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Moorland Fertilisation: a wild grouse chase? The Ralia experience

Dr Adam Smith
Game & Wildlife Conservation Trust

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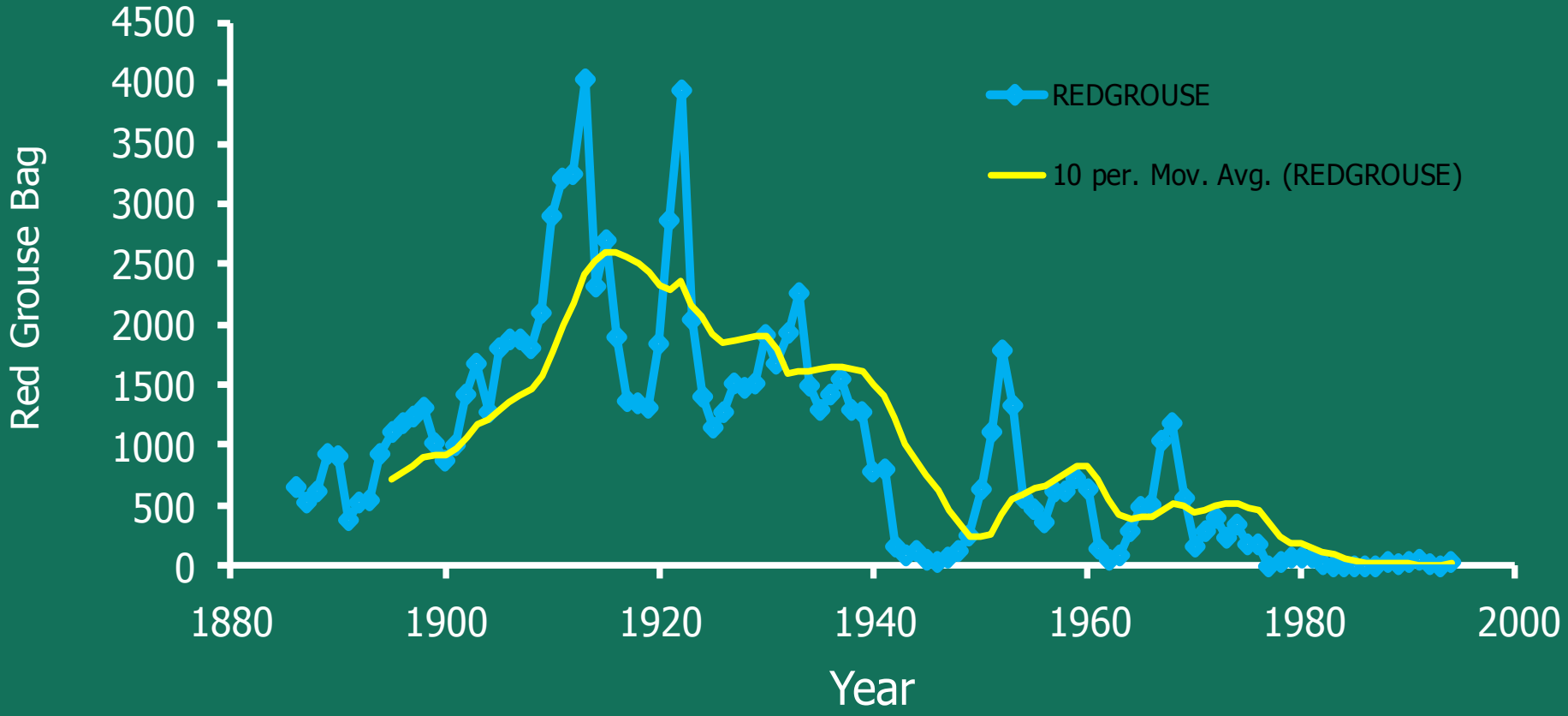
Ralia Moor, Strathspey



- Historically successful moor
- Since mid 1970's poor production

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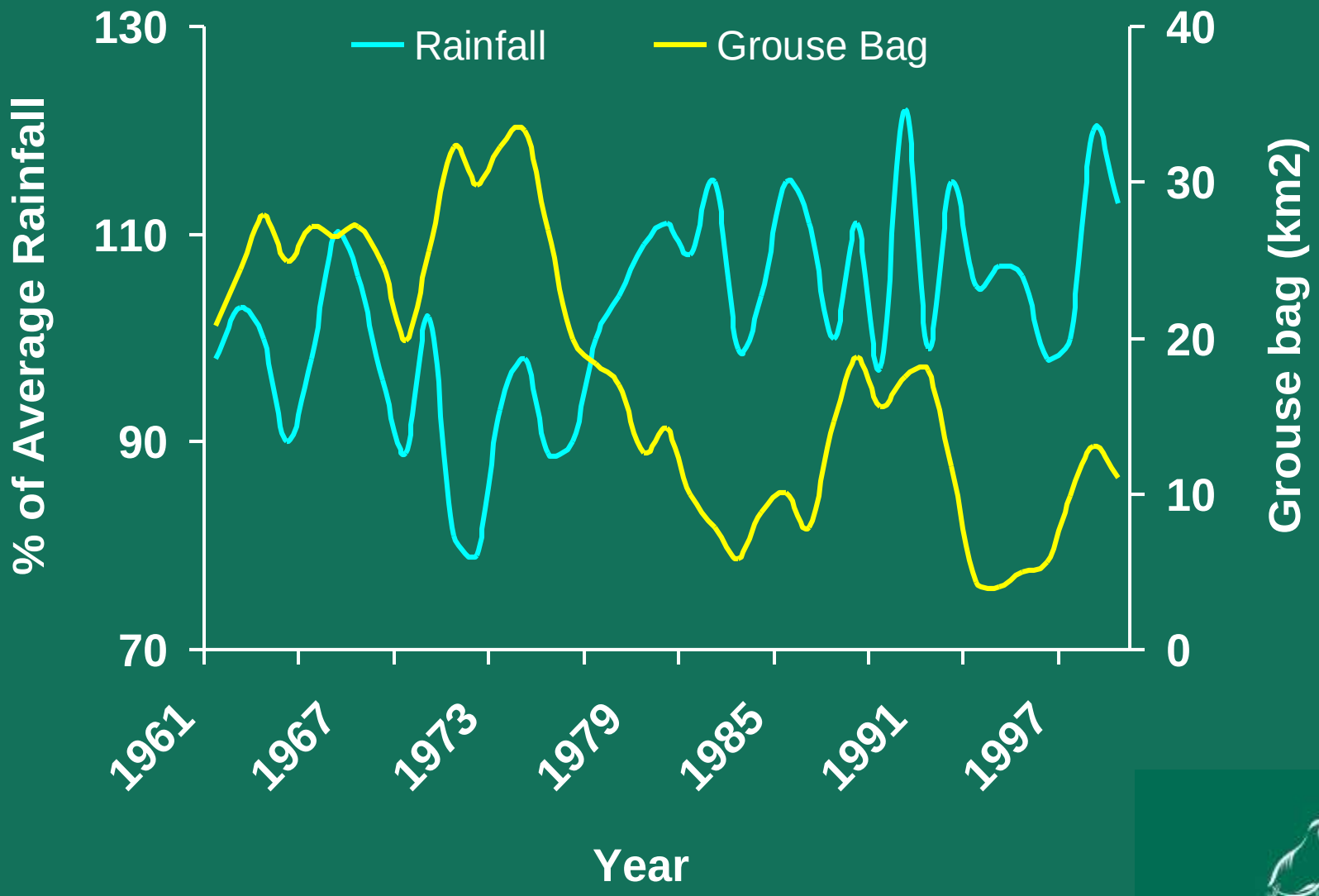

(National Game Bag Census & Met. Office)

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Climate and grouse

Red Grouse
June Temperature and Heather Productivity (Hudson 1992)

Ptarmigan
June Temperature in previous year (Watson et al. 2000)

Capercaillie
Cold April and cold, wet May and June (Moss et al. 2001)

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Other Environmental Change

- **Habitat Change**: muirburn, grazing & pests
  - **Predation Risk**: direct and indirect effects
  - **Diet**: quantity, quality and timing
- **Disease**: tick (LI) and strongylosis

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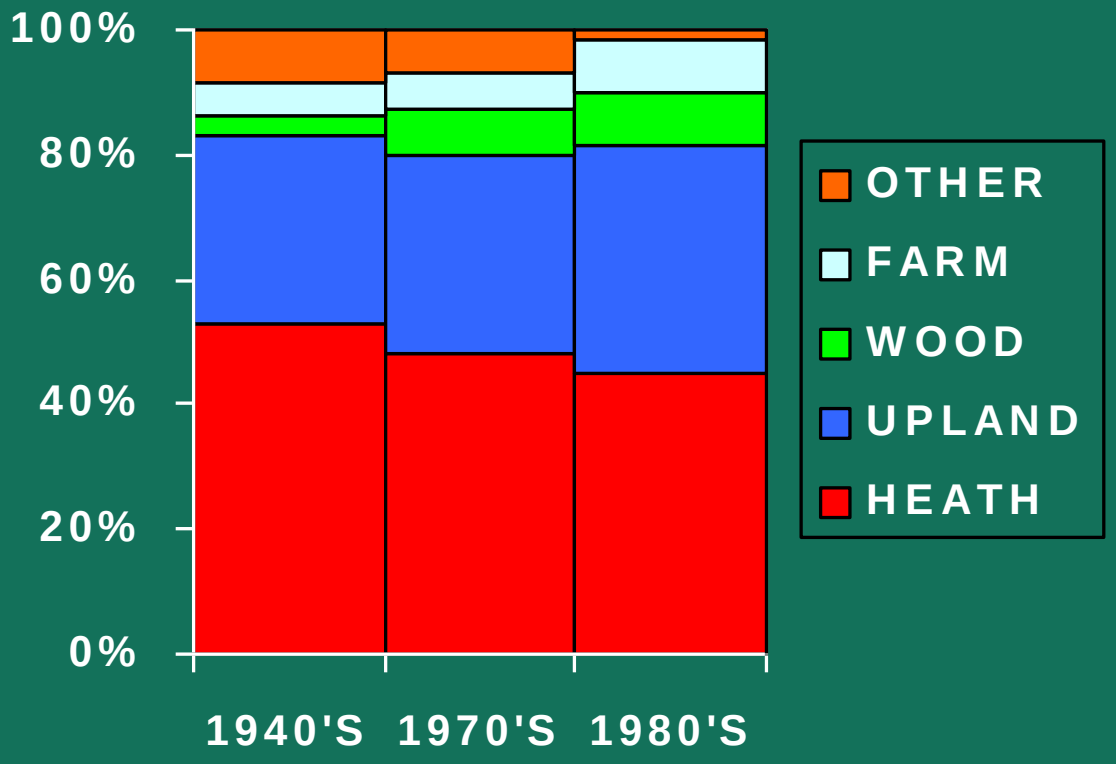
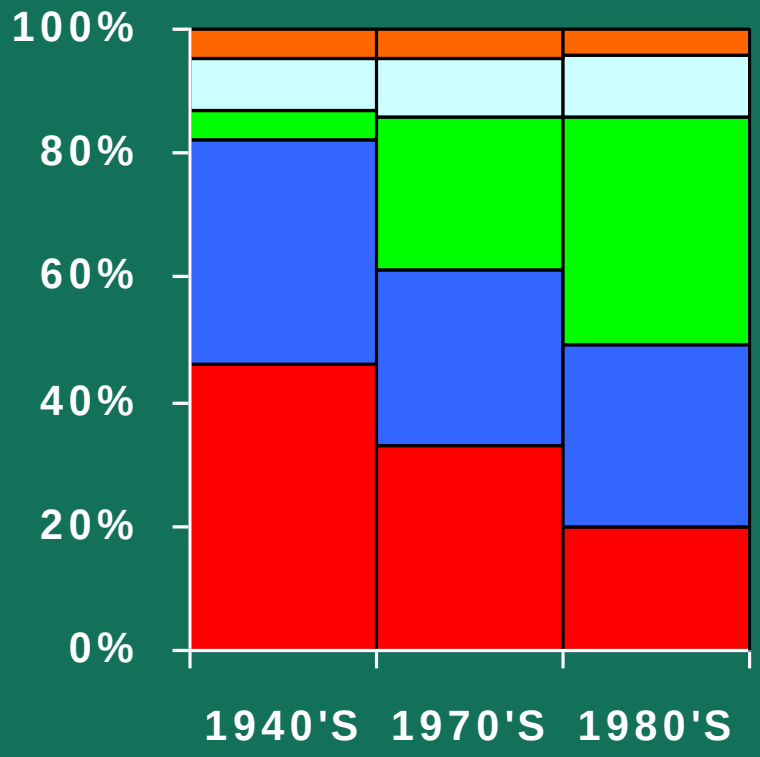
Change in Upland Habitat





Shooting interest retained

Shooting interest lost

(Barton and Robertson 1998)

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Grouse Diet

- Adult diet:
  Heather quantity and quality

- Chick diet:
  Abundance of invertebrates

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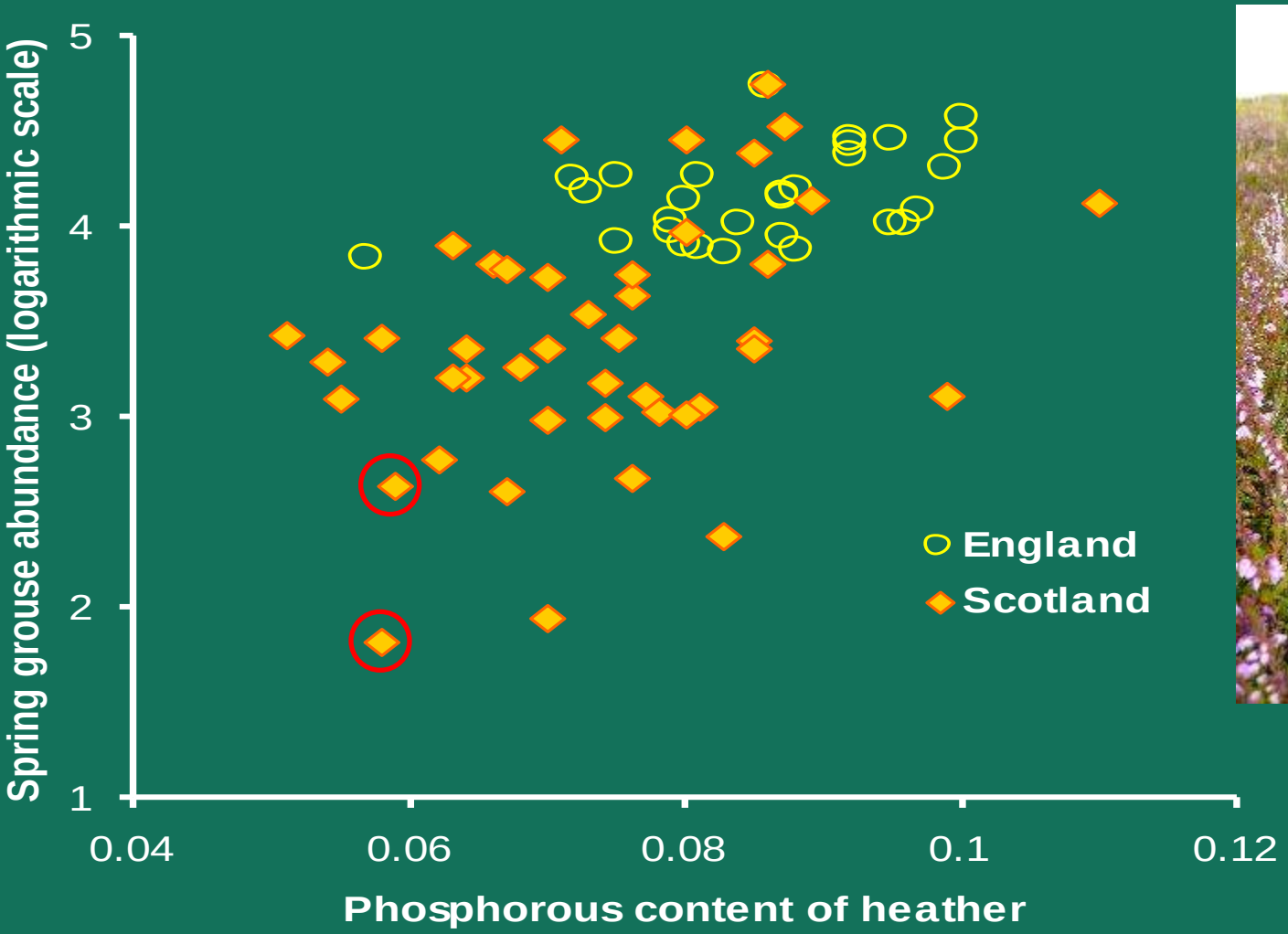
Grouse Diet:
Heather nutrient quality



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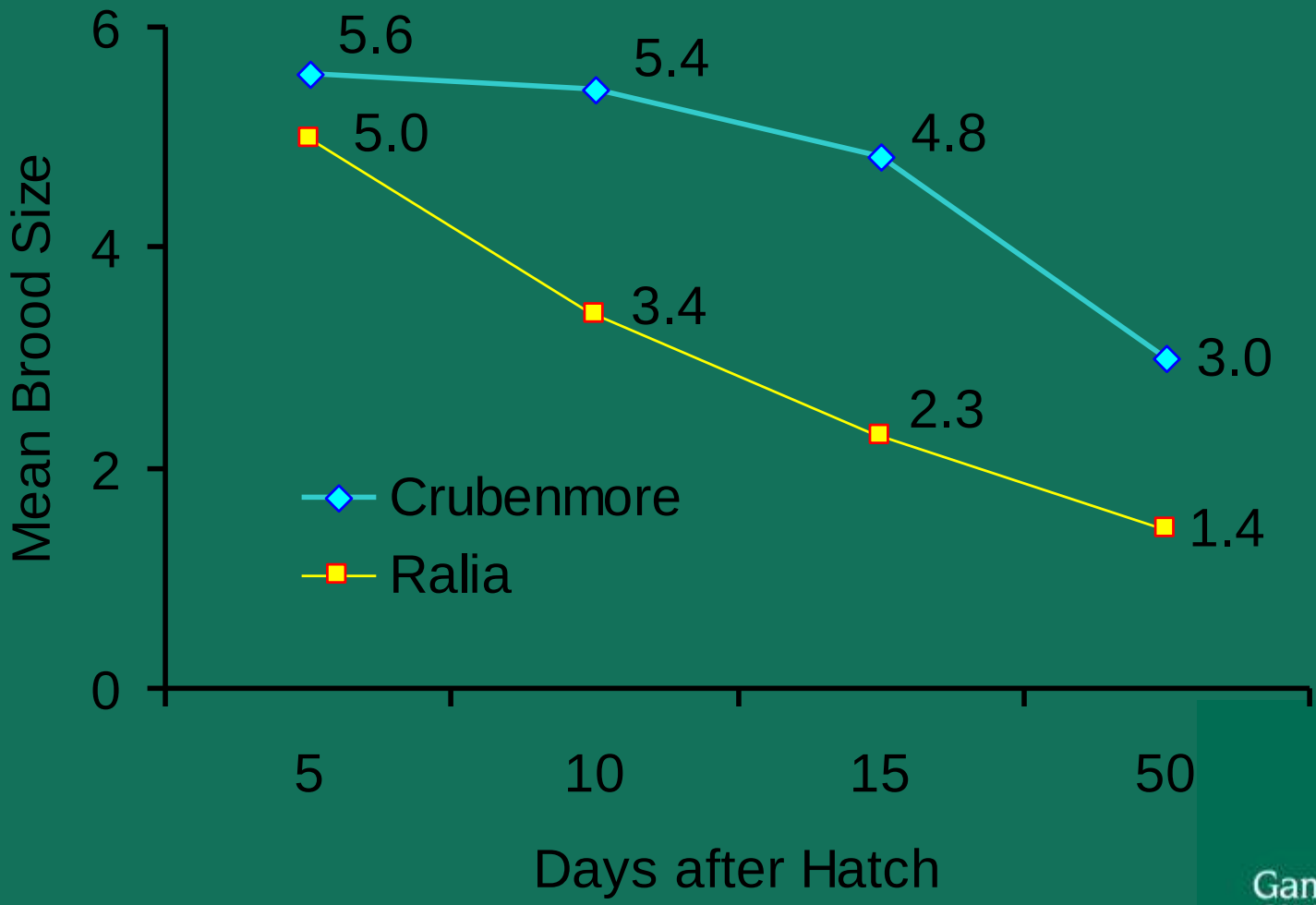
Brood Size (Control birds)



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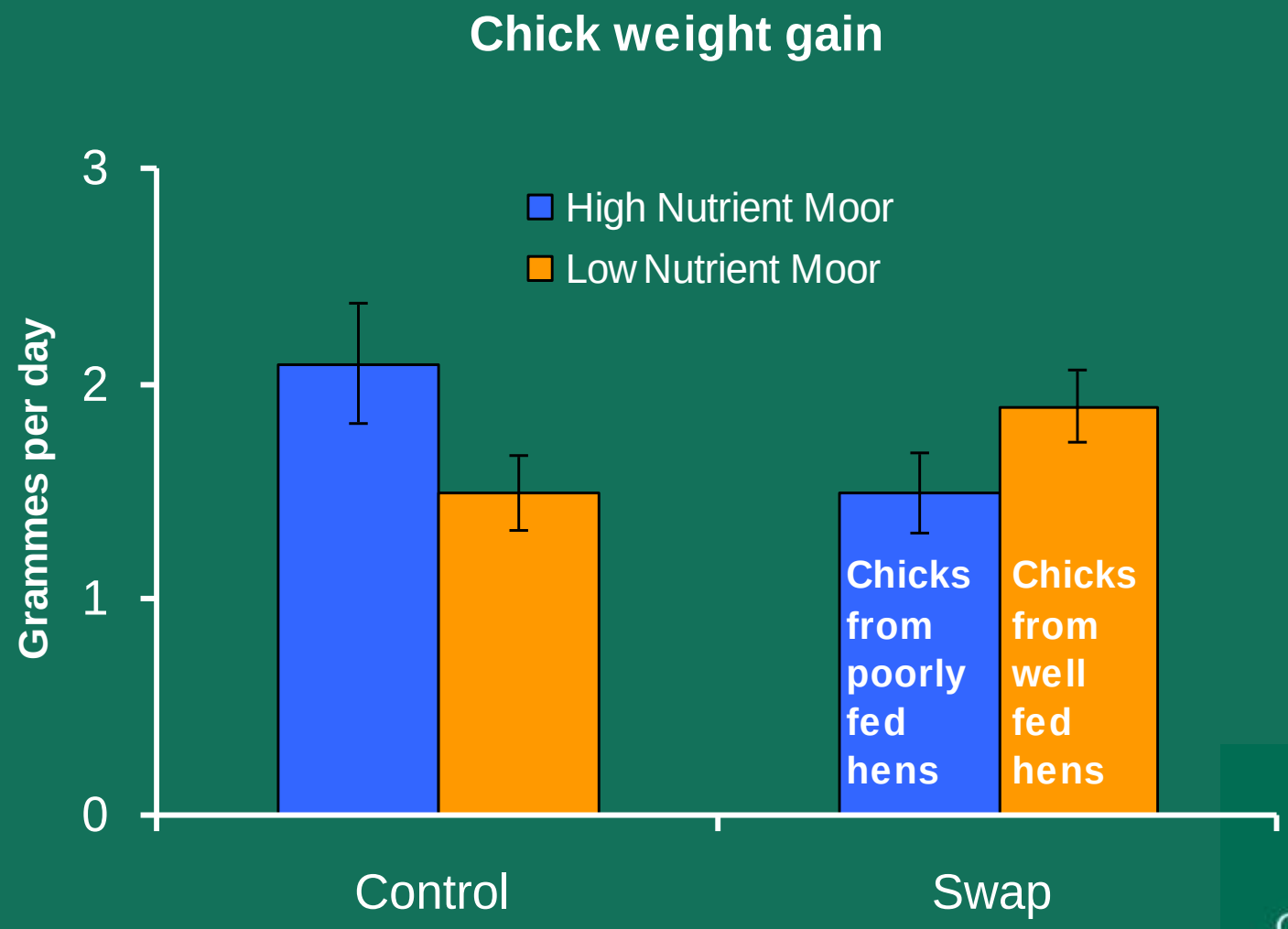
Maternal Nutrition



(Smith & Howarth *in prep*)

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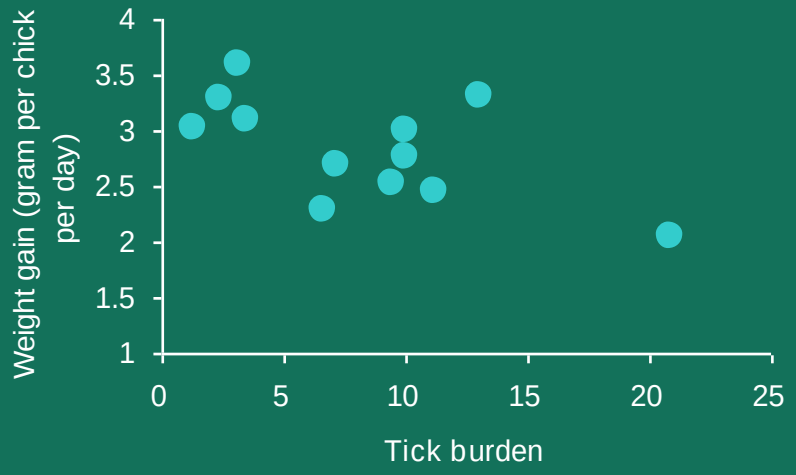
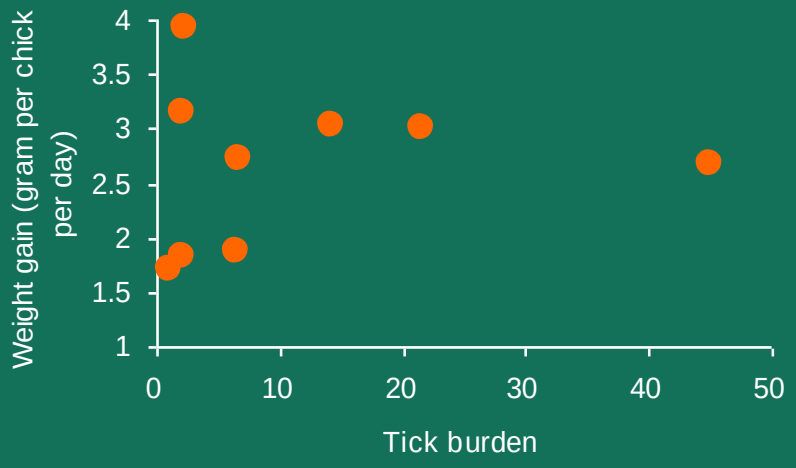
Diet and Disease



Chicks from low P moor



Chicks from high P moor

Can parasite effects be offset to some extent by allowing chicks access to more/better food?

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Fertilisation Experiments

1960s and early 1970s

Institute for Terrestrial Ecology

Experiments showed increased cock territory density and improved hen breeding condition.

Miller et al 1970	(Deeside)
Watson & O'Hare 1979	(Northern Ireland)
Watson et al 1984	

Design did not allow study of factors affecting chick survival to be studied.

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How could fertilising moorland produce more grouse chicks?

By improving both the plant and insect food supply to young chicks with high demands…….

…..and by improving the diet of the hen before, during and after laying

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Methods

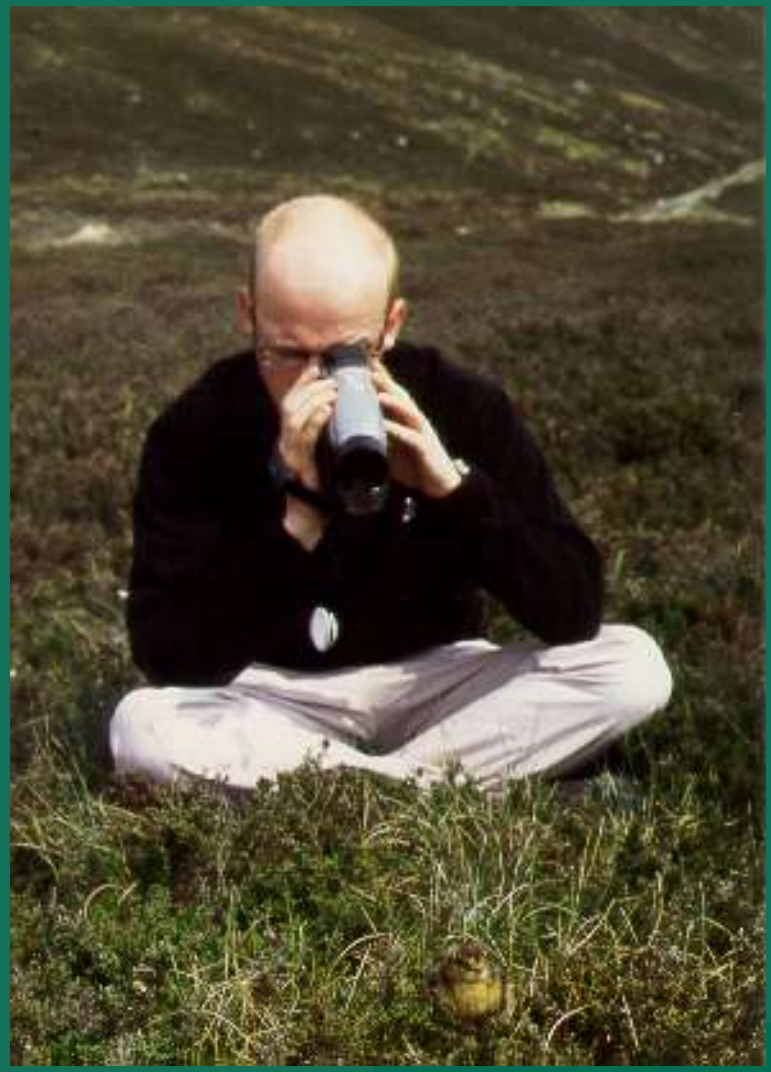
- Alan Kirby

- 12 paired 100m2 plots
- Testing Grazing, Lime and Fertiliser interactions

- Four 0.5km^2 plots on Ralia and Cuaich moors in Strathspey

- 17:17:17 NPK fertiliser

- 1000kg per 1ha (~1/2 ton acre)



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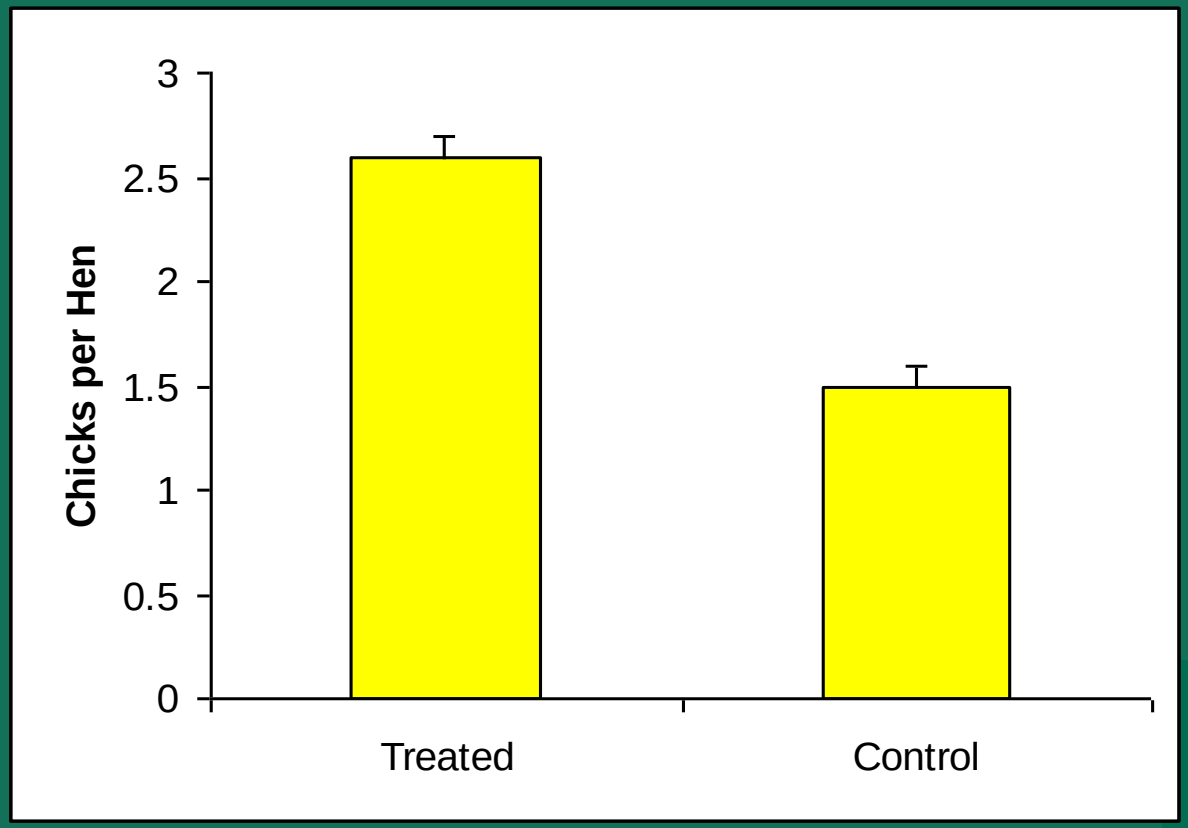
The addition of slow release fertiliser significantly increased the average number of chicks each hen raised



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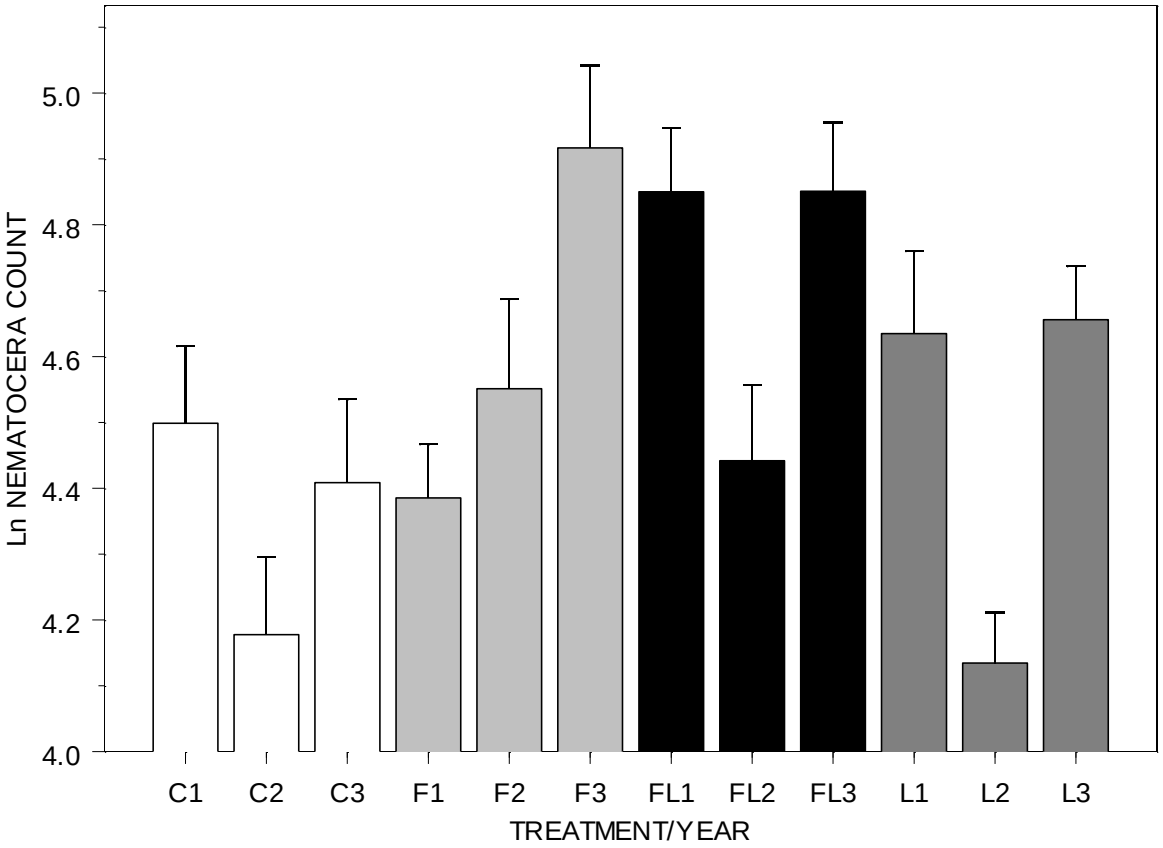

The mean number of Nematocera trapped every 10 days (± se) averaged across all sites (n = 48), in each of the three years of study in plots receiving applications of fertiliser and/or lime. (C = Control, F = Fertiliser, FL = Fertiliser & Lime, L = Lime, Numbers denote year of study where year 1 is 2000)

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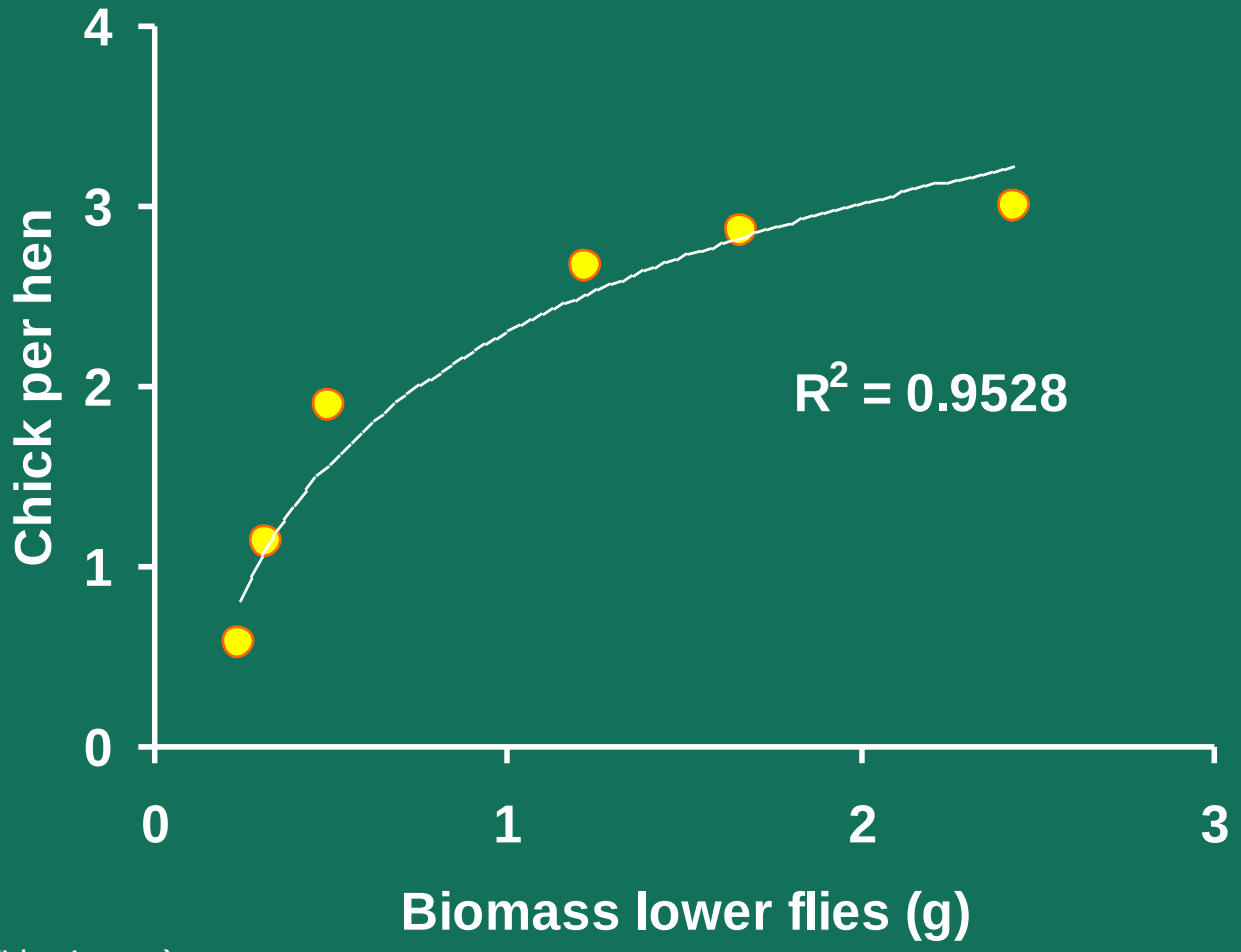
Chick Diet

Quality



More Craneflies are associated with better chick productivity

(Kirby *in prep*)

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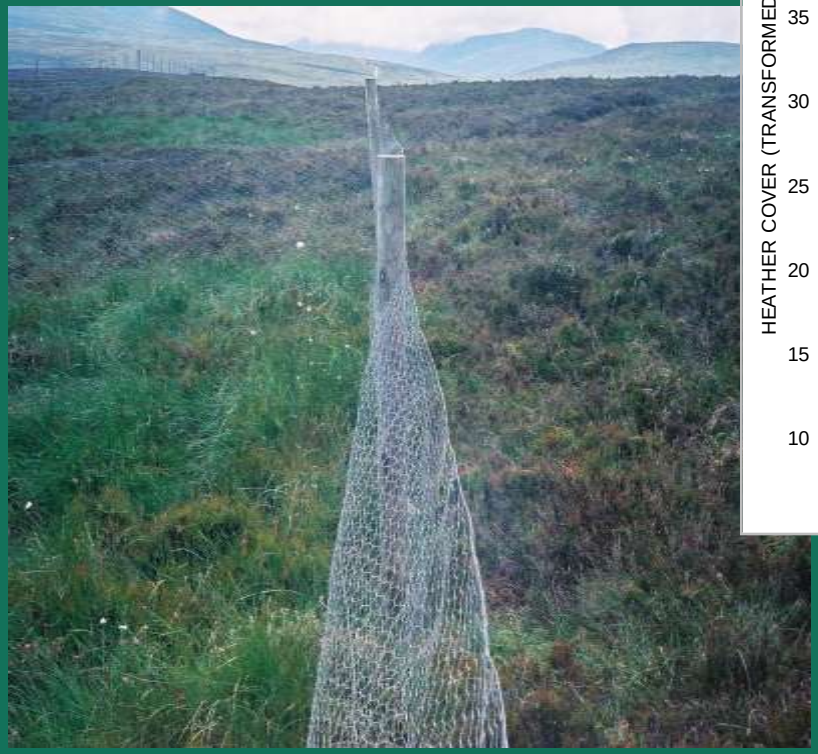
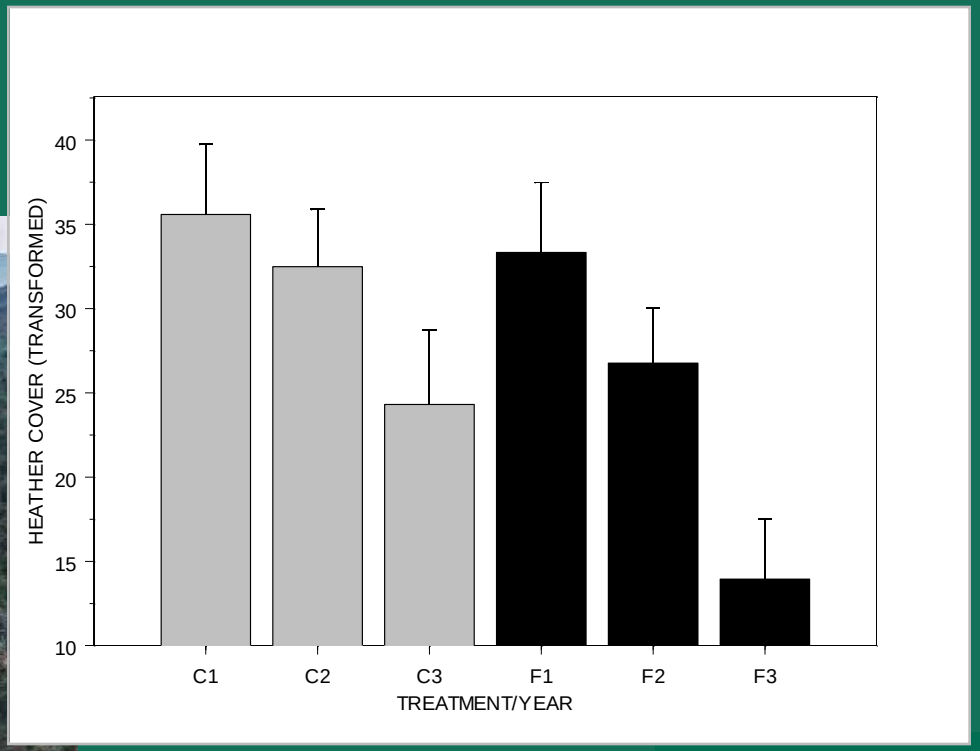
Although this technique has provided good results the ***GWCT does not advise using fertiliser on grouse moors.*** This is because the long term effects on habitat are yet to be established and cost effectiveness issues.





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Changing nutrients

Fertiliser: Effective but…

Expensive, Limited time, Risk of grass invasion if broken canopy

Liming: effect unclear

Subsoiling: could be effective

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Beetles emerge
in warm early spring
Mating swarms form

Beetles lay eggs
at base of heather plants
in damp moss

Larvae hatch July
Feed on roots
& heather leaf cuticle

First signs of
damage to heather
Foxy red &
'fusty' smell
in late July/August

Larvae descend to
moss layer and pupate

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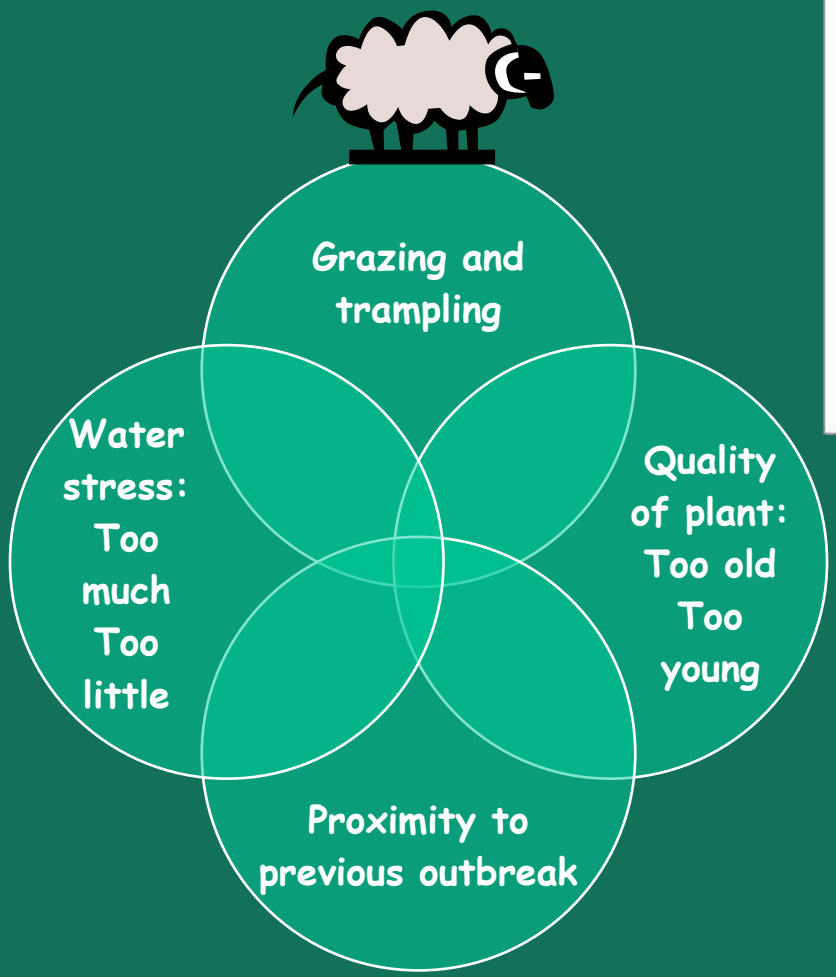
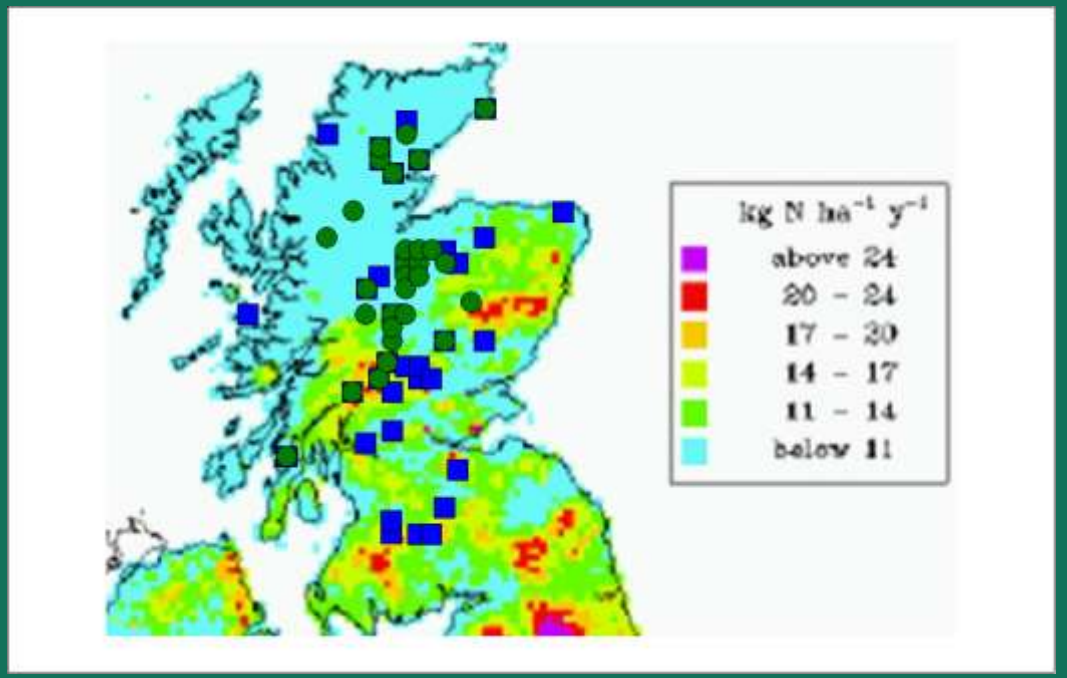
Impacts of beetles on heather





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Muirburn

	Most	→	→	Least
Nitrogen	Burnt Wet	Burnt Dry Cut Wet		Cut Dry
Phosphorous	Burnt Wet	Burnt Dry	Cut Wet	Cut Dry
Cover	Burnt Dry	Cut Dry	Burnt Wet	Cut Wet

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Grouse Diet: Sustainable Solutions

- Keep for heather: some muirburn & light grazing
  - Improve soil status: Vegetate; Cattle; Re-wet?
- Keep fit for grouse: parasite & disease control

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