Breeding success of birds exposed to treated seed PS2373

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[1] Cambridge Environmental Assessments

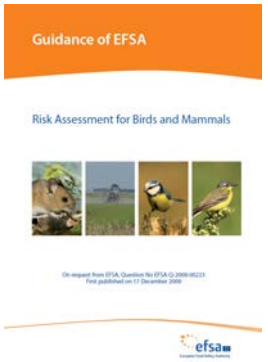
[2]Independent

Background

- Environmental risk assessments for Plant Protection Products. Seed treatments.
- Avian risk assessment – 'long term'
  - Compare exposure estimate to no effect concentration from 21 wk repro study
- Protection goal
  - "..*no long tem repercussions for abundance and biodiversity*".
  - Reproduction, population (EFSA GD B&M; EFSA Protection Goals Scientific Opinion)

Seed treatment risk assessment

- Such assessments often indicate potential for concern
  - At low tiers
  - And after refinement (e.g. residues, diet)
- Assumes
  - One field basis
  - Exposure during sensitive life stage, i.e. breeding coincides with drilling (varies with MS)
- So, are seed treatments a real problem?



Previous work

- ERAR 2012 project presentation
  - Aim to put risk assessment into ecological context
  - Toxicity Exposure Ratio (TER) ~4 (less than trigger for safety, 5)
  - Timing of drilling & breeding, land cover
  - Q. To what proportion of breeding activity might TER apply? A. ~2% (worst-case)..
- Question – *what does this mean for risk assessment?*
- Current project aims to investigate effects on breeding success, and discuss use in risk assessment…

Objectives

1. a. Develop population growth rate estimates for Skylark potentially exposed to treated seed.

   b. Develop population growth rate estimates for Rook potentially exposed to treated seed.
2. Screen Linnet and Yellowhammer for likelihood of exposure during breeding for key spring crops, for which data of sufficient resolution exist.
3. Explore the mechanisms by which land cover can be used to estimate exposure of bird populations to treated seed.
4. Notify industry & MS.
5. Discuss the potential use of population growth rate (PGR) in regulatory risk assessments.

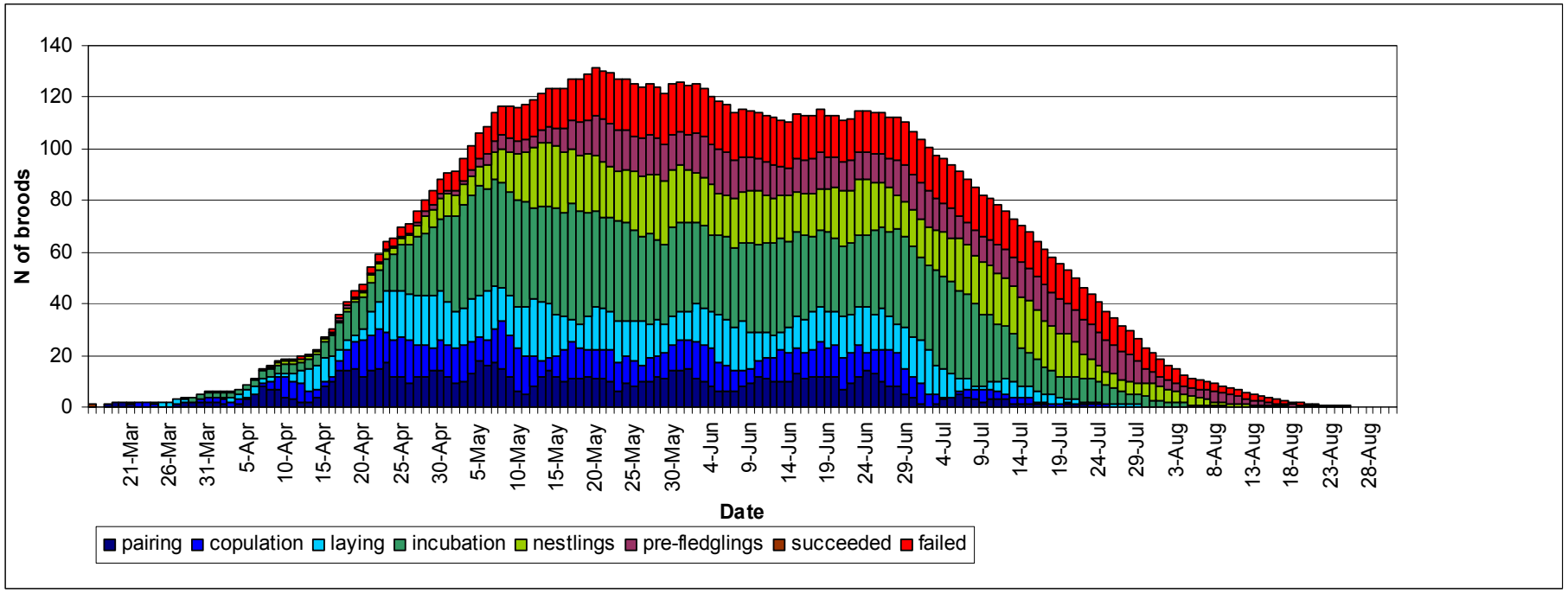
Objective 1
PGR estimates

- Builds on previous work by Joe Crocker
  - PS2346, for insecticide sprays
- 2 approaches were developed:
- 1. 'Empirical' model
  - How many broods are around at a particular application date? *Broods at risk*
  - Information on toxicity profile of pesticide (breeding phase affected)
  - Number of broods at that stage when pesticide applied

Empirical model
Skylark breeding data

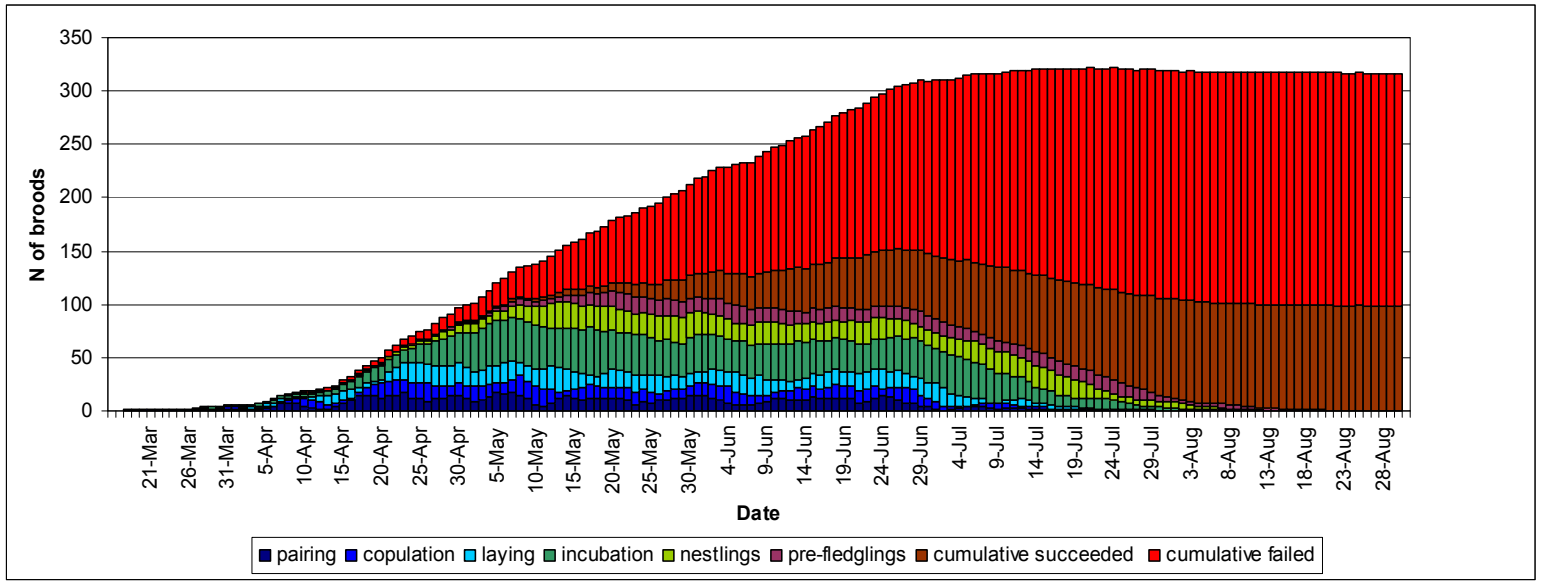
British Trust for Ornithology nest record scheme data. First egg dates – extrapolate forward to subsequent eggs in that clutch, and backwards to pre-egg laying activities, such as pair bonding and nest site selection.

Number of broods at any given breeding phase on any date – no pesticide



Empirical model
Skylark breeding data

Cumulative data, shows successes and failures – no pesticide



Empirical model Example

Cumulative data, shows successes and failures – pesticide sprayed 20th April

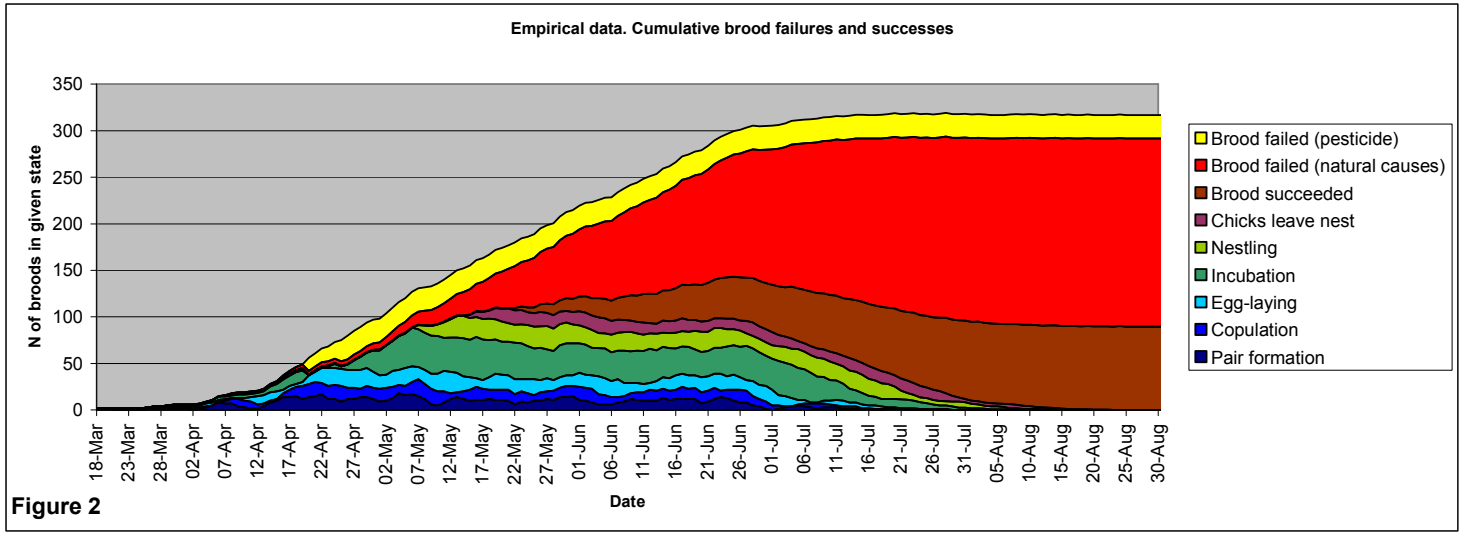


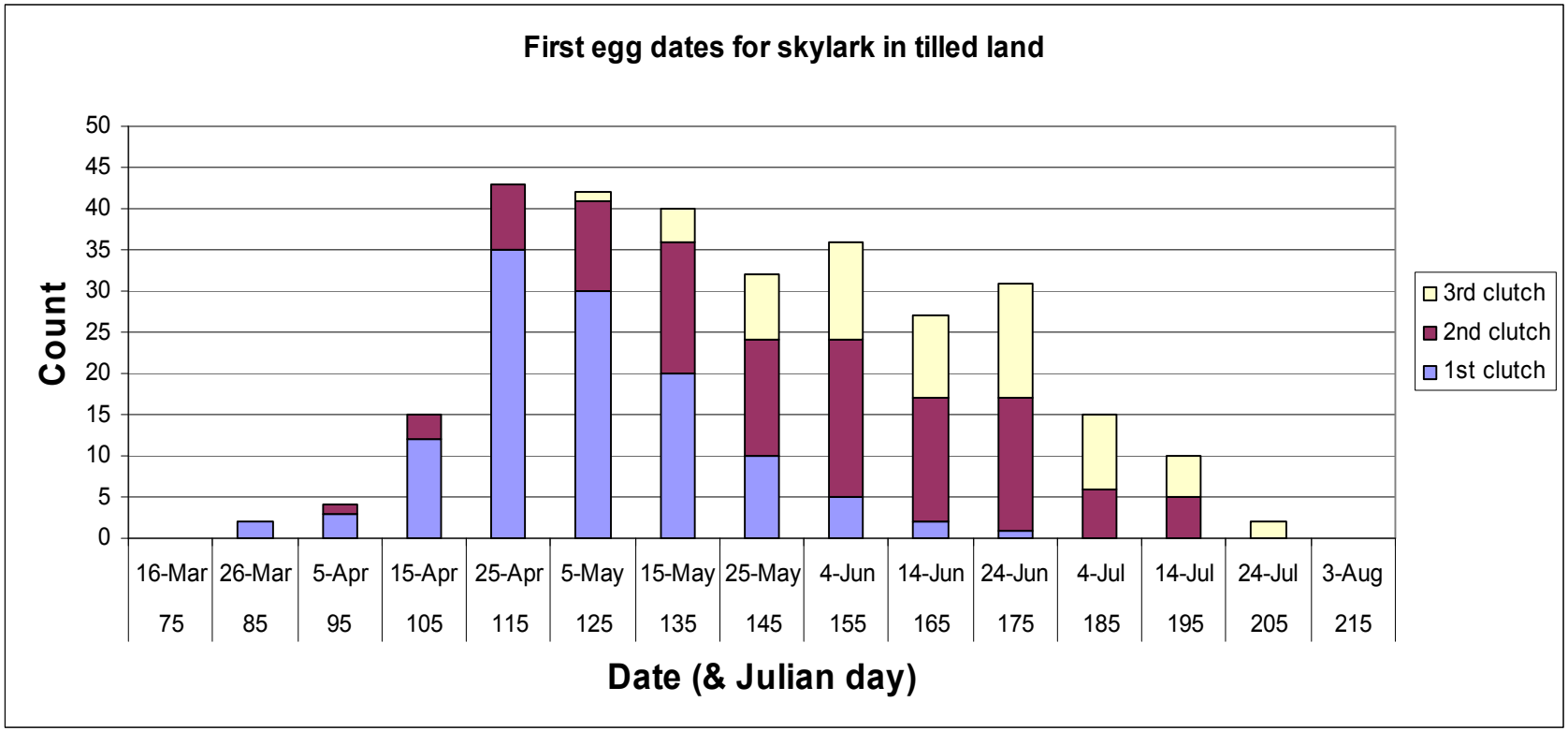
Figure 2

Objective 1
PGR estimates

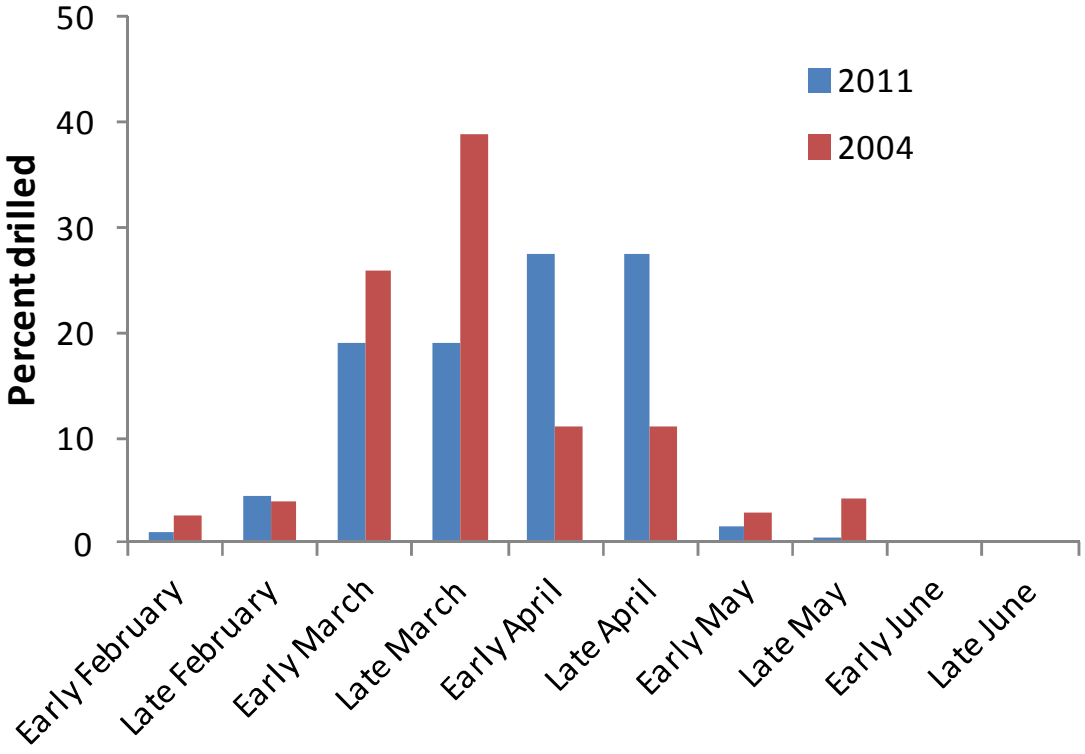
- Second model, ‘First clutch’. More advanced.
- A theoretical population of birds is developed
  - Of BTO first egg dates, which represent 1st *clutches*?
  - E.g. Skylark has more than 1 clutch/year
  - Allows multiple broods to be included, potential to recover lost breeding effort
  - Allows estimate of *N* new adults raised per pair, & hence estimate population growth rate

First clutch model
Breeding data

First egg dates for Skylark, from 3 clutches. Those first eggs which could have been from 1st, 2nd & 3rd clutches, based on knowledge of breeding phases. Actual field records do not distinguish clutches.



Drilling data



Spring barley:
Inter-year variation

Pesticide Usage Survey, (FERA)
ADAS agronomist survey
Last ~10 years, key spring crops

Objective 1
PGR estimates

- Second model, ‘First clutch’
- Individuals progress through a transition matrix, based on duration of breeding phases (e.g. egg-laying, incubation, nestling), with a daily probability of nest failure due to:
  - Natural causes, or exposure to treated seed
- TER element included at individual level
  - If TER < trigger for safety, then breeding abandoned, enter recuperation phase
  - If time remaining in season, re-start breeding

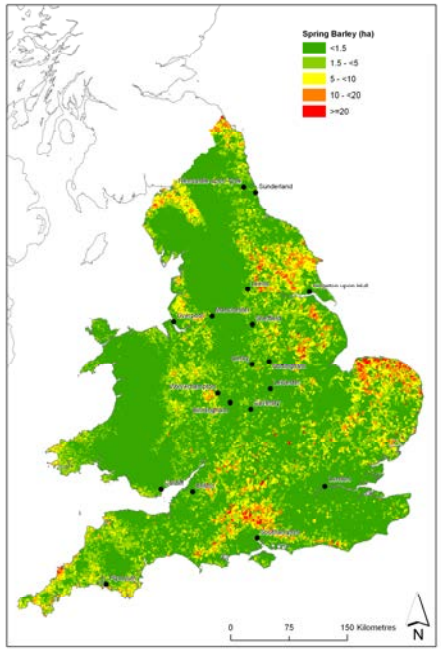
Objective 1
PGR estimates

- The two models produce similar results
- More advanced First clutch model to be used for Objective 1, PGR estimates – Skylark & Rook
  - Rook breeds early, and has only 1 clutch – at risk? Historical evidence that rooks have been affected by mercury seed treatments (Malmberg, 1973)
- Explore if Empirical model allows easier extrapolation to other species

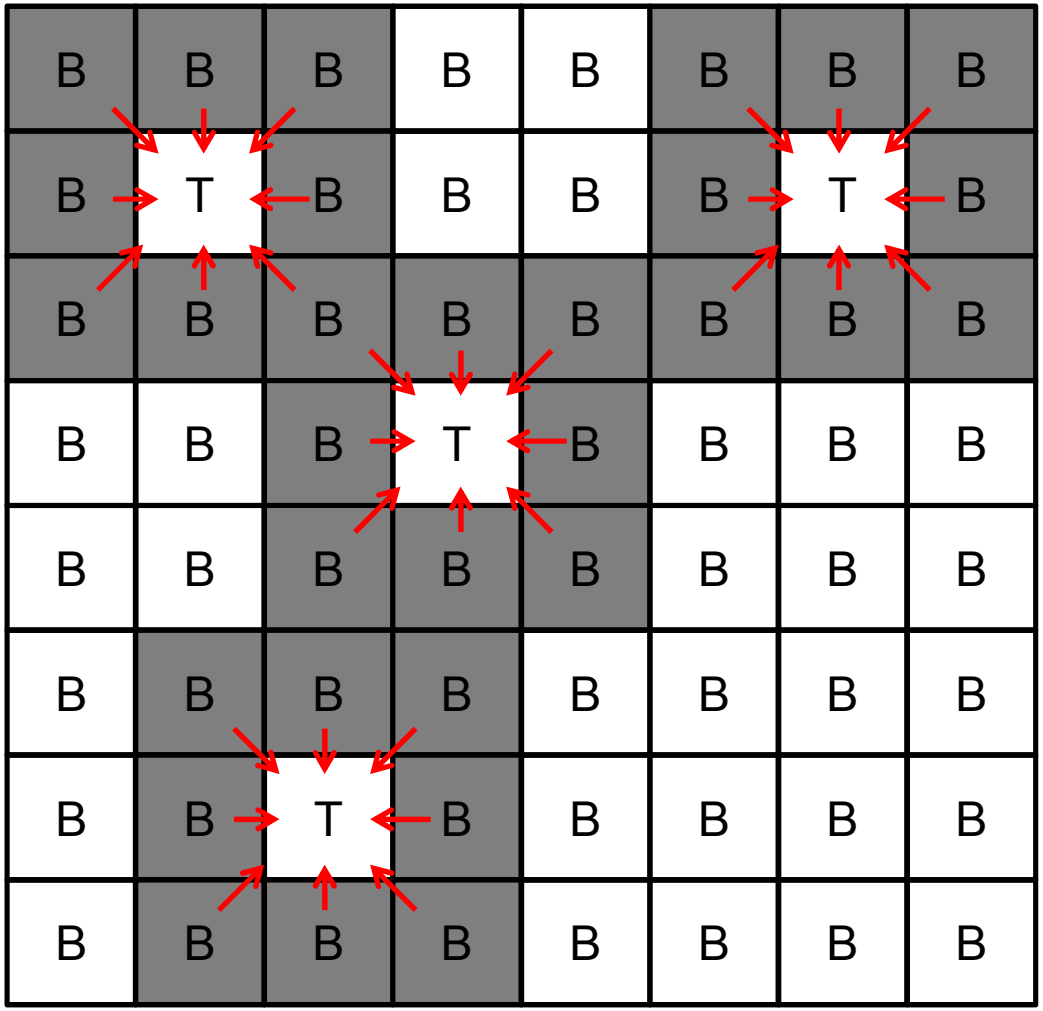
RSPB

Objective 3
Land cover

- How does percent land cover affect exposure of a population?
- Can it be used in risk assessments?
- Key element is forage flight distance during breeding
  - Foraging may occur beyond defended territory
  - Skylark ~350 m (varies with crop & quality of forage)
  - Rook?



Landscape issues



Assumes birds (B) do not nest on drilled fields, and that birds are evenly distributed

Given a certain forage flight distance (here, 1 field) for a given density of crop (treated area = T) in the landscape, what is the proportion of our population of breeding birds that would be able to feed on treated area (shaded)?

Objective 5
Use of PGR in risk assessments

- Relate to protection goals
- PGR is real, vs. TER..
- Explore relationships between TER and PGR
  - Can animals with TER <5 make up lost effort?
- Will vary with species' biology
- Wide discussion required

Summary

- Aims to resolve uncertainties in long term risk assessments for problematic scenarios – seed treatments
- Aims to develop ideas on landscape issues
- Provide discussion on use in risk assessment
- Would be great to calibrate against field data!
- Reports 2014

Thanks for your attention

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