

From Paris to Pignut – what can we learn from woodland indicator plants

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Plants as symbols



Generalists vs specialists



Convenient arbitrary split into:

- Woodland specialists - 'ancient woodland lists' 158
More stress-tolerators, higher shade tolerant
- Woodland generalists 186
Taller, more competitive



But be warned



Geographic groupings



north-west: high rainfall, more high altitude areas, older rocks, more acidic soils and peats



central and eastern Highlands: links to Scandinavian climate. Cold winters.

(melancholy thistle, Scots pine, downy birch, twinflower, globeflower)

↑ declining temperatures to the north

western seaboard: influenced by Atlantic Gulf Stream giving relatively mild winters and very wet conditions.

(holly, madder, climbing fumitory, hay-scented fern, bog myrtle)



↑ links to continental climate (hornbeam, beech, small leaved lime, yellow archangel, pedunculate oak)

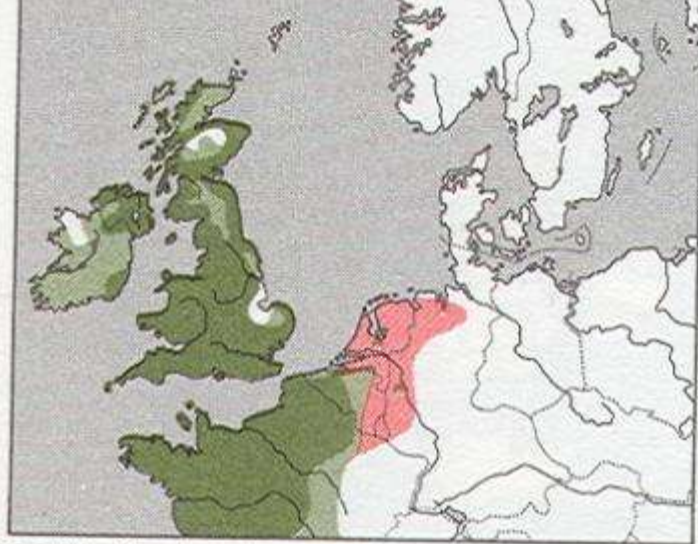


south-east: generally low rainfall, high summer temperatures, low altitude, high proportion of base rich soils, little peat

↘ links to southern continental climate (clematis, spurge laurel, field maple, butcher's broom, large leaved lime)



Patterns in environment.



1868 *Endymion non-scriptus*
Bluebell

1130 *Primula elatior*
Oxlip

From A. Fitter, *An Atlas of the Wild Flowers of Britain and Northern Europe*, Collins, 1978

What use is all of this?



Looking at change over the last c40-50yrs

- BSBI Atlas 1950s – 1990s
- BSBI Change project 1987-2004
- Countryside Survey 1984-2007

- Bunce re-survey of 103 broadleaved woods 1971-2001

- Individual wood studies

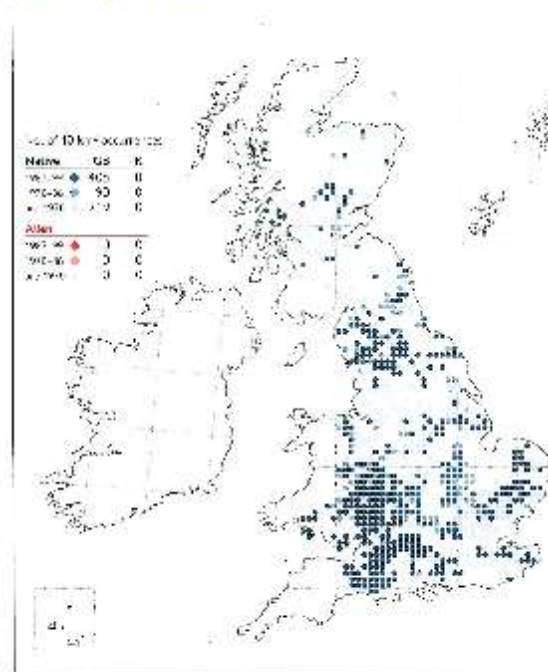


Broad-scale distribution changes (BSBI Atlas)

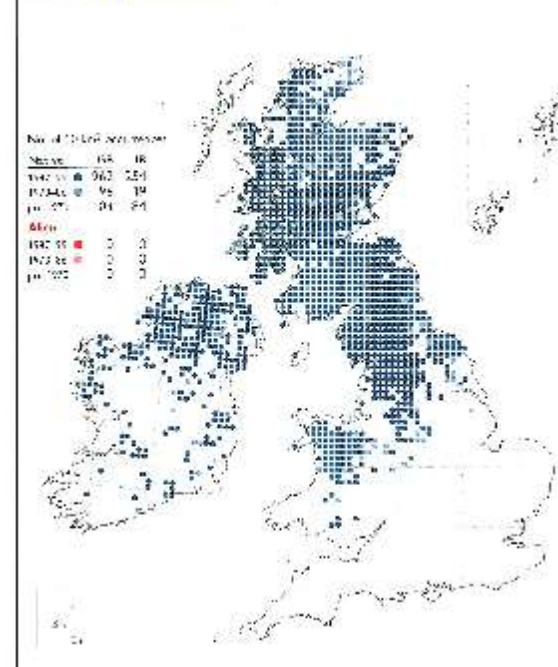


From Preston, C.D., et al *New Atlas of the British and Irish Flora*

Paris quadrifolia Herb-Paris



Crepis paludosa Marsh Hawk's-beard

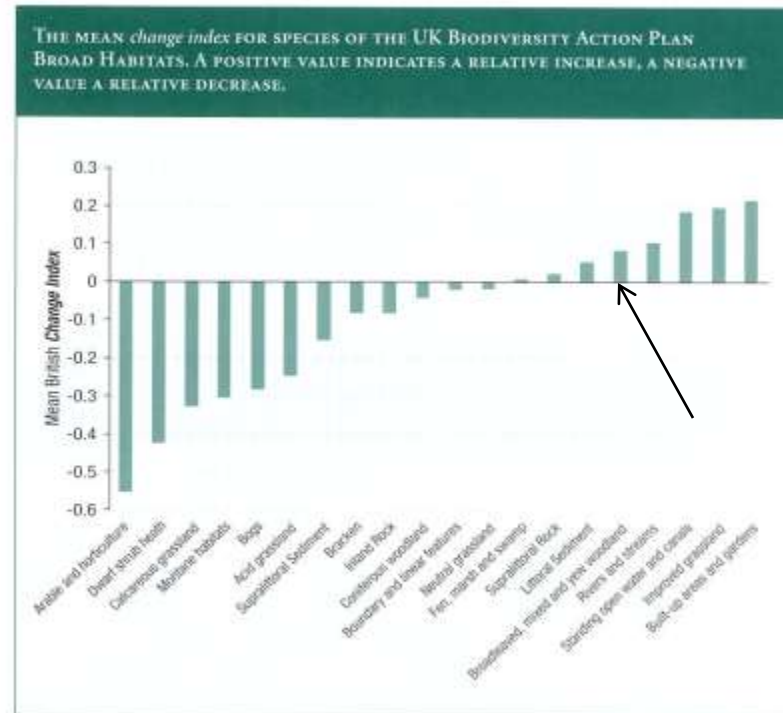


National level change in distribution



BSBI Atlas

- Little change compared to other habitats



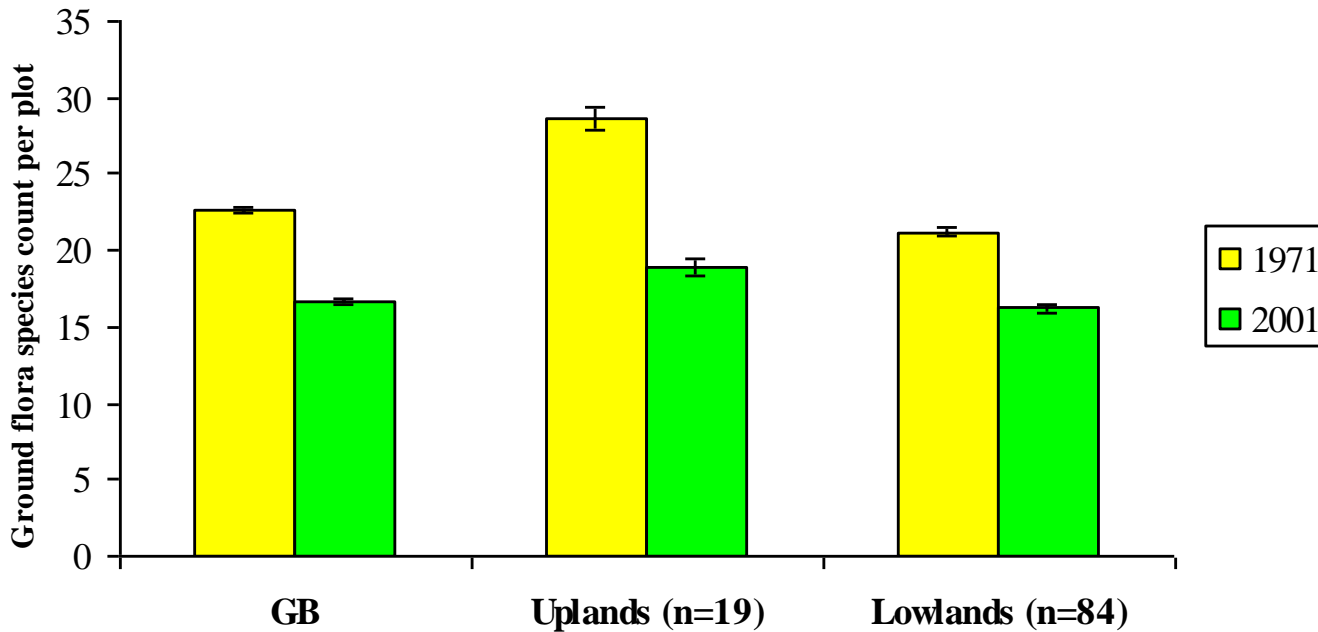
Bunce Survey



- 103 woods, 16 plots per wood, recorded 1971 2001
- Tree/Shrub height and DBH
- Soil samples and soil description
- Site and plot descriptors
- **Vascular plants** and all bryophytes



Change in species richness/plot



- Decline in species richness per plot
- Individual species changes
 - increases and decreases,
 - both generalist and specialist.

Woodland change

- Woodland has been increasing
- But long time for floral changes to show at landscape scale
- Quality of habitat changing
- But changes in quality seldom eliminate species from site



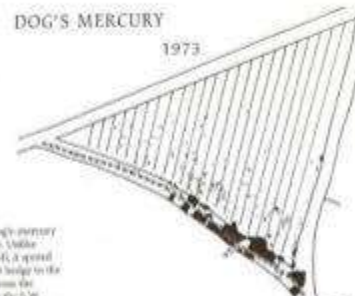
Conversion to conifers



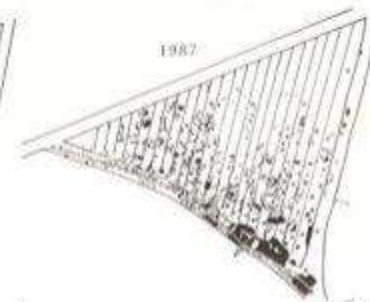
Stand development

- Many woods recent, still being 'invaded'
- Broadbalk Wilderness (Rothamsted) studies
- Dog's mercury, Hayley Wood triangle

1973



1987

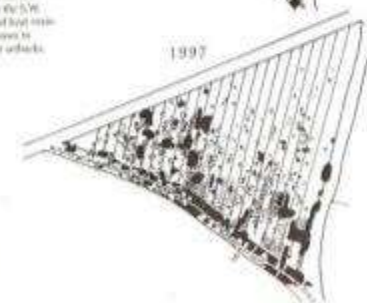


1987

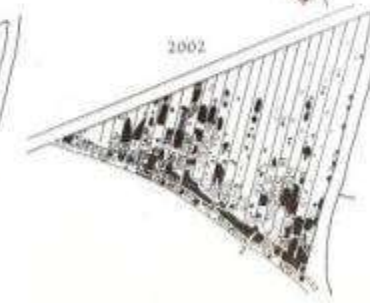
1997

60. Spread of dog's mercury into the Triangle. Under oak and birch, it spread from the adjacent hedge to the east, as well as from the adjacent road to the SW. The fertile soil and high water table continues to advance without setbacks.

1997



2002



2002

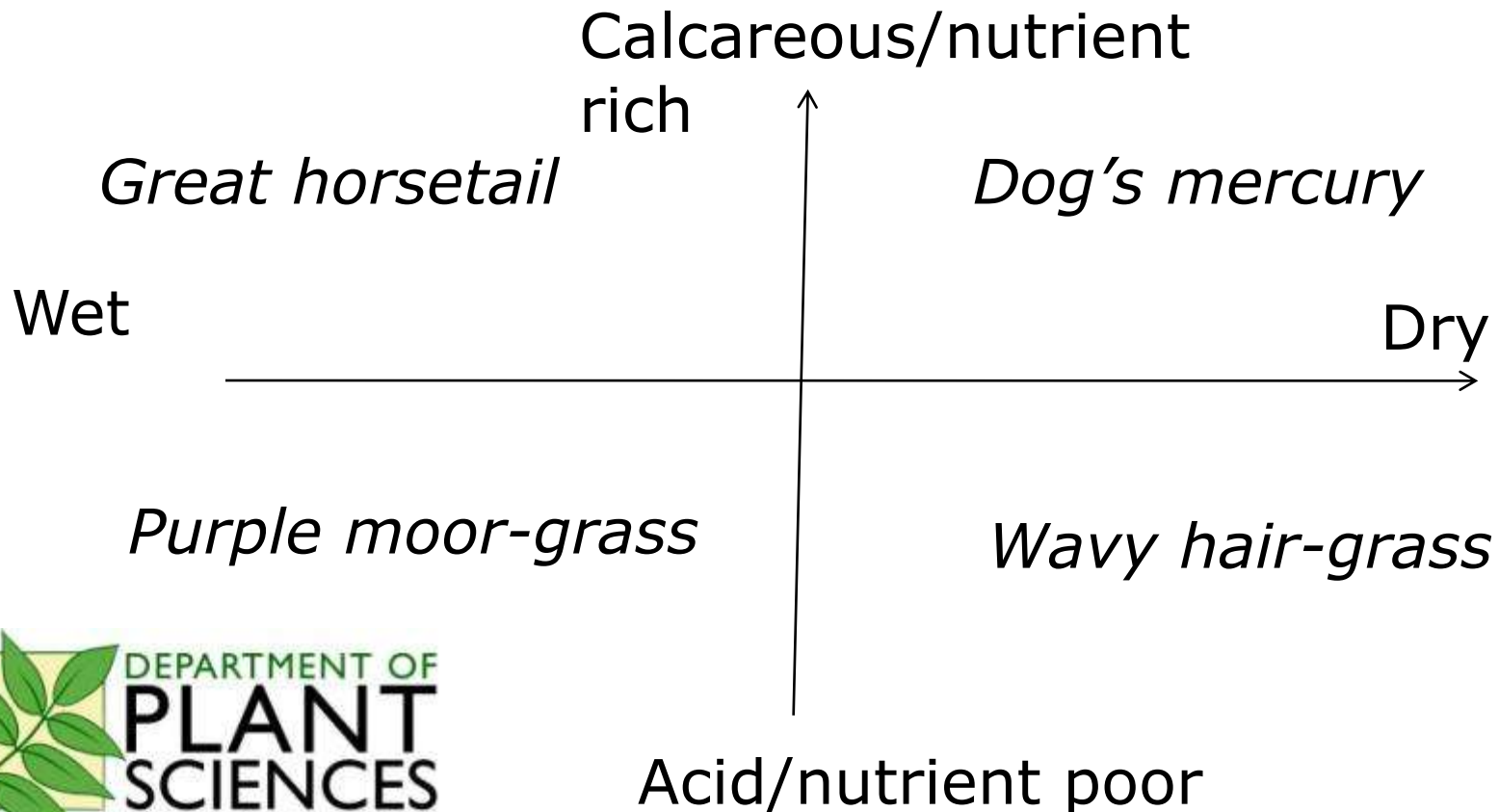
Has the nature of the flora been changing



Tolerance of different soil conditions



- Ellenberg Numbers (1-10 scores)
- Species responses to soil acidity/nutrient richness and to moisture

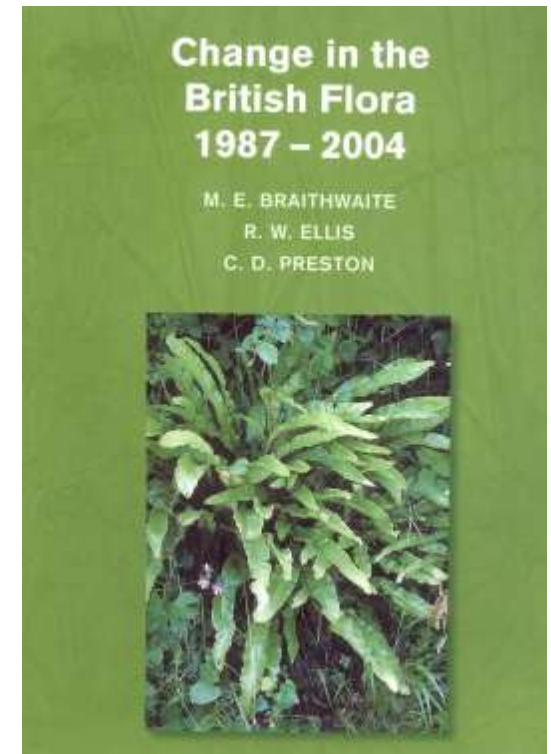


Changes in character of flora? (1)



Local Change

- (Acid) nutrient-poor species tended to decline more



Changes in character of flora? (2)



2007 results

- Species richness decline 1990-2007
- Loss of species suggesting canopy closure
- Increase in competitors, loss of ruderals



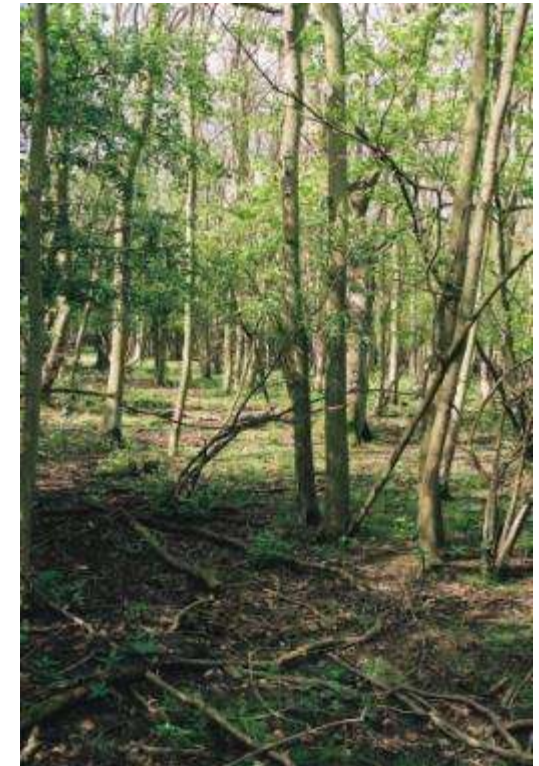
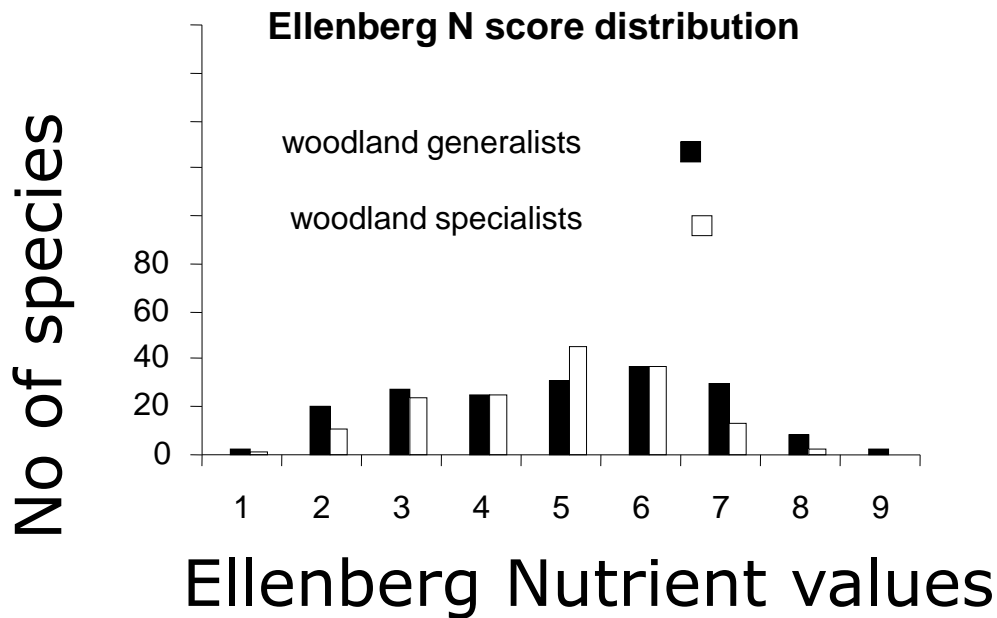
Nitrogen and pH

- Soil pH up
- No general change to more nutrient-rich flora
- (Has been shown in some other studies: Ling 2003)
- Some plant nutrient (Ellenberg) scores up in arable areas
- Individual changes
 - + Nettles, Goose-grass
 - Wavy hair-grass, bracken



Why not a stronger N signal?

- Most woodland flora moderately-high N
- N-effect may be suppressed by shade
- **Potential future concern**



Grazing and browsing



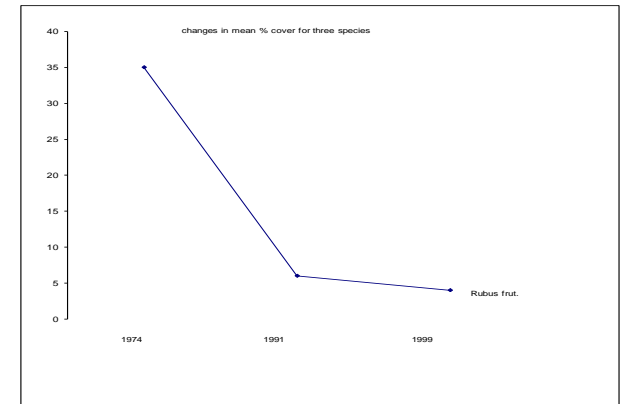
- Deer signs in lowlands up
- But no clear plant effects
 - Regional difference (many woods in uplands over-grazed at start)



Grazing and browsing



- Other studies do show a clear impact in lowlands, eg Monks Woods, Wytham, Bradfield Wood, Lady Park Wood etc).



*Decline of bramble
in Wytham*



Climatic effects in woods



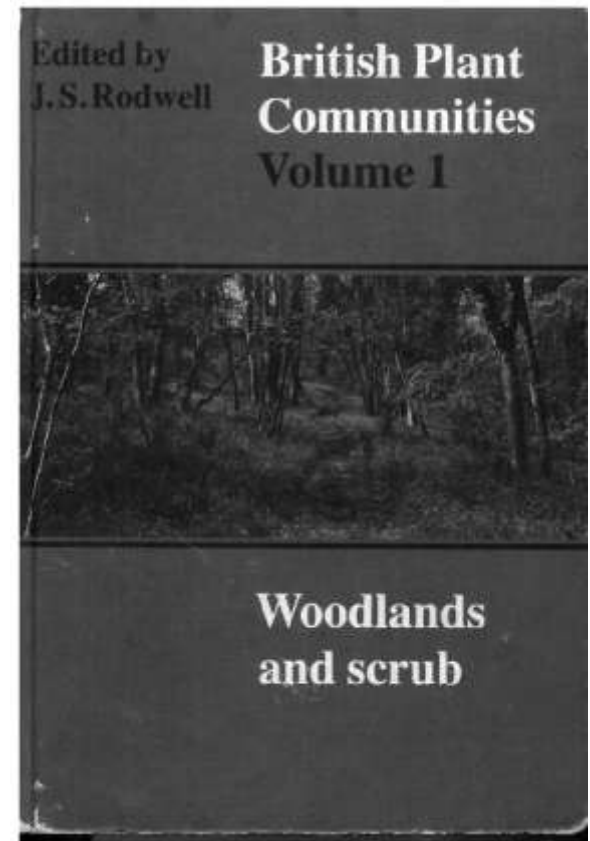
- Frequency, more increases
(Anemone, Goose-grass)
- Cover changes, more decreases
(Ramsons, Wood-sorrel)
- Woodland specialists in both



The flora is going to change



- No clear common denominator
- Assemblages likely to re-sort
- NVC categories may break-down



Other types of climate change effect

- Changes in timing of events
 - Primroses appearing earlier



- MONARCH study and follow-ups

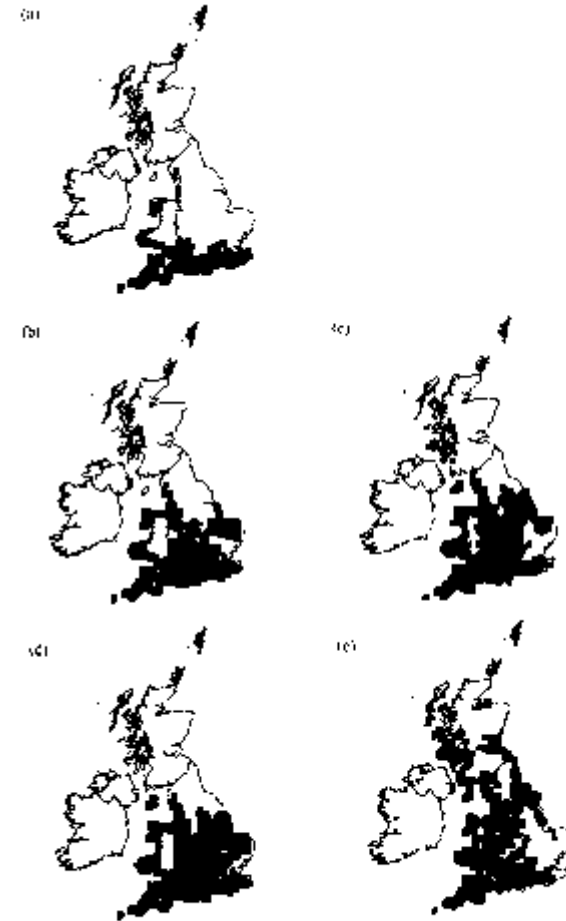


Figure 4.29: SPESDAv1 model results for *Fagus sylvatica* (Beech) for simulated current distributions: (a) 1980-1989, (b) 2020 Low scenario, (c) 2020 High scenario, (d) 2050 Low scenario, and (e) 2050 High scenario, and (f) 2100 High scenario.

Changing stand structure



An aging broadleaved resource

- 1947-2002 Forestry Census data
 - Decline of coppice
 - Re-stocking of felled woods

Reduced management

- Little thinning
- Little maintenance of rides

Bunce results

- Shift to more shaded assemblage
- Reduction in open habitats
- Storm-damaged woods showed species increases



Changes due to internal dynamics



Closed canopy, dense shade, moist microclimate



Increased spp. richness from seedbanks etc

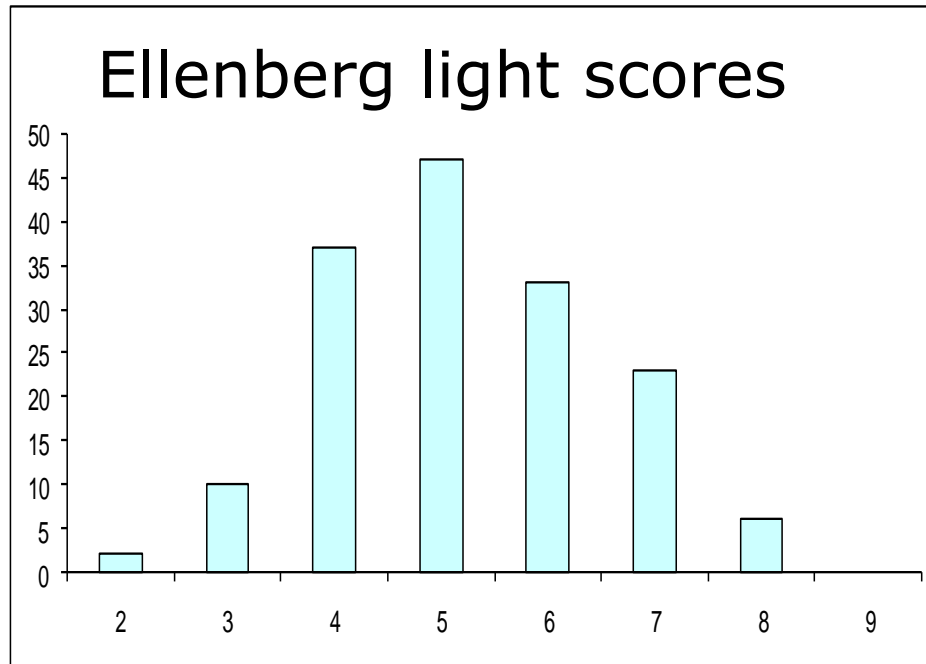
Reduced spp. richness
Increased shade stress

Gap – increased light, temperature, more direct rainfall, lower humidity, higher water table

Woodland specialists also benefit from gaps



Not all necessarily deep shade species



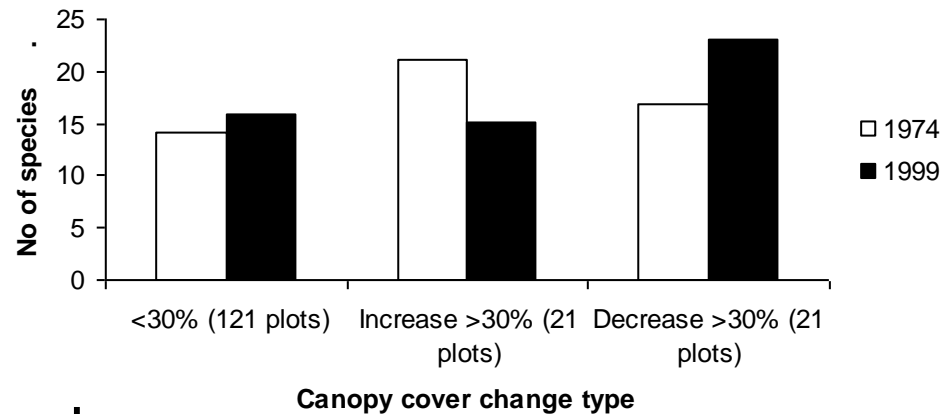
Changing age structure, changing flora



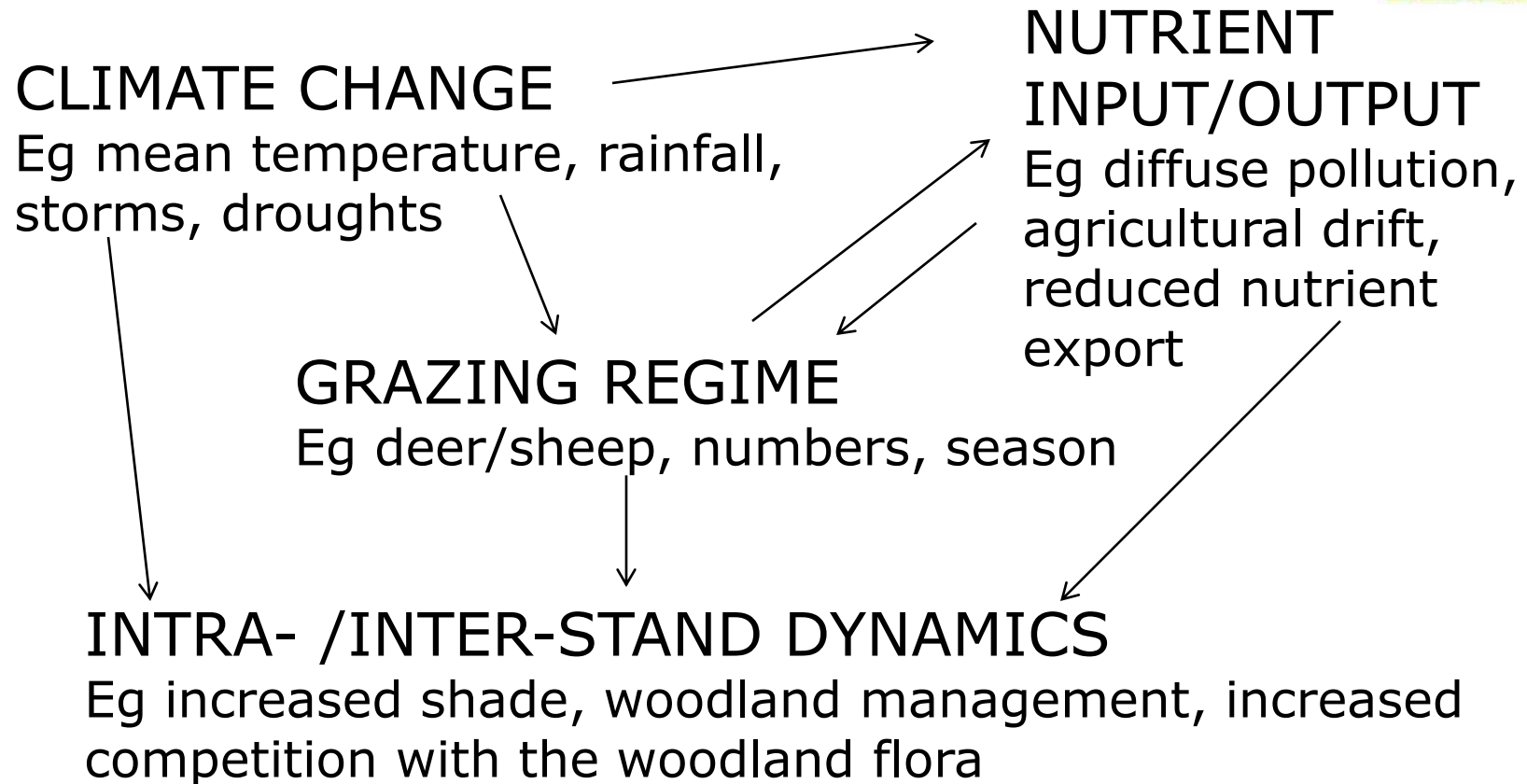
Wytham study 1974-99

- Plots which closed canopy lost species
- Plots becoming more open gained.
- Net change in flora depends on balance of open-closed stands
 - both specialists and generalists.

(b) Species richness



No single cause of change



Conclusion

- Good range of studies
- Woodland plants generally OK at national level
- Habitat area broadly maintained, changes in quality
- Key factors driving change
 - Increased shade, changed age structure
 - Eutrophication (pollution, reduced export?)
 - Increases in deer grazing in lowlands particularly
 - Beginning to see effects of climate change
- Interactions, rather than single factors at any one site

Meanwhile where was the pignut?

- Too late to see it!
- Does tend to be associated with ancient woods, but also ancient meadows



Our debt to 'tramps'



- **The wandering botanist is naturally mistaken for a tramp off the beaten track or for an officious inspector of something or other (Church 1922).**



Thank you!

