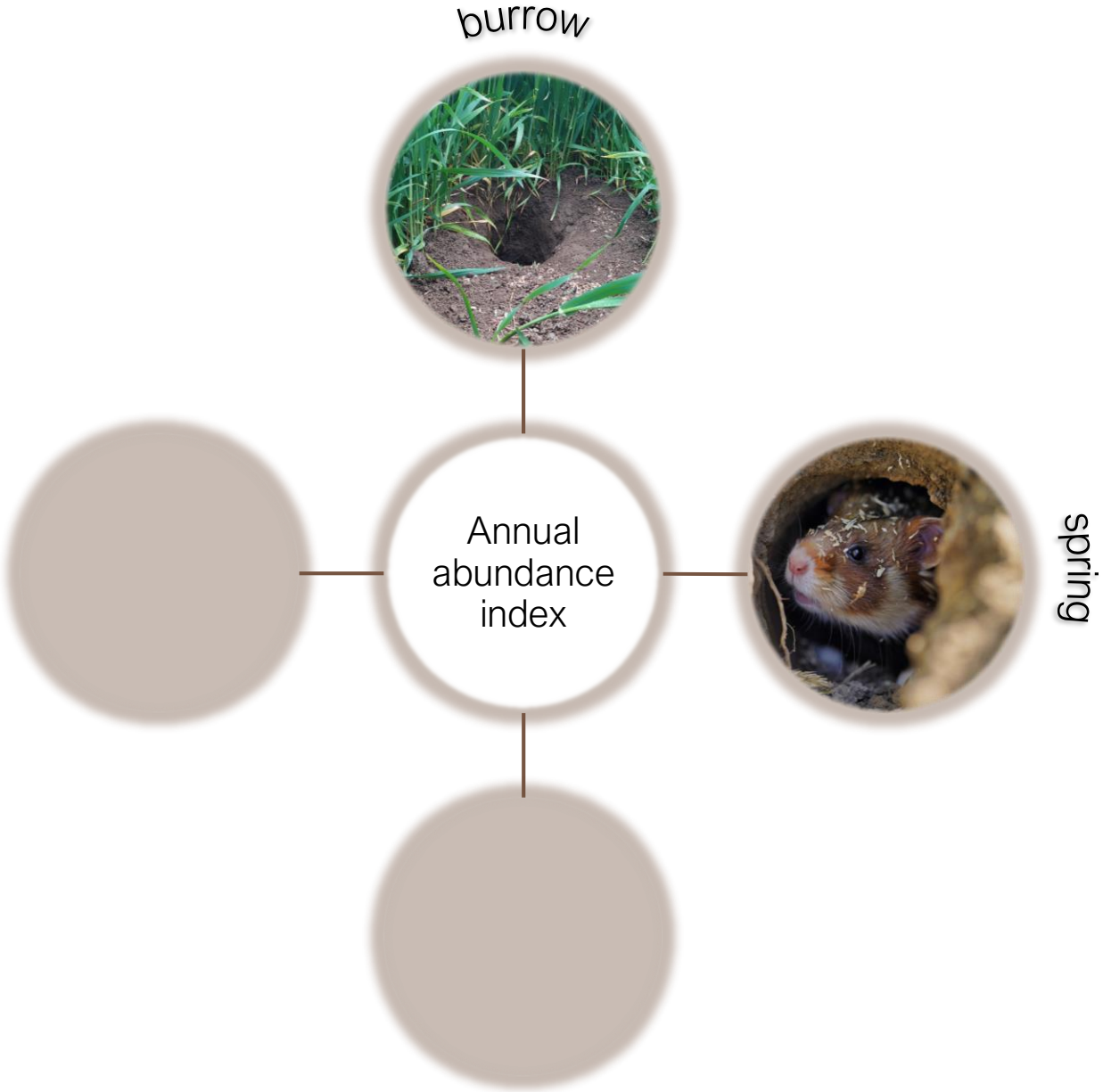
burrow

Annual abundance index

When

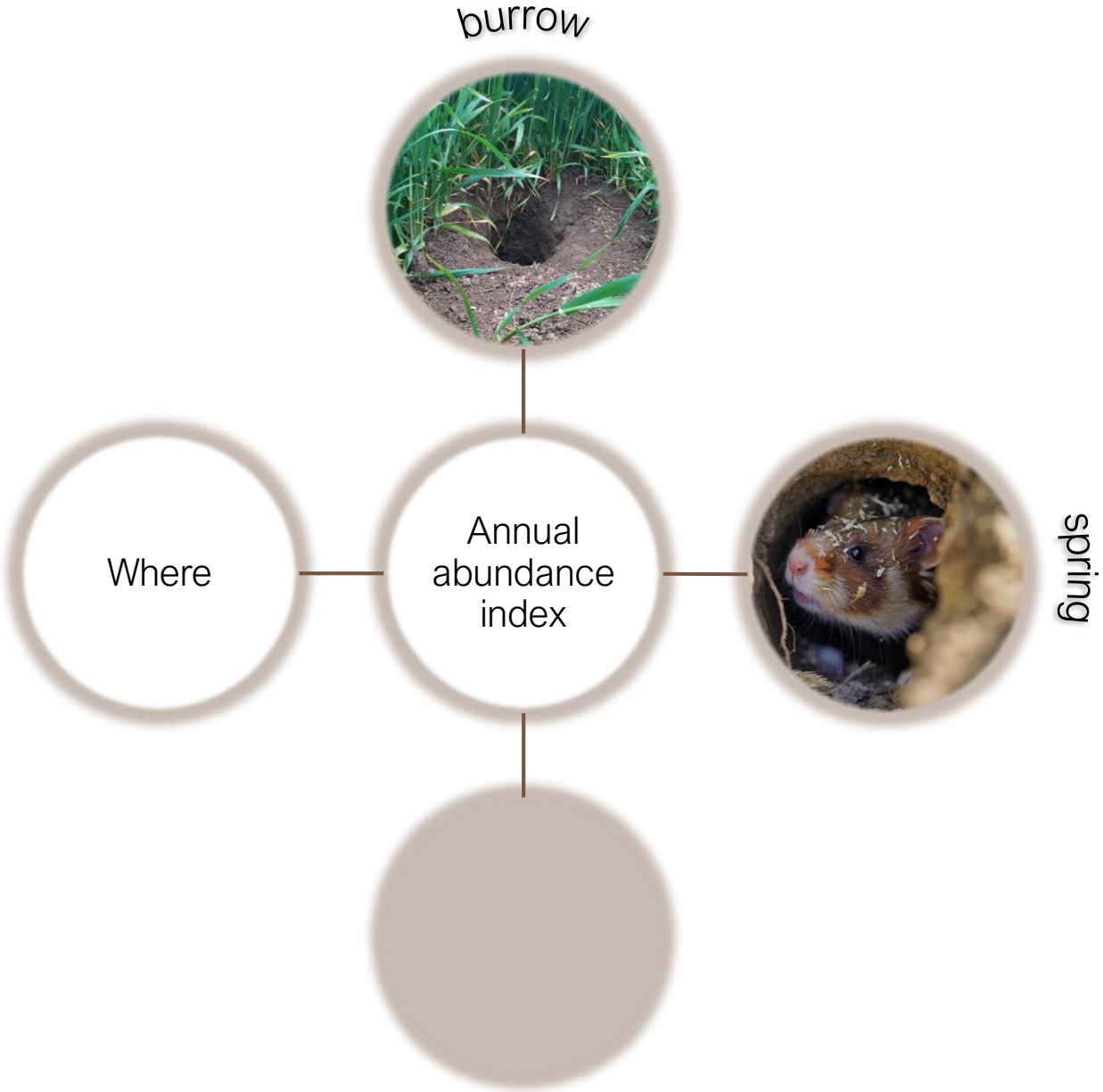
Species Monitoring

The protocol



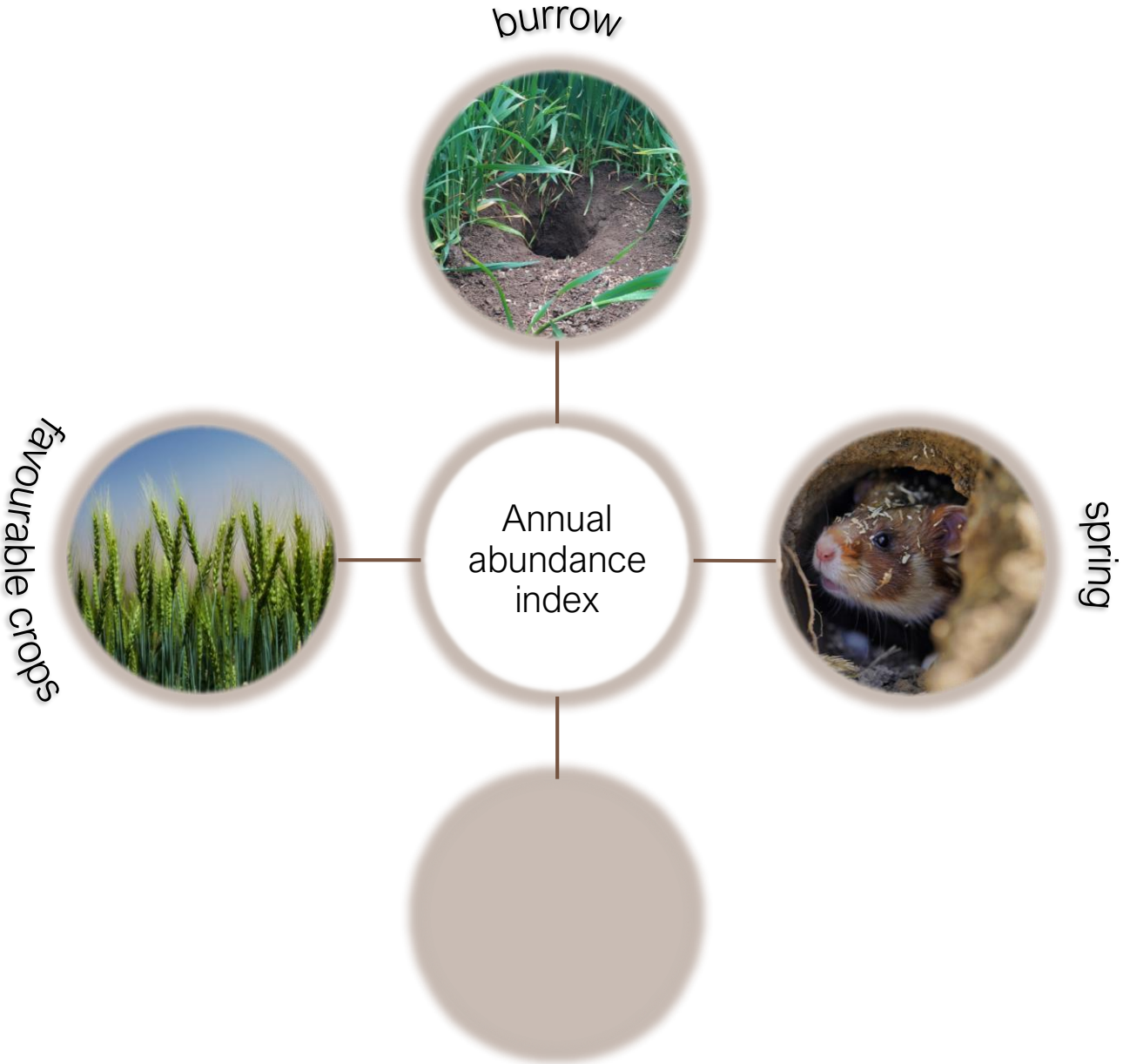
Species Monitoring

The protocol



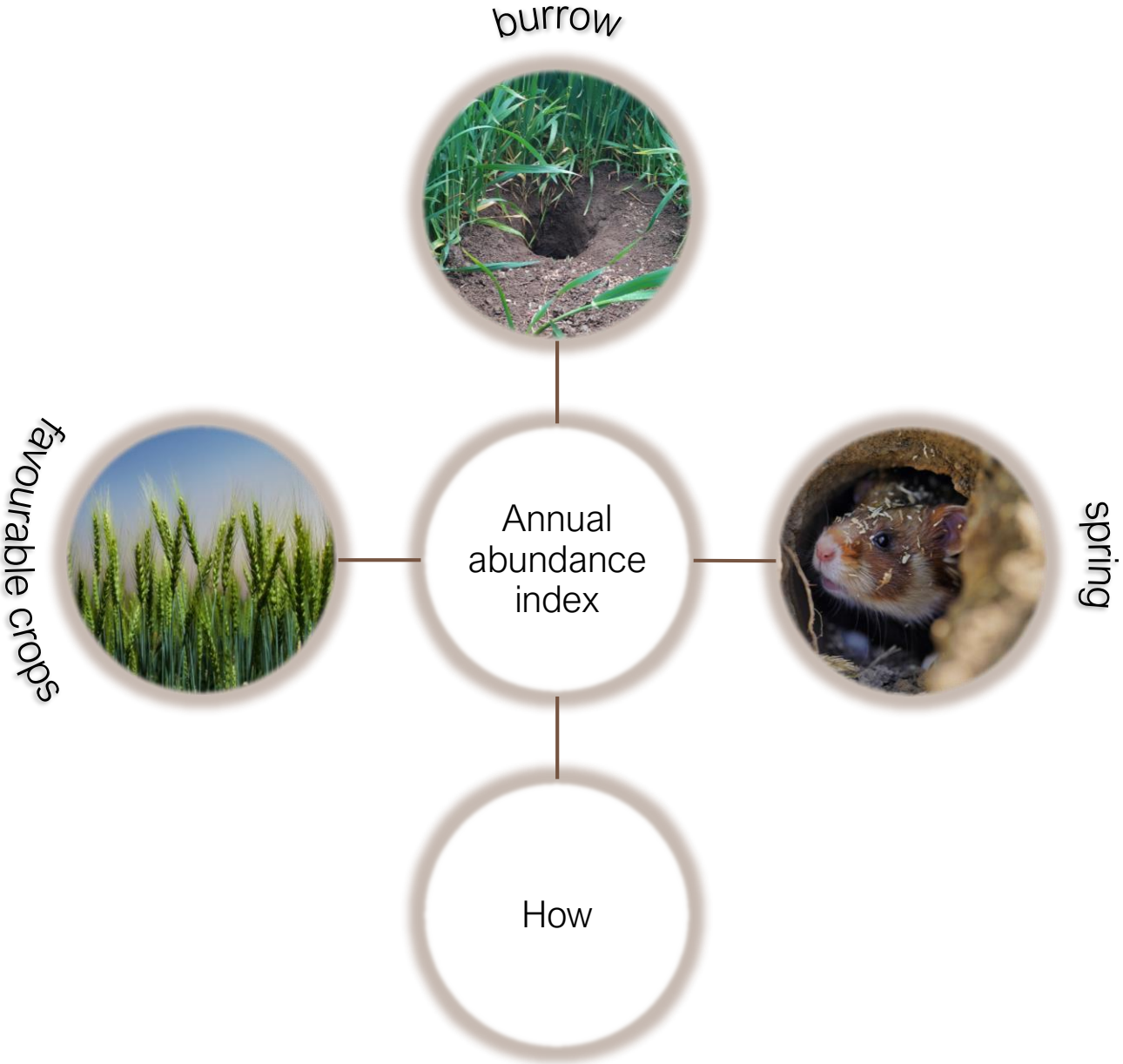
Species Monitoring

The protocol



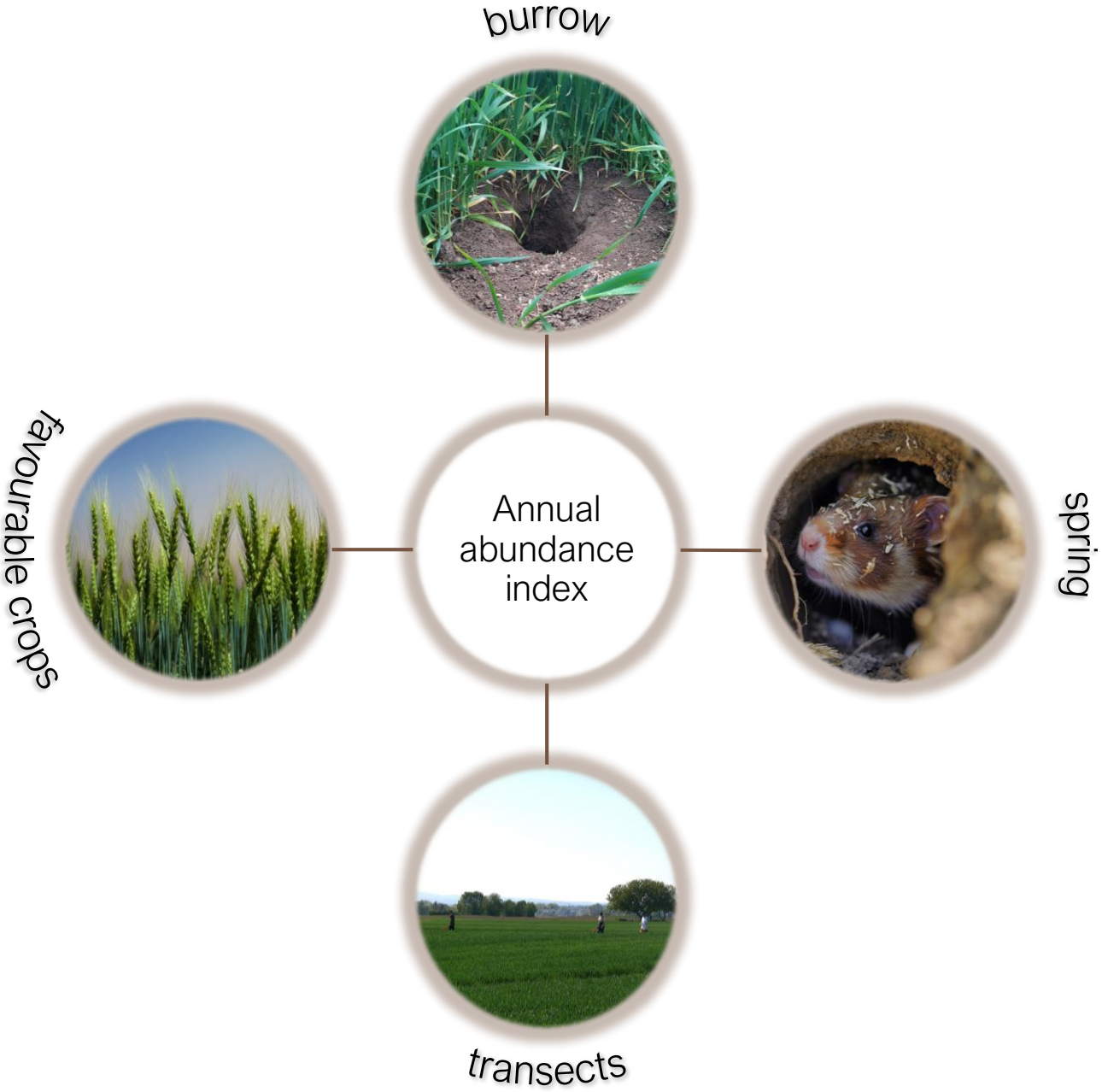
Species Monitoring

The protocol



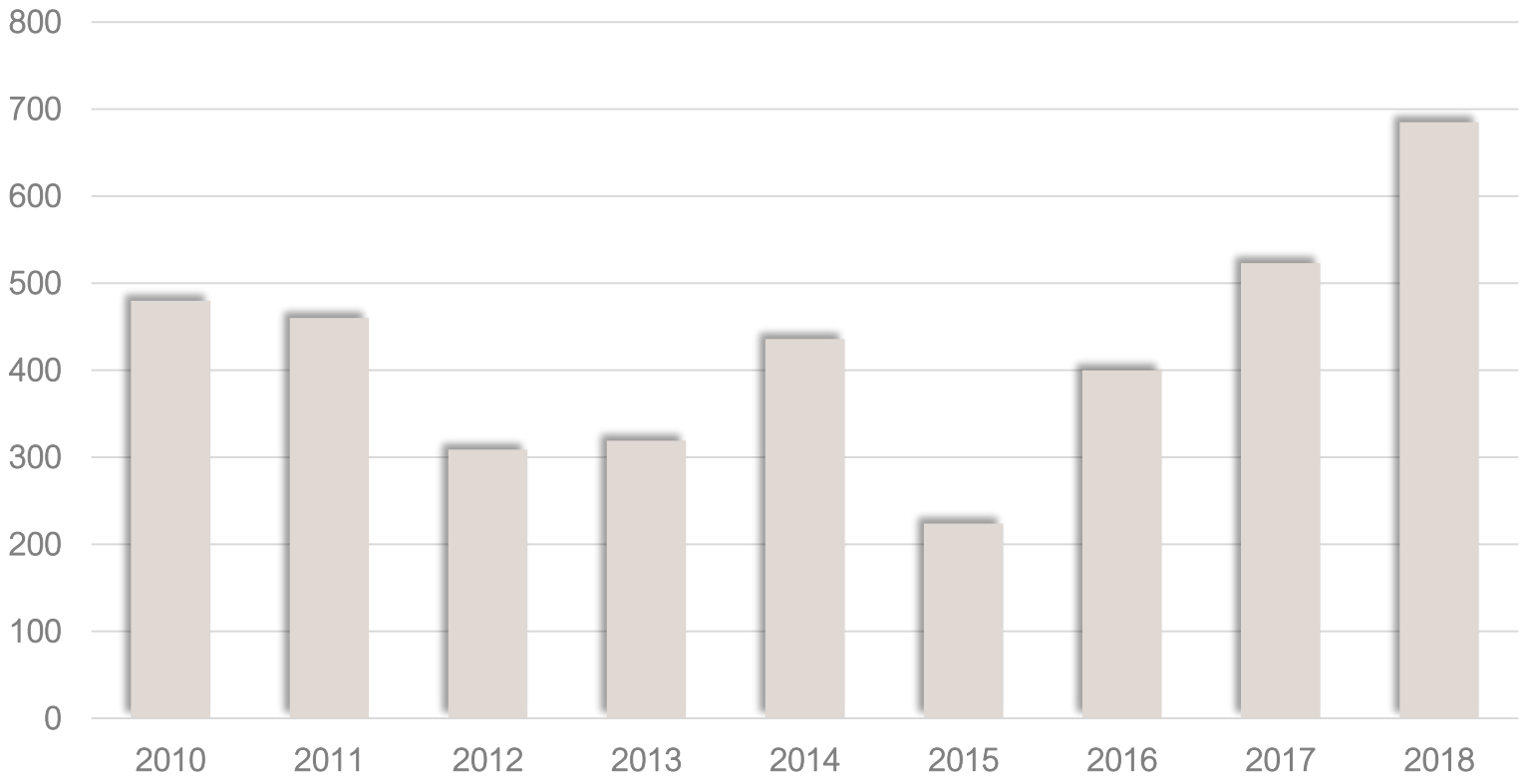
Species Monitoring

The protocol



Species Monitoring

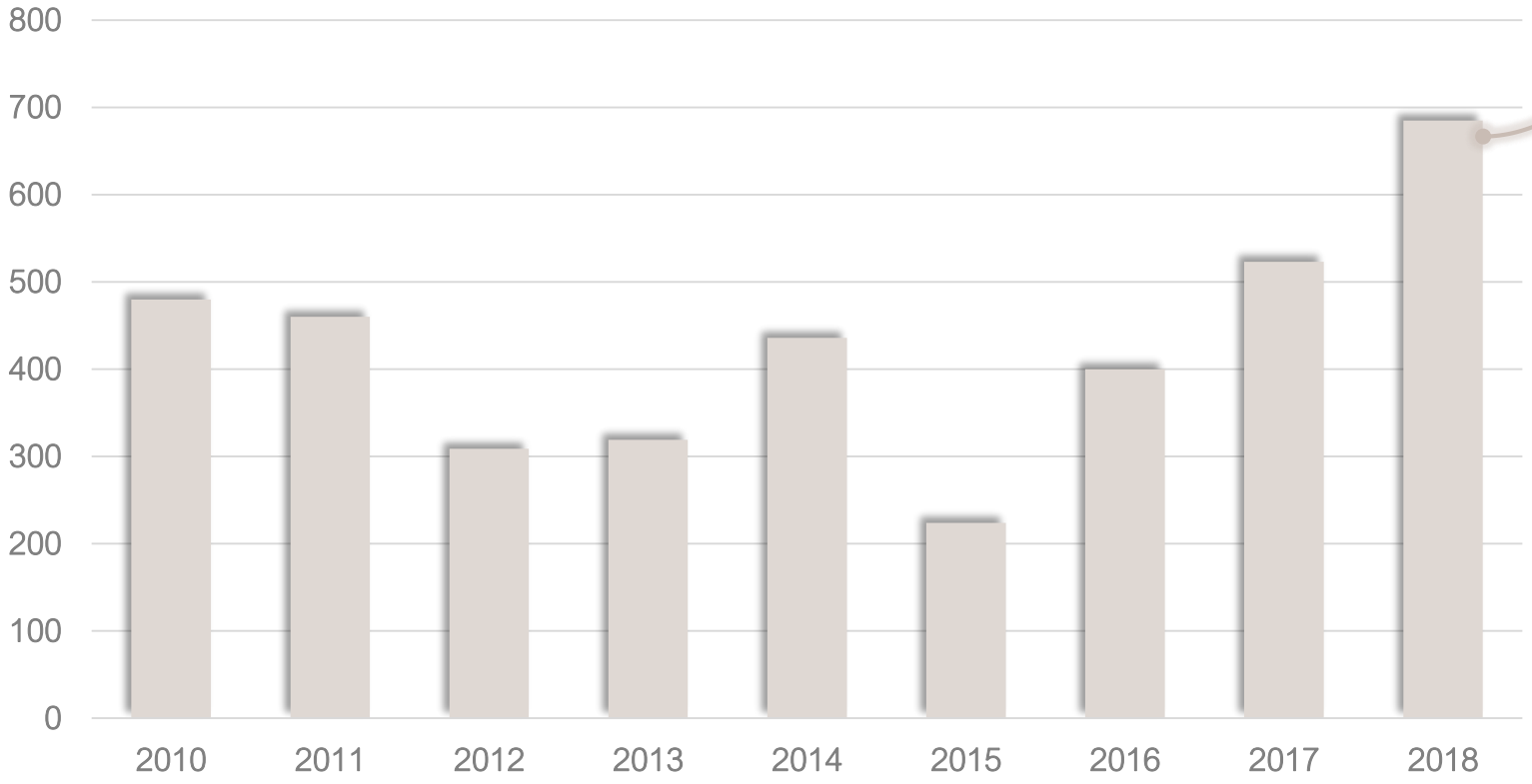
The results



Number of burrows found during the spring census by the OFB

Species Monitoring

The results



Number of burrows found during the spring census by the OFB

No measure of uncertainty

+

The surveyed plots change every year

+

What was favourable in 2000 may have changed

=

Difficult to interpret the annual variations

Species Monitoring

The protocol flaws

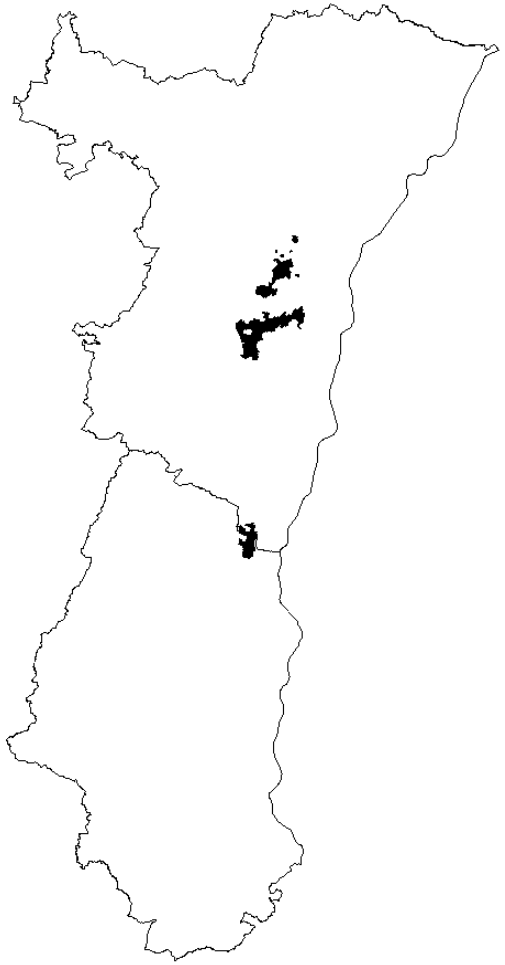
Surveys are only in the protected areas

+

Protection depends on the burrow locations

=

Hamster return difficult outside the protected area



No measure of uncertainty

+

The surveyed plots change every year

+

What was favourable in 2000 may have changed

=

Difficult to interpret the annual variations

Species Monitoring

The protocol flaws

Surveys are only in the protected areas

+

Protection depends on the burrow locations

=

Hamster return difficult outside the protected area

Annual abundance index

favourable crops

- *Expand the surveyed area*
- *Update the suitable habitat definition*

transects

>1 visit per plot

No measure of uncertainty

+

The surveyed plots change every year

+

What was favourable in 2000 may have changed

=

Difficult to interpret the annual variations

Species Monitoring

The protocol flaws

Surveys are only in the protected areas

\+

Protection depends on the burrow locations

=

Hamster return difficult outside the protected area

Annual abundance index

favourable crops

transects

- *Expand the surveyed area*
- *Update the suitable habitat definition*

Species Distribution Modelling

No measure of uncertainty

+

The surveyed plots change every year

+

What was favourable in 2000 may have changed

=

Difficult to interpret the annual variations

Part III

Distribution Modelling

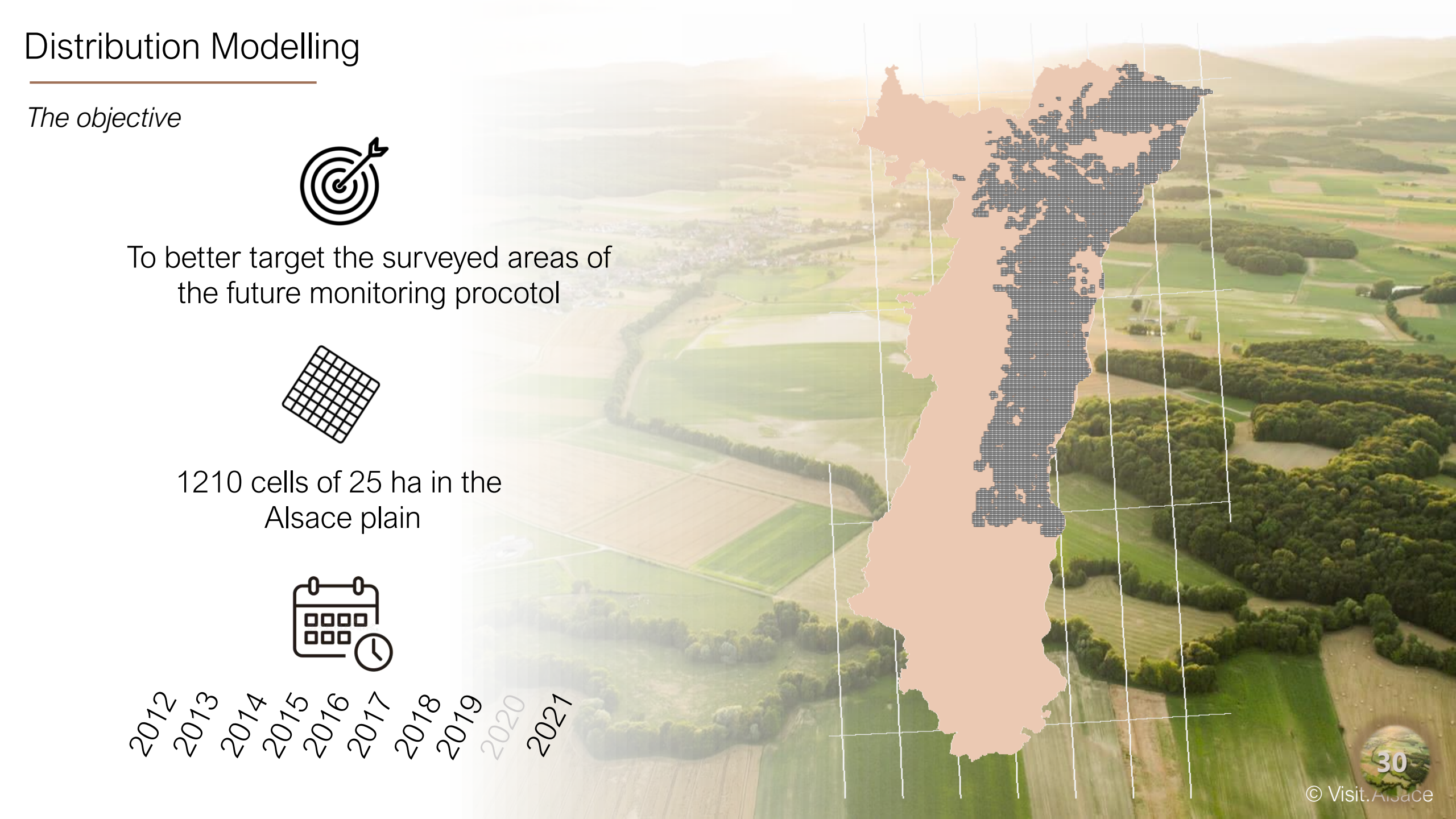
Distribution Modelling

The objective

To better target the surveyed areas of the future monitoring procotol

1210 cells of 25 ha in the Alsace plain

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021



Distribution Modelling

The methodological challenges

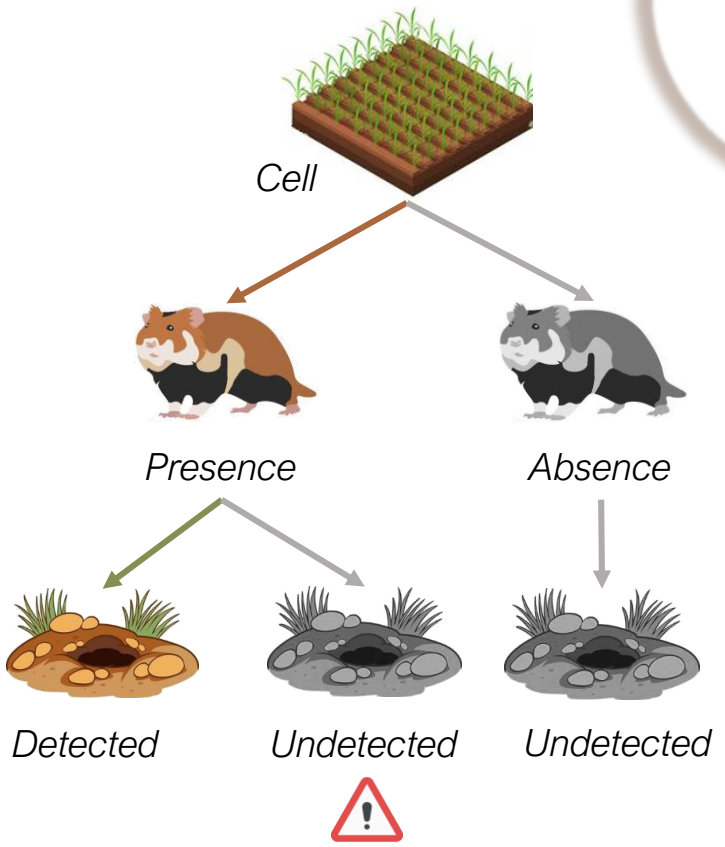
Species Distribution Modelling

Distribution Modelling

The methodological challenges

Species Distribution Modelling

Imperfect detection



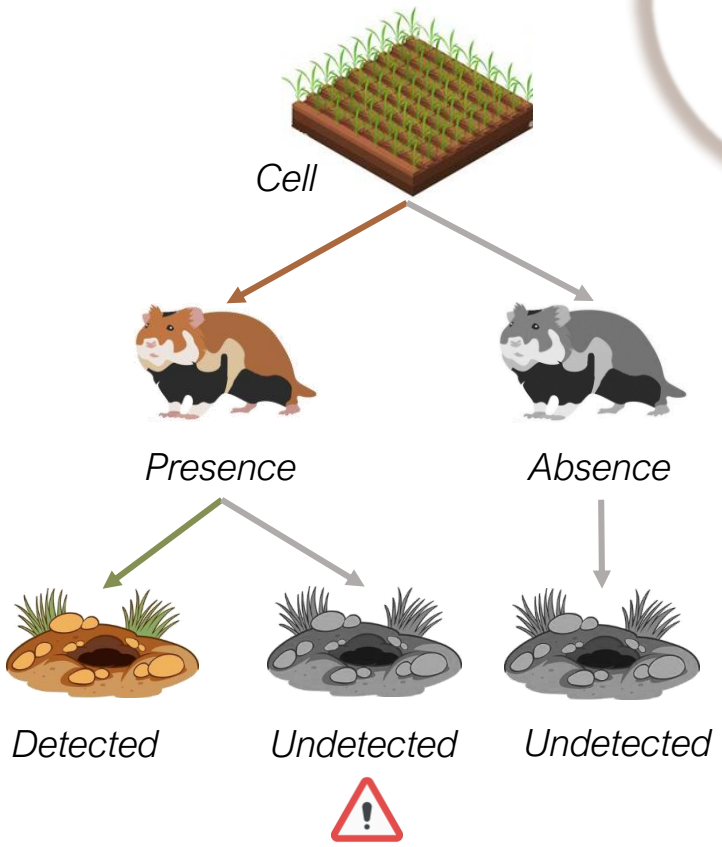
Distribution Modelling

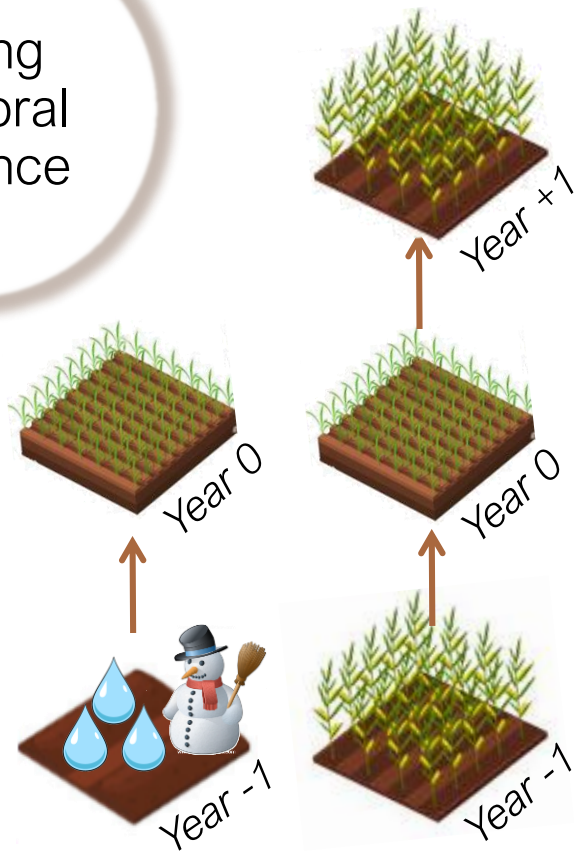
The methodological challenges

Species Distribution Modelling

Imperfect detection

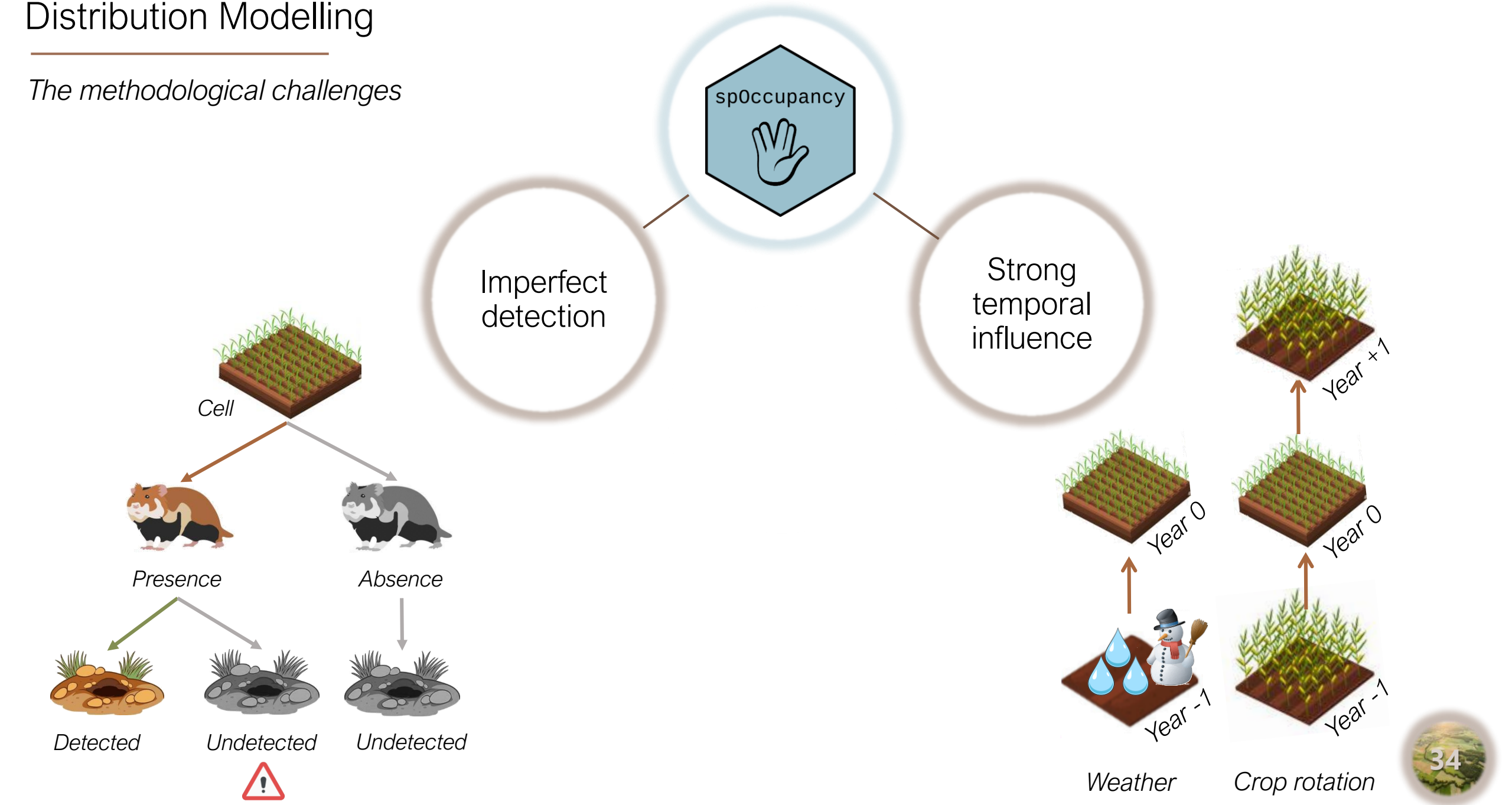
Strong temporal influence





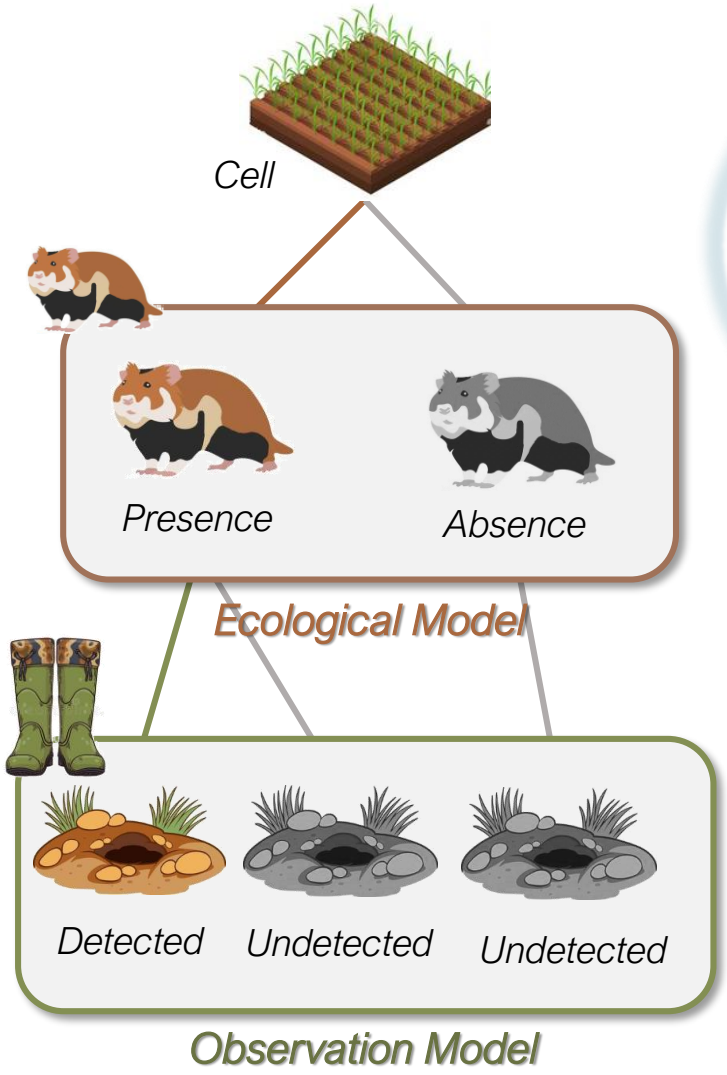
Distribution Modelling

The methodological challenges



Distribution Modelling

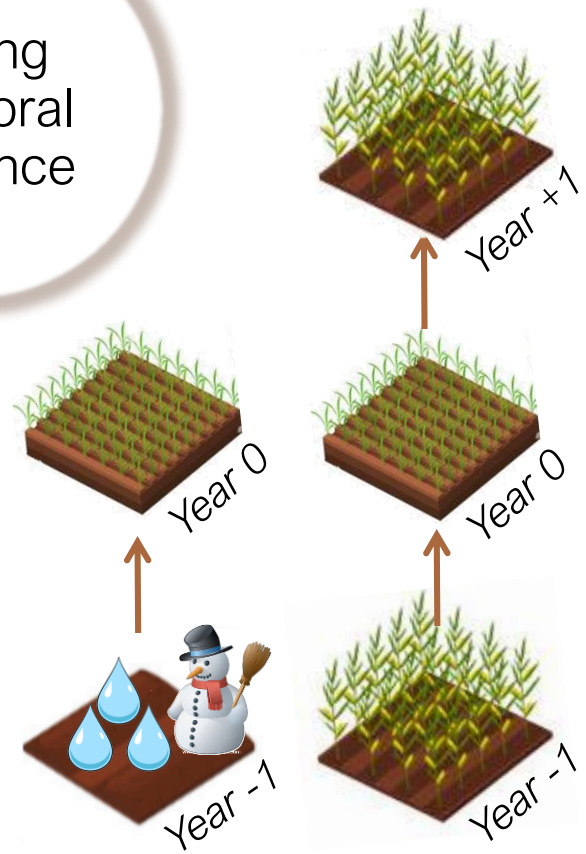
The methodological challenges



sp0ccupancy

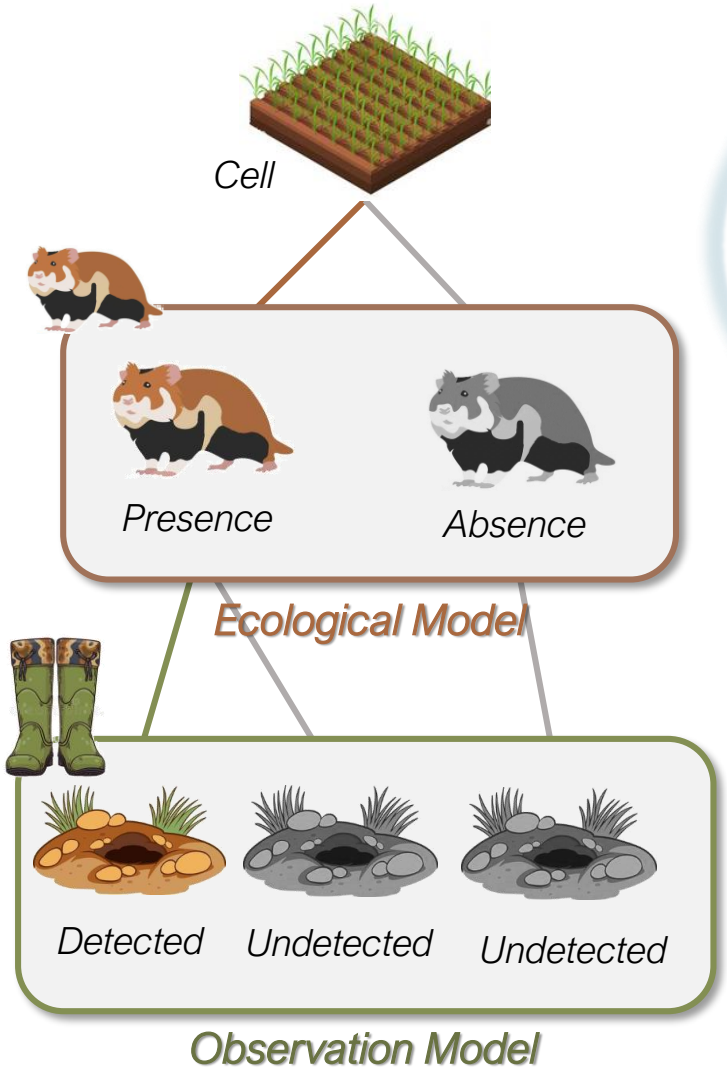
Accounted imperfect detection

Strong temporal influence



Distribution Modelling

The methodological challenges



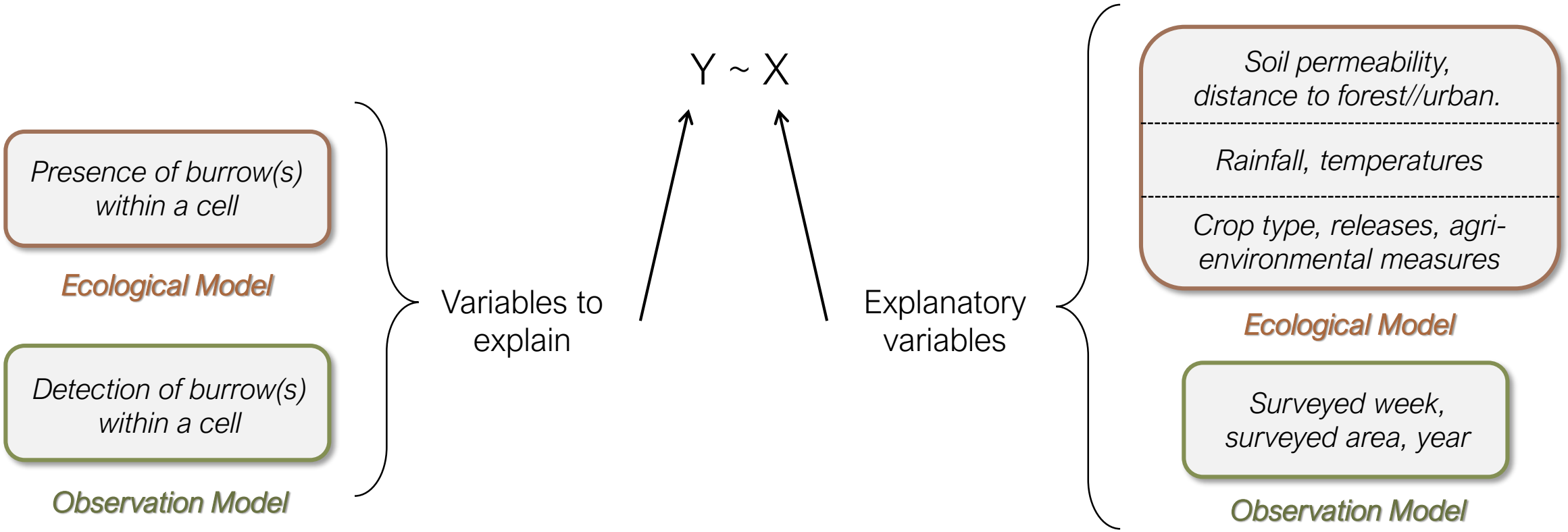
sp0ccupancy

Accounted imperfect detection

Multi-Season Model

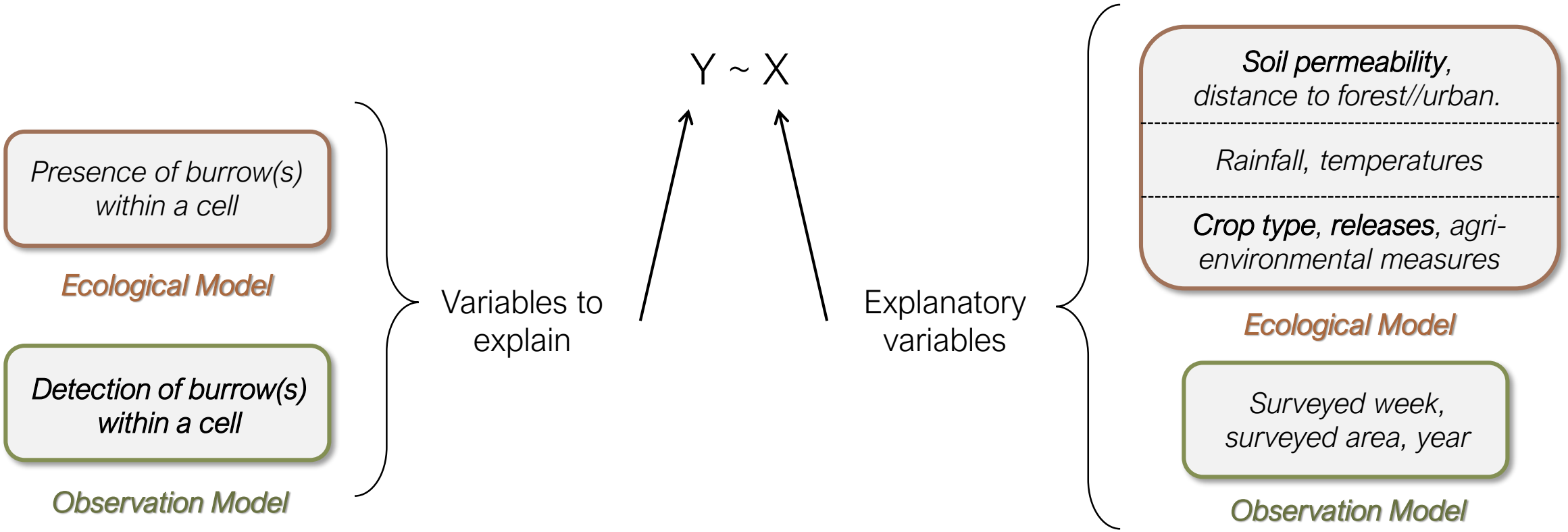
Distribution Modelling

Multi-season spatial occupancy model



Distribution Modelling

Multi-season spatial occupancy model



Distribution Modelling

Variable to explain (observation model)

Burrow detection

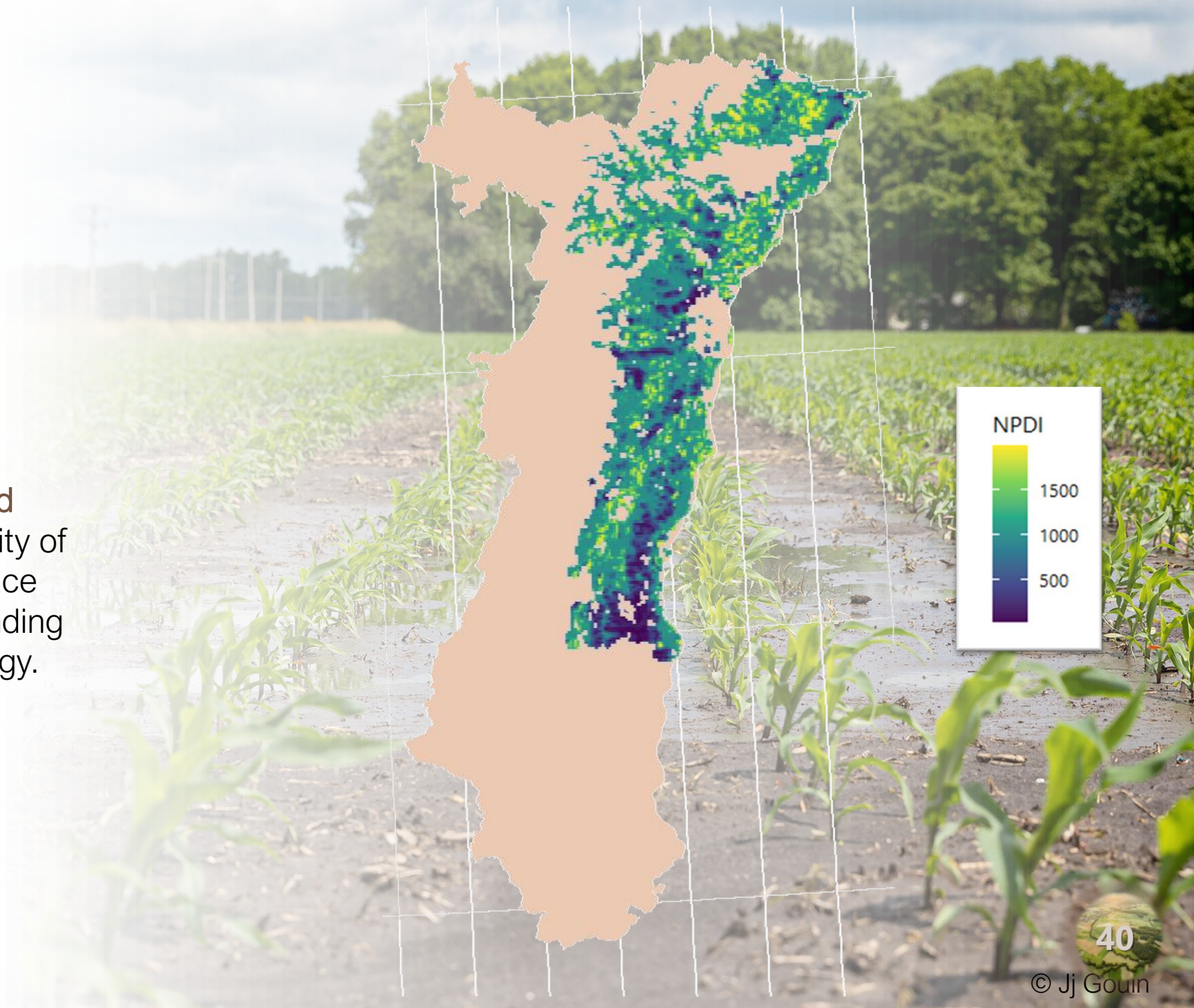
From burrow spring censuses only, with known survey locations.

Distribution Modelling

Explanatory variable (ecological model)

NDPI

The Network Development and Persistence Index reflects the ability of subsoil formations to allow surface water to run off or infiltrate, depending on the water systems and geology.



Distribution Modelling

Explanatory variable (ecological model)

Spring TCA of standing crops

The Total Core Area of the standing (*i.e.* unharvested) crops at the end of winter per cell is calculated with the yearly data registered in the context of the European Common Agricultural Policy (CAP).

Distribution Modelling

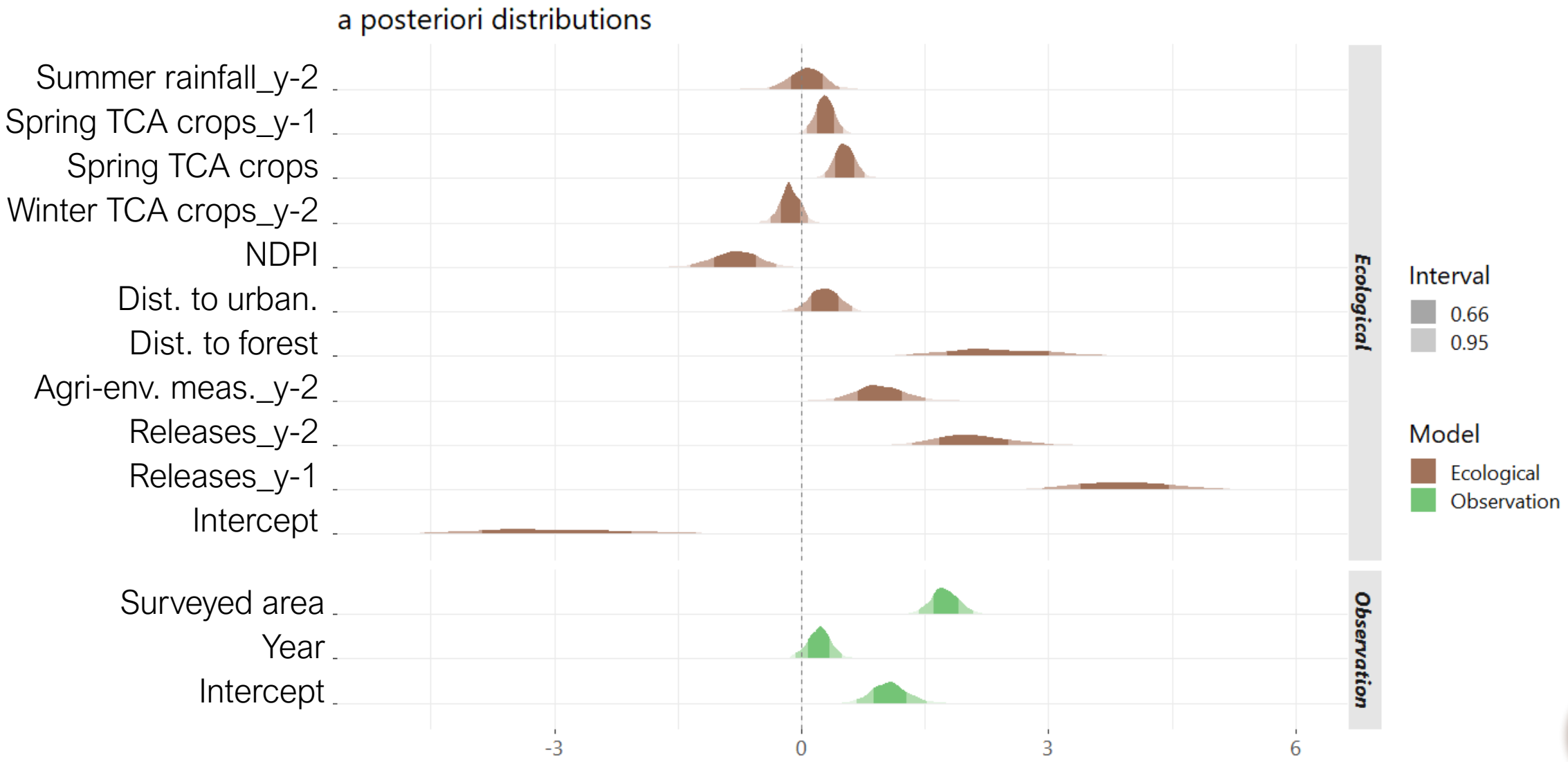
Explanatory variable (ecological model)

Releases

Releases of captive-born individuals take place every year in the protected areas and where the population seems to be declining. The releases take place in June on unharvested "favourable crop" plots.

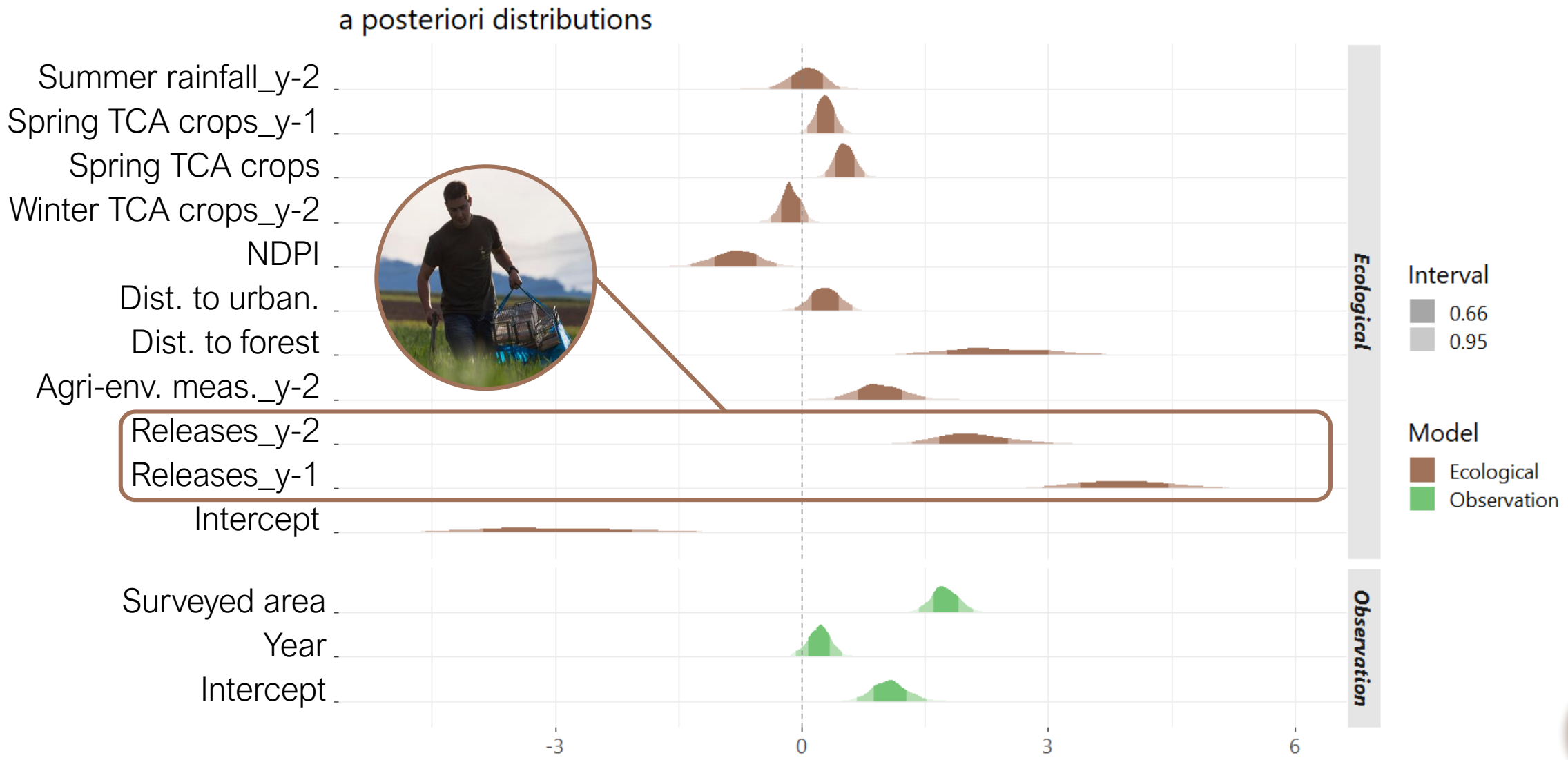
Distribution Modelling

First results



Distribution Modelling

First results



Distribution Modelling

First results

a posteriori distributions

Summer rainfall_y-2
Spring TCA crops_y-1
Spring TCA crops
Winter TCA crops_y-2
NDPI
Dist. to urban.
Dist. to forest
Agri-env. meas._y-2
Releases_y-2
Releases_y-1
Intercept

Surveyed area
Year
Intercept

-3
0
3
6

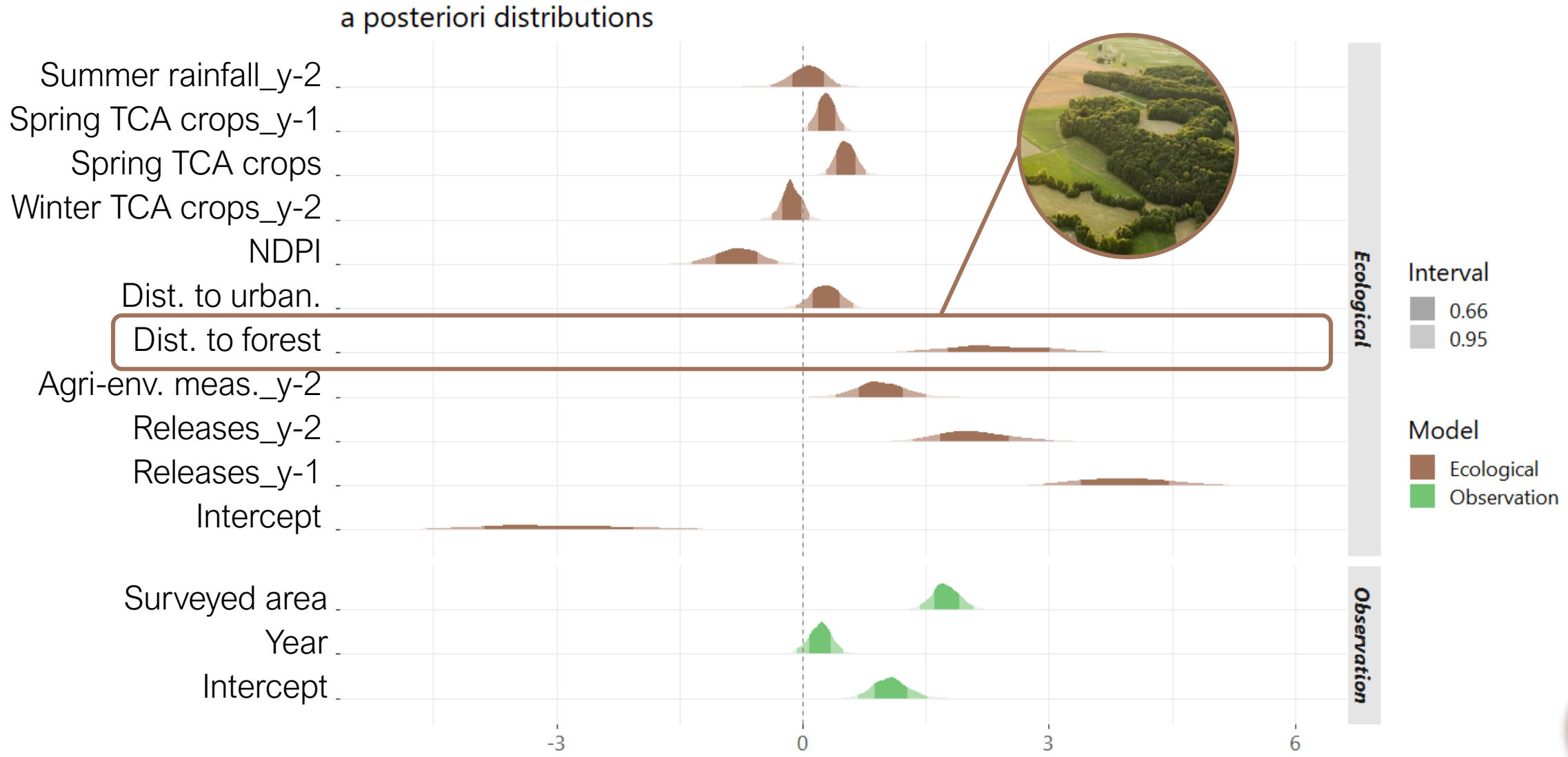
Ecological
Observation

Interval
0.66
0.95

Model
Ecological
Observation

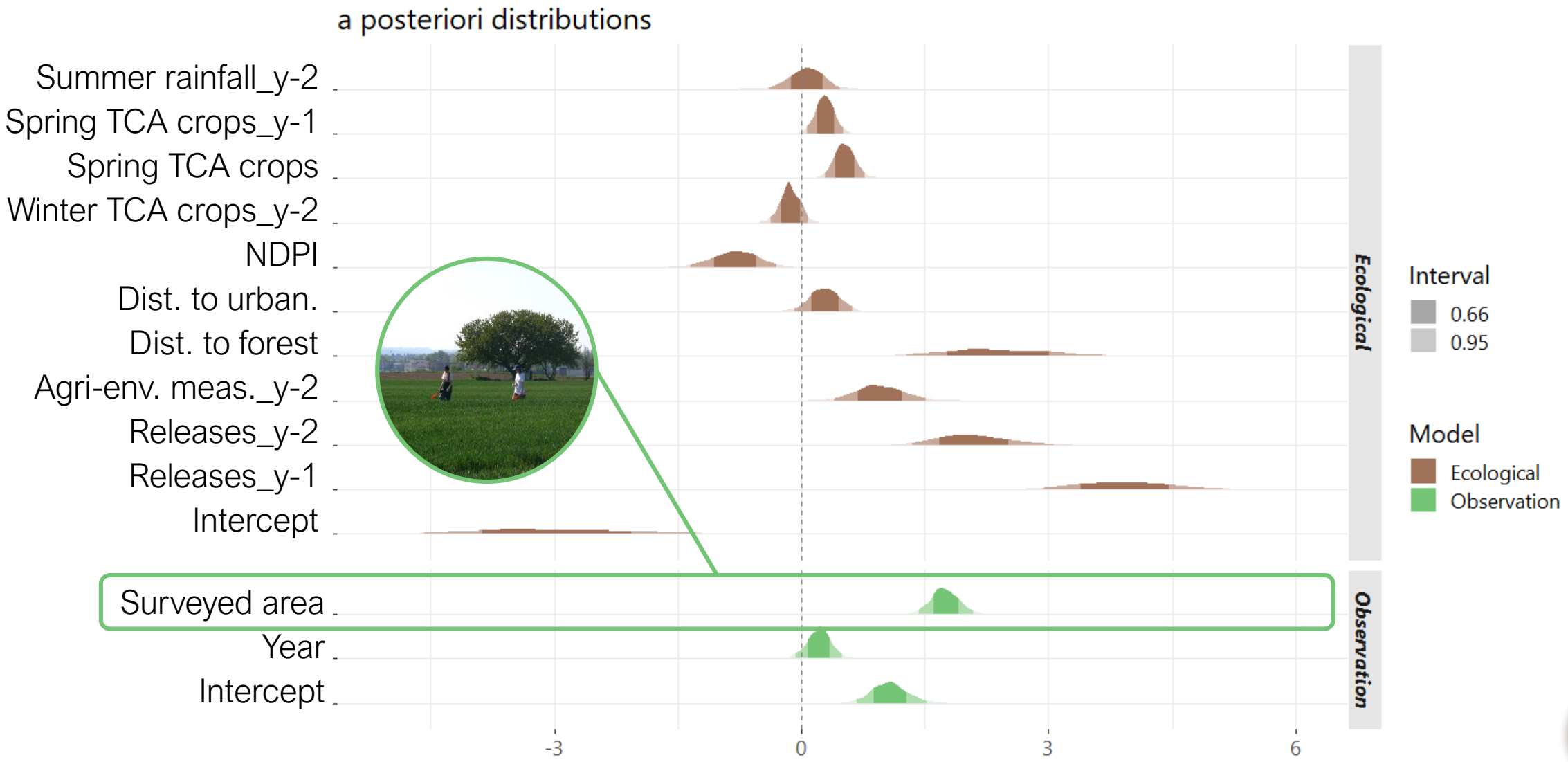
Distribution Modelling

First results



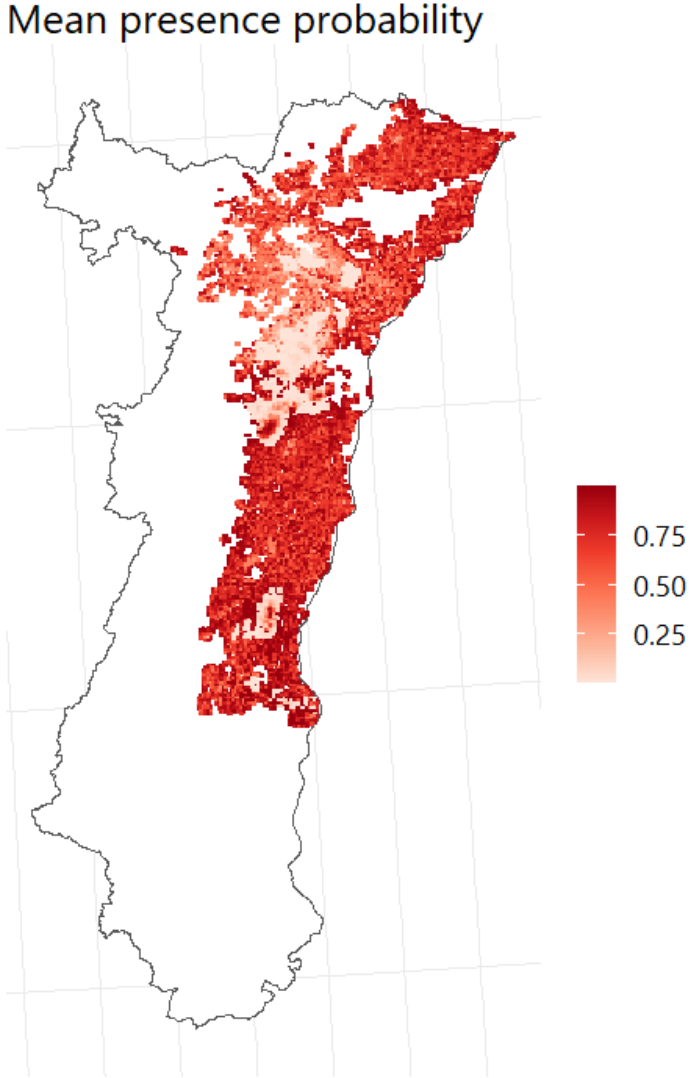
Distribution Modelling

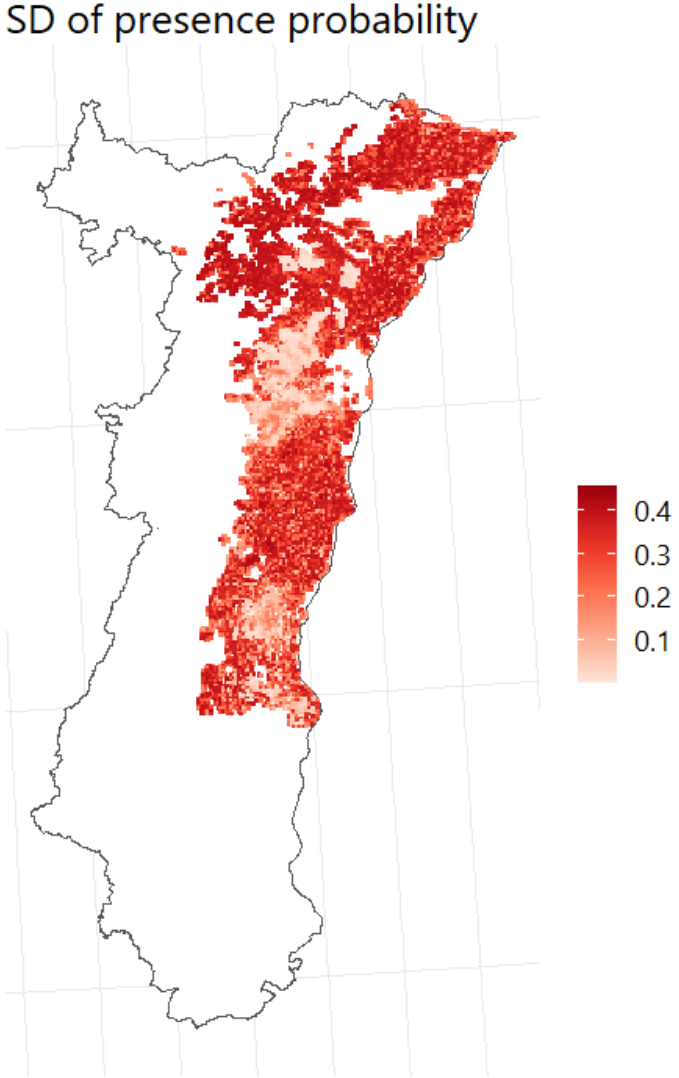
First results



Distribution Modelling

First results





The key messages

1. The current monitoring protocol in Alsace complicates the comparison of inter-annual variations in the number of burrows and may provide biased population size estimates.

2. Estimating the distribution could help to
   a. Better understand the effects of landscape variables on the presence of the species in Alsace,
   b. Better define the survey plots of the future monitoring protocol.

3. The use of the monitoring dataset for distribution modelling involved several methodological challenges.

4. The work is still ongoing!

Thank you for your attention!