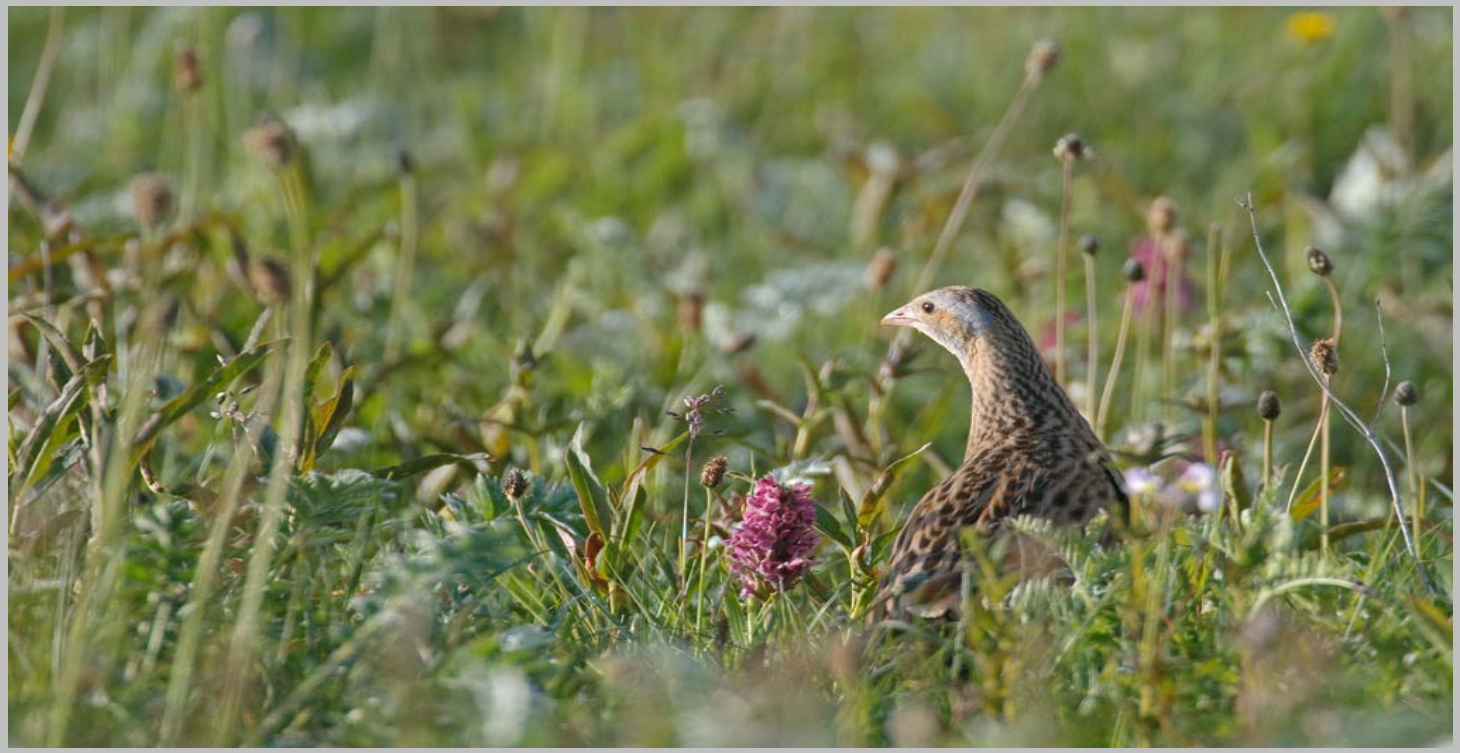
Impacts of agriculture on biodiversity



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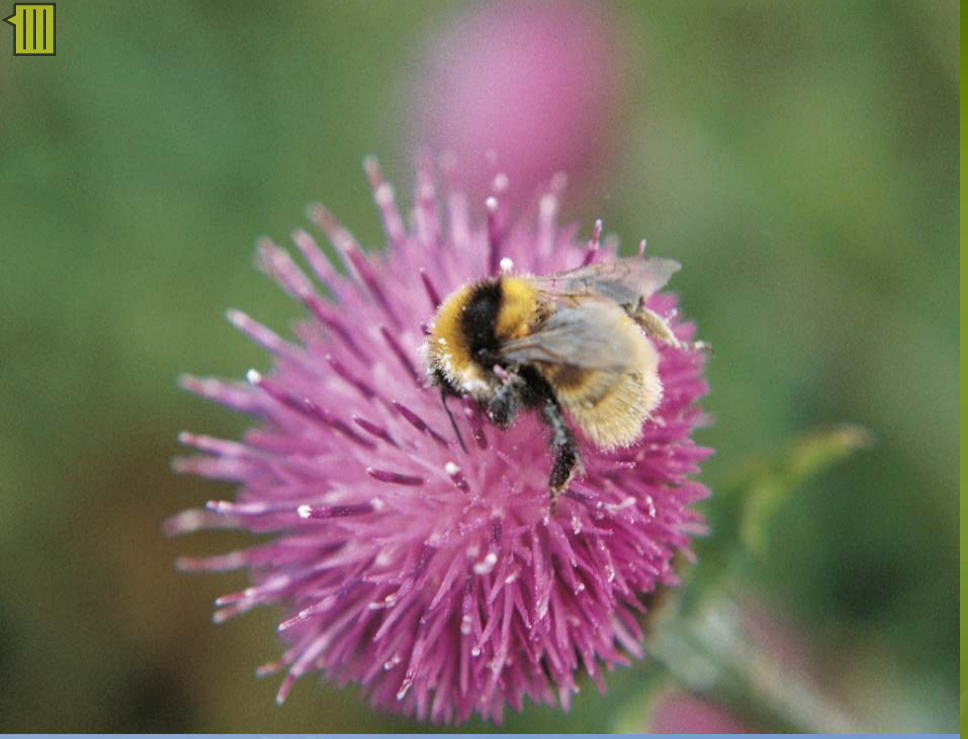
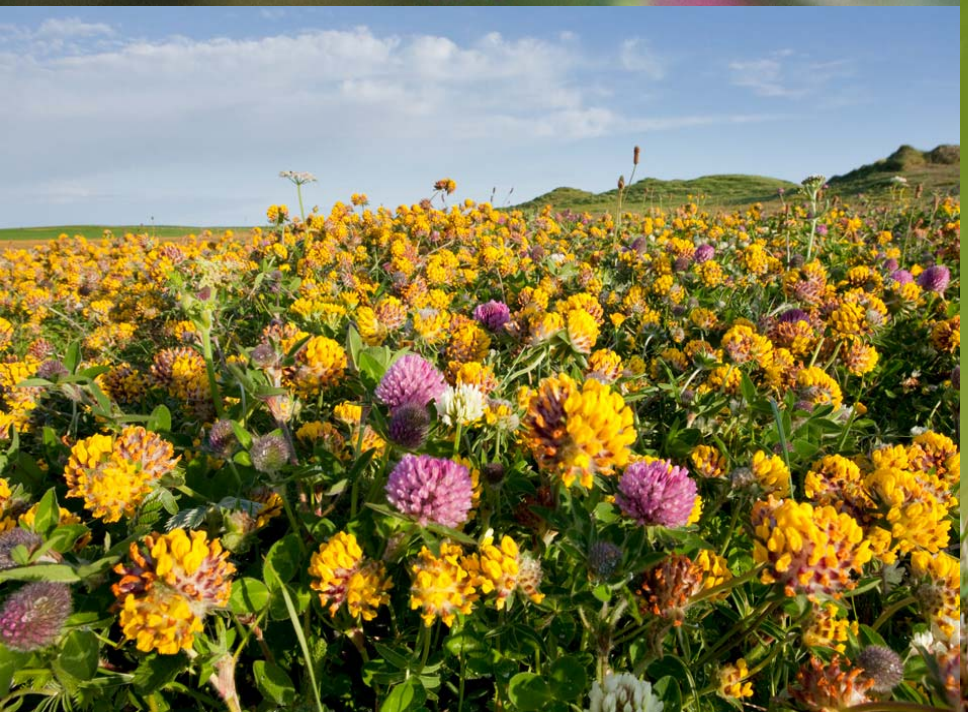


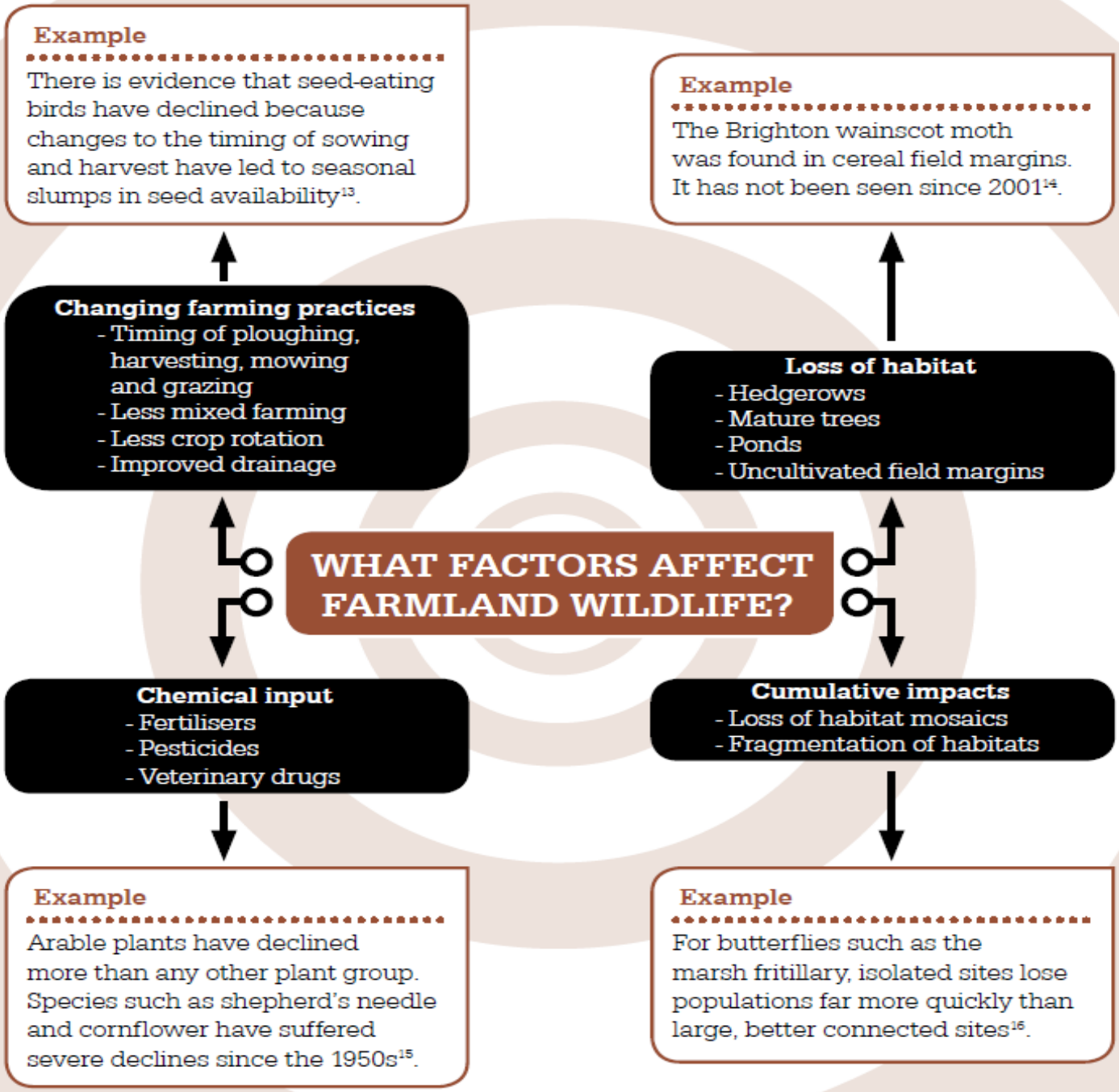


Within any agricultural landscape, biodiversity is greatest in areas that:

- Contain a wide range of niches (different habitat, different vegetation structure)
- Are subject to medium levels of disturbance
- Occur at large enough scale to maintain viable populations
- Provide a sufficient amount of similar habitats within close proximity to give species choice of suitable habitats

Agricultural trends linked to biodiversity declines:

- Intensification – progression to higher input-higher output systems
- Specialisation – loss of mixed farming systems and shift to monocultures
- Abandonment – decline or cessation in traditional farming practices


Example
There is evidence that seed-eating birds have declined because changes to the timing of sowing and harvest have led to seasonal slumps in seed availability[13].
Example
The Brighton wainscot moth was found in cereal field margins. It has not been seen since 2001[14].
Changing farming practices
- Timing of ploughing, harvesting, mowing and grazing
- Less mixed farming
- Less crop rotation
- Improved drainage
Loss of habitat
- Hedgerows
- Mature trees
- Ponds
- Uncultivated field margins
WHAT FACTORS AFFECT FARMLAND WILDLIFE?
Chemical input
- Fertilisers
- Pesticides
- Veterinary drugs
Cumulative impacts
- Loss of habitat mosaics
- Fragmentation of habitats
Example
Arable plants have declined more than any other plant group. Species such as shepherd's needle and cornflower have suffered severe declines since the 1950s[15].
Example
For butterflies such as the marsh fritillary, isolated sites lose populations far more quickly than large, better connected sites[16].

The State of Farmland Nature

- Farmland bird populations declined rapidly during the 1970s and 1980s
- By 2000, their numbers were half what they were in 2000
- Specialist birds (heavily dependent on farmland for food and breeding) have declined more severely

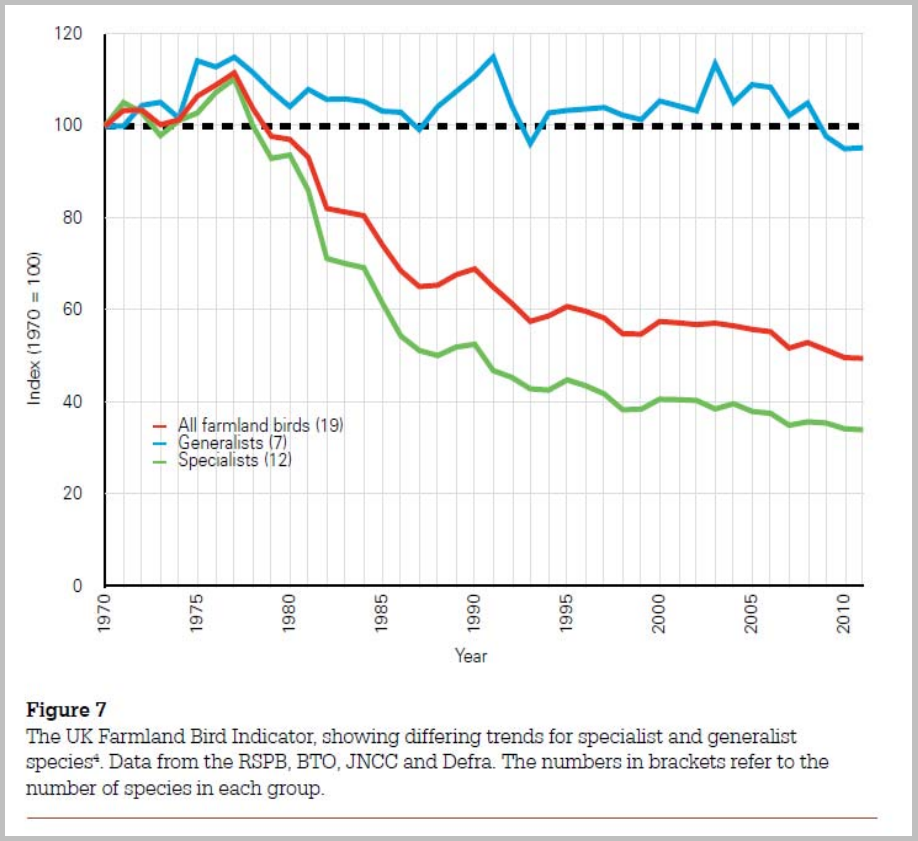


Figure 7
The UK Farmland Bird Indicator, showing differing trends for specialist and generalist species[4]. Data from the RSPB, BTO, JNCC and Defra. The numbers in brackets refer to the number of species in each group.

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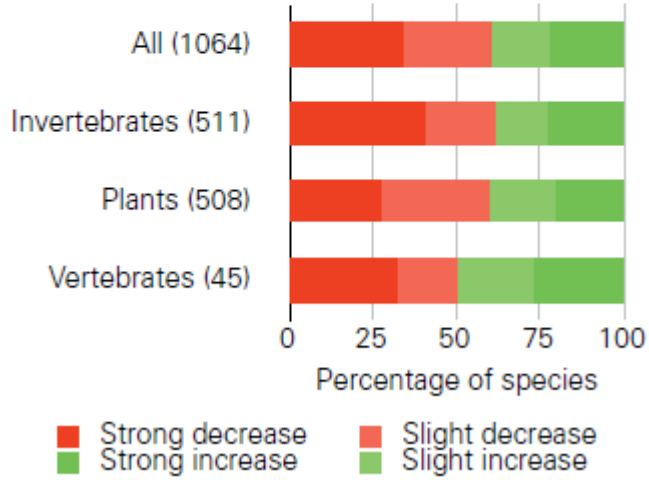
The State of Farmland Nature

- Butterfly populations show year to year variation but have declined 32% in the last 21 years
- 64% of farmland moths and 70% of carabid beetles studied are declining
- Arable plants are the fastest declining group of plants in the UK

Figure 6
The proportion of farmland species that are increasing or decreasing in each taxonomic group, measured by either population size or range over a period of up to 50 years. The values in brackets represent the number of species assessed.



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Birds in Scotland

- Scotland remains a stronghold for many birds associated with farmland and upland habitats:
  - almost all of the UK's breeding corncrakes
  - half of the lapwings, oystercatchers and curlews
  - a third of skylarks
  - 15-20% of grey partridges, choughs, starlings, linnets and yellowhammers
- Important wintering grounds for many species from further north

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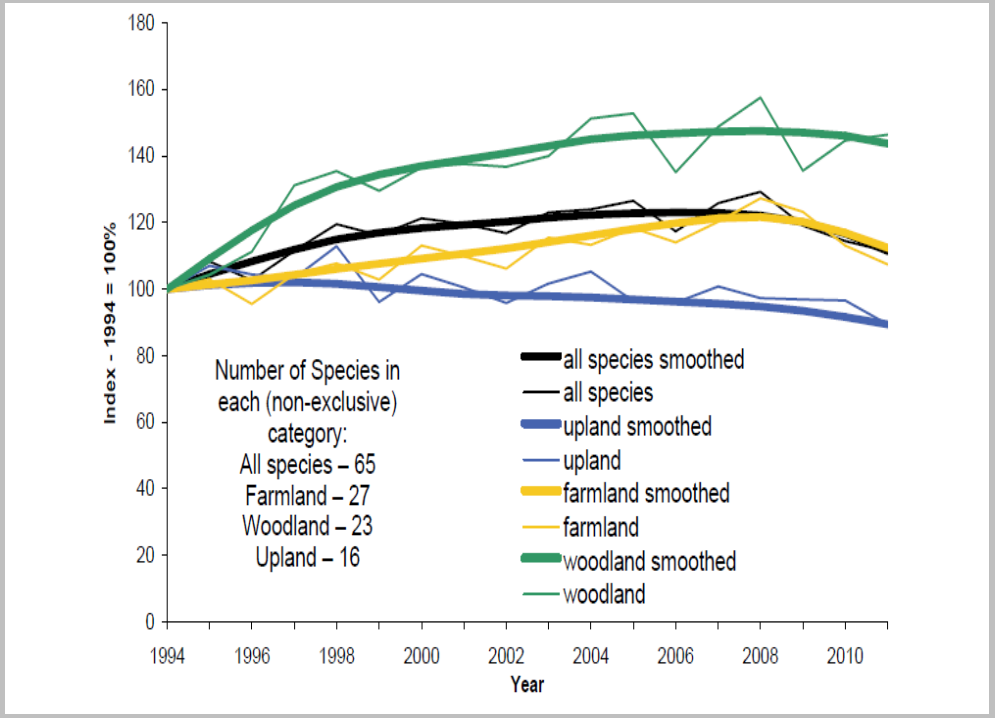
‘Abundance of terrestrial breeding birds’ indicator

- Trends for 65 breeding birds between 1994-2011
- Based on data from Breeding Bird Survey (random 1km survey squares)
- Some species e.g. grey partridge, tree sparrow and corn bunting to scarce for BBS to reliably monitor



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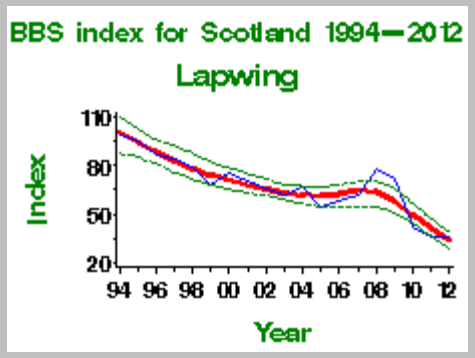
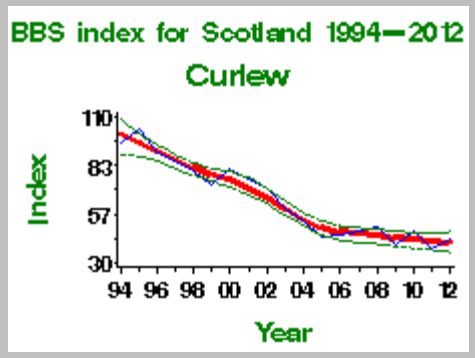
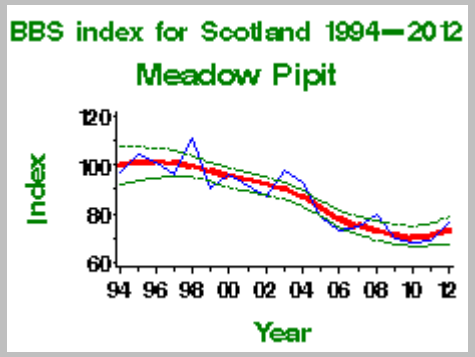
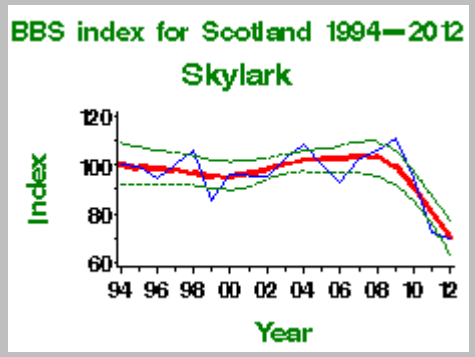
Unpicking the data: single species trends









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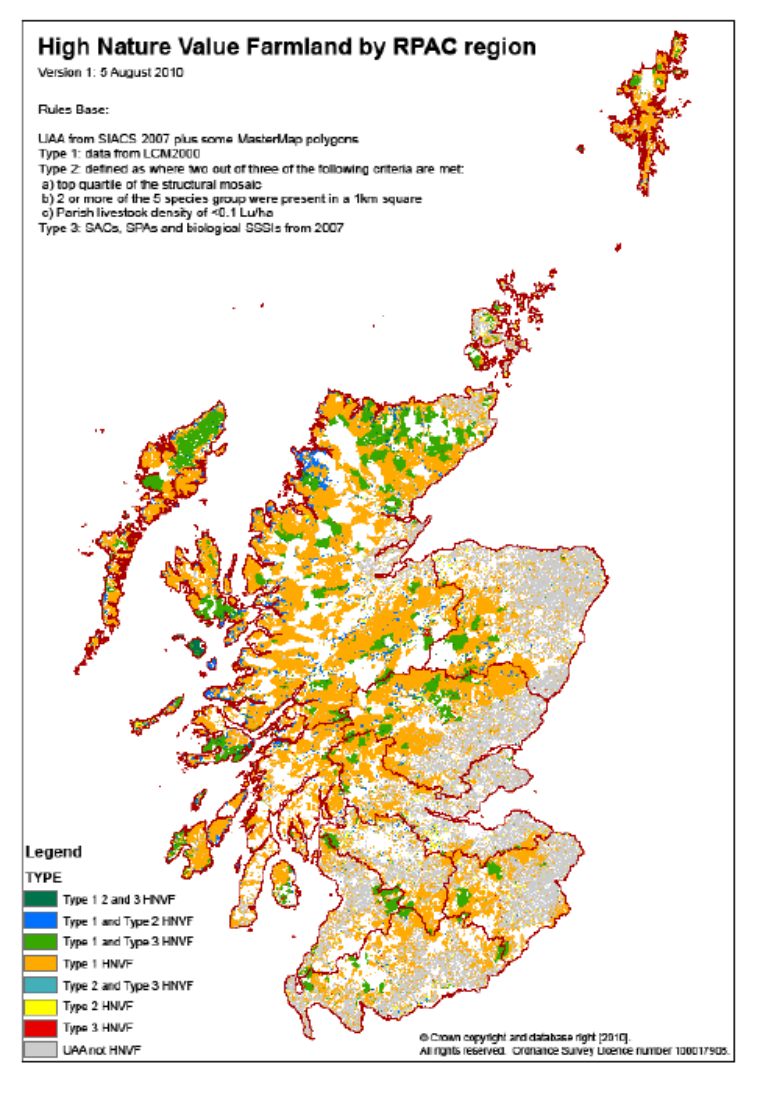
Main agricultural causes of declines for selected species

Species	Main agricultural causes of population change
Grey partridge	Decline caused by indirect effects of pesticides on chick survival through reduction in insect populations, and effects of changing hedgerow management on availability of nesting habitat.
Corncrake	Long-term decline caused mainly by destruction of nests and young by early and repeated cutting of forage grasses. Conservation measures to delay cutting and provide cover throughout the breeding season have led to population recovery in the core range in Scotland.
Lapwing	Declines caused by the combined effects on availability of nesting opportunities and nest success of grassland intensification, loss of spring cropping and loss of mixed farming.
Skylark	Decline caused by loss of nesting and foraging opportunities in dense, autumn-sown crops coupled with high rates of nest loss in intensive grass silage systems.
Chough	Causes of long-term population fluctuations not fully understood, but both intensification and abandonment of grazing management of coastal grasslands may have contributed to declines, through reductions in abundance and availability of soil invertebrates and, in turn, the effects of this on survival, especially of first year birds.
Corn bunting	Mainland decline caused by effects of herbicide use, efficient harvesting, and loss of spring-cropping on availability of weedy, grain-rich over-winter stubbles, combined with impacts of arable and grassland intensification on insect chick foods. These effects are compounded by the impacts of earlier cereal harvesting and repeated silage cutting on nest success. On the Western Isles where cereal sowings are exceptionally late and agrochemical inputs very limited, corn buntings nest very successfully in dune grassland. Here declines are being driven by early harvesting and baling of cereals as arable silage which removes the over-winter grain source.

HNV farmland

- 40% of Utilisable Agricultural Area estimated as HNV farmland
- Occurs mostly in the uplands dominated by semi-natural vegetation (peat, heath and grass) and grazed extensively
- Example: Western Isles machair with 15,000 breeding pairs of 6 wader species, corncrake, twite and corn buntings



Not just biodiversity

- Wide range of other environmental impacts associated with intensive farming:
  - GHG emissions
  - water pollution and over-abstraction,
  - soil erosion and degradation
  - loss of landscape diversity and character

Drivers of agricultural change:

- Research & Development and technological change
- Markets and consumer behaviour
- Public policy

Where next?

- Increasing recognition of the multiple and complex values that nature provides (crop pollination, carbon storage, flood attenuation)
- Progress in economic valuation and quantifying the costs of biodiversity loss and provision
- Recognition of the intrinsic value of nature, not captured by economics
- Less progress in embedding these values in markets and public policy

Where next?

- We need fundamental change to our food and farming system
- True Cost Accounting is a useful tool to make explicit the real price of our current systems and account for externalities
- Part of reframing the debate about sustainable food and farming and how we achieve it – beyond current narrow confines