Grassland Creation

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Scope

- Habitat creation does not create equivalent sites to old, long-established ones.
- Habitat creation is not a substitute for the Conservation of the best sites.
- But 90% + loss of wildflower-rich grassland, so habitat creation/enhancement very important – bees, butterflies, birds etc

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Assess your site:

- What is round it – habitat types, linkage opportunities – links to Lawton Principles – bigger, better, joined up and more?
- What are the needs of the surrounding habitats or nearby species eg butterflies – is grassland the best solution? Can it act as a stepping stone?
- Do they fit into local landscape scale projects or National Character Assessments (England),
- What is its current ecological character, and how does this want to be changed/enhanced or replaced? What are the desirable and undesirable features
- Are there other features to consider eg. archaeology, geodiversity, other management requirements eg. game, forestry, water catchment, access?
- What are the needs of local people, or future visitors?
- Where will access be for stock, machines and/or people – ie consider future management?
- Where is it?

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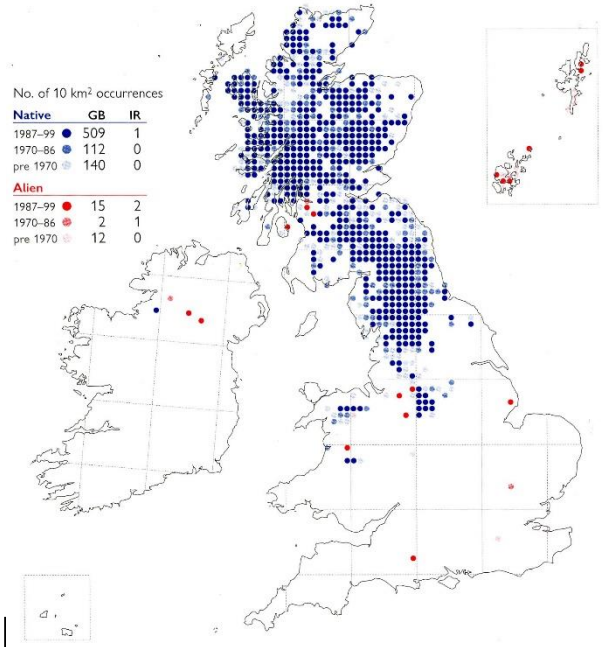
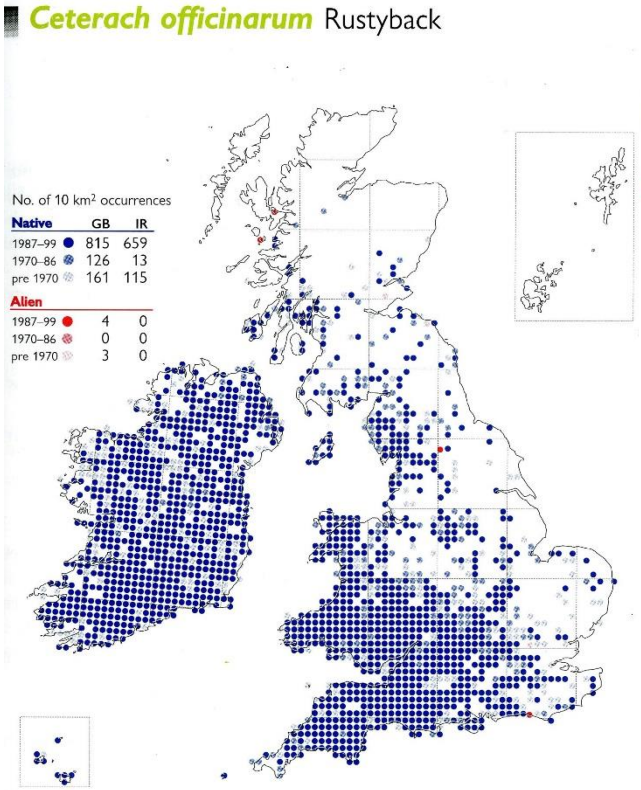
Where is it?

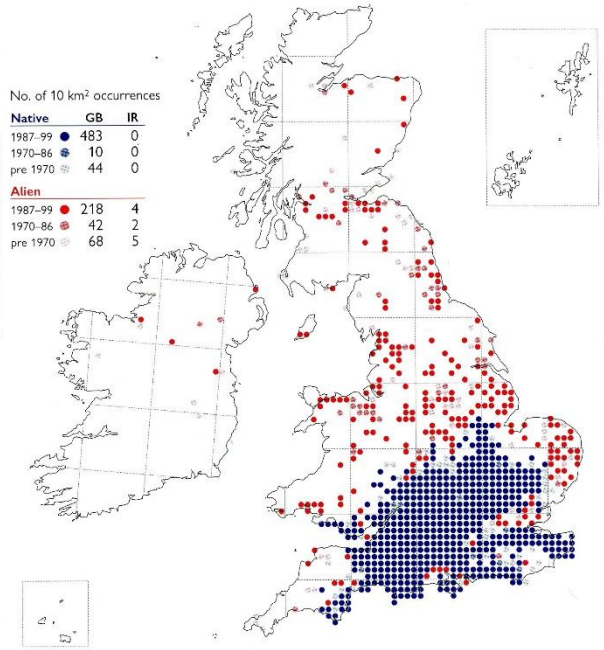
Cirsium heterophyllum Melancholy Thistle



Ceterach officinarum Rustyback



Viburnum lantana Wayfaring-tree



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Set realistic objectives:

- BAP targets or NVC type?
- Particular species eg butterflies, bumblebees ?
- Links, buffer, increased size,
- Reduction of isolation
- Water pollution control
- Reduction of flooding
- Floodplain reconnection
- Amenity & public enjoyment
- Environmental Education
- Interpretation, part of wider scheme eg.
- Archaeology
- Carbon storage & sequestration

Social benefits

- Reduces antisocial behaviour
- Increases well being – reduces stress – flowers, bird song
- Increases self –respect
- Increased value and adoption of local environment
- Increased house values
- Best if local people involved

Costs

- How much money have you to spend?
- What time frame – have you time to prepare soils too high in nutrients or to control invasive or undesirable species, eg thistle or nettle influx?

All these will affect your decisions.

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Physical Parameters

Consider the geology/topography:

- Slope – too steep to mow?
- Stoniness – can you mow or not if you need to?
- Rock type, exposures, influence on soils and drainage?
  Any geodiversity interest to maintain?
- Aspect – there are differences between north and south facing slopes?
- Frost hollows, drainage and flooding (which season)?

Specification was to stone pick here – unnecessary as upland sheep pasture – stone held ground together

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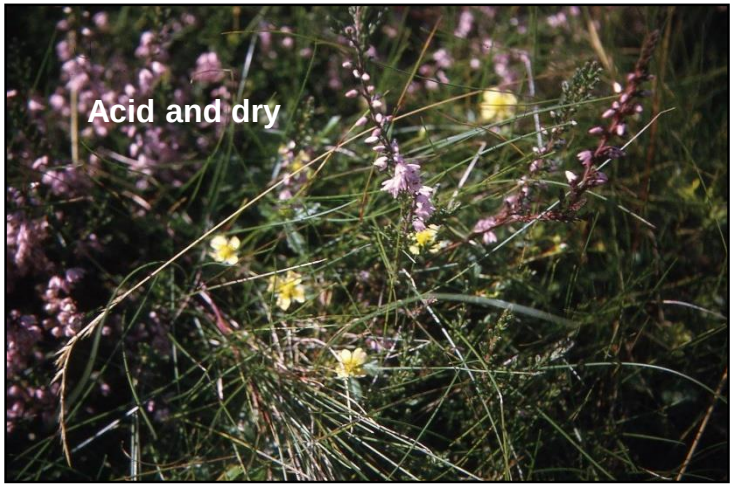
Physical parameters cont…

Consider the soils:-

- pH – critical in determining species mix
- Nutrient levels – too high will be too vigorous and will not be diverse
- Depth – deeper, more resilient to drought but could also produce more vigorous growth
- Type – clay, silt or sandy?
- Wetness/drainage – springs, seasonal flooding? Can you destroy any drains?



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Nutrient levels…

NUTRIENTS

N <0.1%

Index 0	P mg/l or ppm	K mg/l or ppm	Mg mg/l or ppm
0	0-9	0-60	0-25
1	10-15	61-120	26-50
2	16-25	121-240	51-100
3	26-45	241-400	101-175

Need soils with P index 0 ideally, up to c.20mg/l max – but this will be quite fertile. Compare with reference site nearby.

K levels best index not >2, Mg levels not that important

Inorganic N will leach/wash out quickly, higher nitrates may be in organic matter

High Legumes →can increase N

if High P too →increases grass dominance at expense of slower growing species

Top soil on left, subsoil on right – big difference in vigour of grasses and colour of result

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How to reduce nutrients

- crop with rye, barley, ryegrass (silage), adding N, but no P – may take several years
- invert sub and topsoils – deep plough (Woodland Trust)
- flood in winter to remove P?
- strip off topsoil – create mounds, - be creative, but if take off site, need planning permission owing to traffic increases
- Mix topsoils with other materials
- Specify subsoils on new sites – be careful not just rock
- wait – 12-15 years as nutrients leach out

Wildflower meadow with >100 spp on parent material – boulder clay – with whole soil profile removed by mistake, but worked well

Experimental mixing of topsoil with various inert materials Knowlsey College

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Choosing a Grassland Community

- The soil pH, depth, nutrients, topography, location all determine community
- Find local template for guidance (old flora/accounts?)
- Match the site – eg. wet/marsh/dry areas with appropriate species/community
- Create communities that reflect soils, physical conditions
  (use CSR strategy to choose if necessary - Grimes)
- Use locally native species

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Plant establishment options

- **Natural colonisation** –

Need to be within about 10kms

Will take time to colonise - colonisation gaps must remain – best on very nutrient-poor soils with other habitats of suitable spp nearby.

Must not be undesirable seed bank (test this first by growing samples)

- **Sow seed**

- **Add plants**

Miller's Dale NR natural colonisation in old quarry with good grassland all round

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Commercial Seed mixes

- Grasses + broadleaved plants usually 80:20 ratio – is that right for your site?
- Broad leaved plants only – if native grasses colonise naturally?
- Make up your own mix using your template etc
- Buy ready mix –
  - beware of species not in your area,
  - compare seed weight and % by number from different suppliers – seed very variable in size. Seed mix sold by weight, can be very different nos of seed of different species – 80:20 mix = by weight,
- Buy selected spp only?
- Add annuals – only if not needing to cut in summer?
- Yellow rattle to reduce grass vigour?

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Collecting Seed

By hand – collect individually,
involve volunteers/schools
Use paper bags, keep cool & dry, label
place, date

Small machines – brush harvesting
spread seed on sheet, allow invertebrates to disperse
Harvest more than once in season for more spp.
Not all seeds will dislodge. Collect in strips

Store cool/dry – can store till needed

Get permission first if needed

Hand collected for c. 500m^2

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Collecting seed on plant material

Green Hay, concentrated hay – bale or loose, use straight away

Cut and clear material into trailer – only if ground flat

Use quickly

Don’t store

Spread with clean muck spreader or by hand

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Add plants?

- pots, micro-propagation, plugs
  - Those that fail or expensive as seed
  - Involving volunteers
  - Planting rates- 30-60cm spacing, or 0.1-9/m^2,
  - Plant autumn
  - Plant in gaps 25x25cm

Potted plants grown from local cuttings for acid vegetation

Cowslip added – did not spread in dense grass

Succisa + other spp plugs for more vigorous grassland added after seed mix grew

Ground Preparation

Questions to ask…

- Are the existing species desirable – on which case do not destroy?
- Will they out-compete your desirable species – if no, do not destroy, if yes, remove first?
- Will they have a seed bank, or recover from rootstocks etc and become a problem later?
- Does this matter?

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Ground Preparation – consider future management:

- **Options**
- Herbicide – to remove undesirable plants – no need otherwise
- Cut material and clear arisings
- Scarify/disc harrow – need 30-50% bare in colonisation gaps
- Rip if heavily compacted or power rotovator
- Cultivate completely –to fine tilth
- Do nothing – only if colonisation gaps present & surface suitable?

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Seed mix sowing rates

Whole mixes

- 40, 30, 20, 15 or 10kg/ha?
  - Grass 50-80%, or as it comes
  - At lower rates, can afford more wildflowers, less grass, use where colonisation gaps will last
  - Broadleaved only – 0.5 to 1gms/m^2 (5-10kg/ha)
- Allow for chaff if collected seed
- Yellow rattle – 0.5-2.5kgs/ha (target 100-200 plants/m^2)
- 1:2 or 1:3 for green hay to field ratio
- 1gm/m^2 for annuals to seed mix, or 5gm/m^2 alone

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Sowing

- Seed sown on surface – different sizes of seed
- Bulk up – sawdust, sand, barley meal (beware birds will eat this),
- Divide into portions so don't run out!
- By hand, fiddle or machine-towed rotary spreader, or precision drill (needs cleaned seed), best on surface not buried
- Apply roller (Cambridge roller has ridges), rake lightly or nothing
- Sow in late August/September except areas which flood, waterlogged in winter, in Scotland or at high altitude.
  - ❖ Need to sow so that plants can establish before frosts.
  - ❖ Some need winter cold to germinate eg yellow rattle, cowslip
  - ❖ Add annuals if not too vigorous for 1st year colour

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Aftercare and Management

All sites will need management–possibilities in the first two years include:

- Adding additional seed or plants to replace failures
- First year – top if necessary or light graze to control larger annuals and invasives? Allow up to 4 cuts with arisings removed
- Subsequent years - cut annually in autumn & remove arisings or graze or cut for hay then aftermath graze or cut in spring, remove arisings
- Cut at end of season if low nutrients, prefer cutting in autumn so maximise invertebrate/small mammal value, unless hay crop or grazing used
- Cutting times will need to tie in with objectives eg for people, or fire prevention in urban areas
- Cut edges and paths – people prefer tidy appearance

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Management cont…

- Managing water
- Controlling invasive, undesirable species (plants and animals)
- Controlling competitive species
- Managing and controlling stock – securing fences etc
- Managing people, dogs, rubbish etc
- Promoting the site as relevant
- Working with people to enjoy the site/use it/benefit from it – health and wellbeing agenda

Stansted Airport Grasslands

1. On Subsoil…

Over 100 spp recorded, usually 70-80/year, sown from hay field mix southern marsh orchid appeared, sulphur clover (locally rare) and pyramidal orchids spread in. Cut and cleared autumn annually, rabbits present

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Stansted Airport Grasslands cont…

Wildflower seed sown on road banks on stored topsoils, growing well. Broomrape colonised. Some MG5 within 10 years

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A Small Meadow

First year 1999- many annuals - small

Patchy establishment

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A Small Meadow cont…

More even, better populations after about 7 years, 67 higher plants (in 500m^2), 37 of 40 sown spp (hand collected) established, 6 then lost, 3 spp orchids after 16yrs

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Small meadow data

- Spp nos/100cm2 quadrat increased from 9.34 to 12.4 over 12 yrs, dropped to 5.73 2018
- Knapweed and bird's foot trefoil % cover (n=30, random quadrats)
- Cover becomes less patchy over time

	Knapweed	bird's-foot trefoil
2003	2.66	1.00
2005	3.29	2.86
2007	12.33	0.83
2009	6.4	3.53
2011	6.00	2.5
2012	6.67	3.33
2014	5.33	4.97
2015	10.77	3.83
2016	5.40	5.17
2017	5.37	5.73

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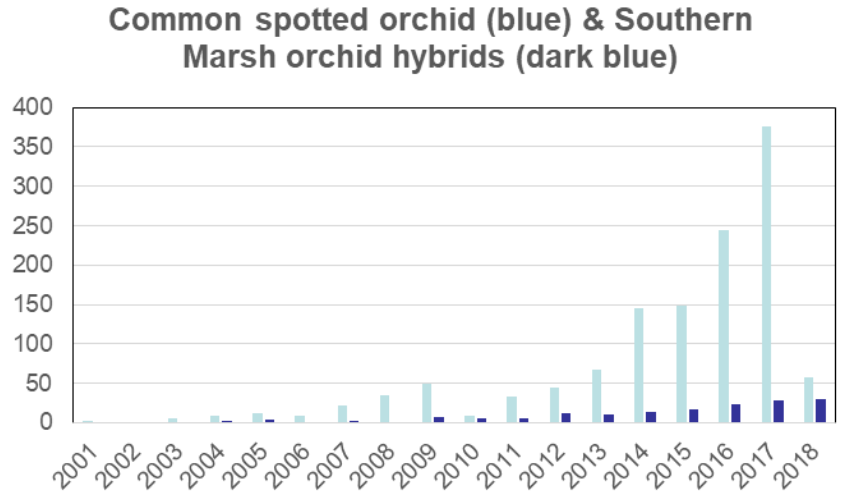

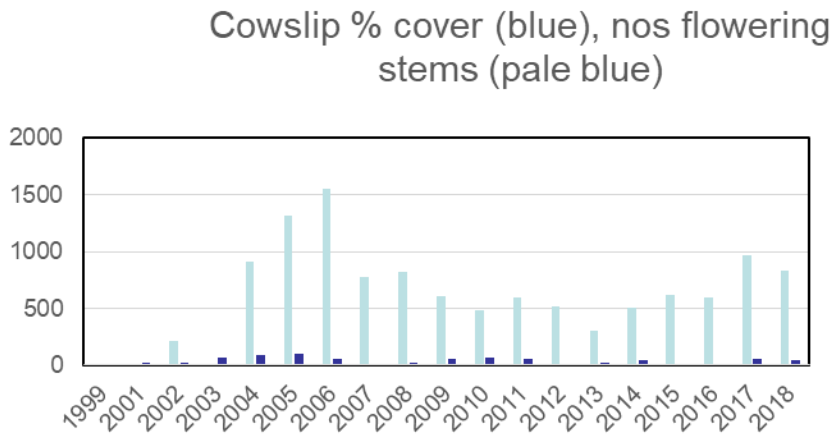

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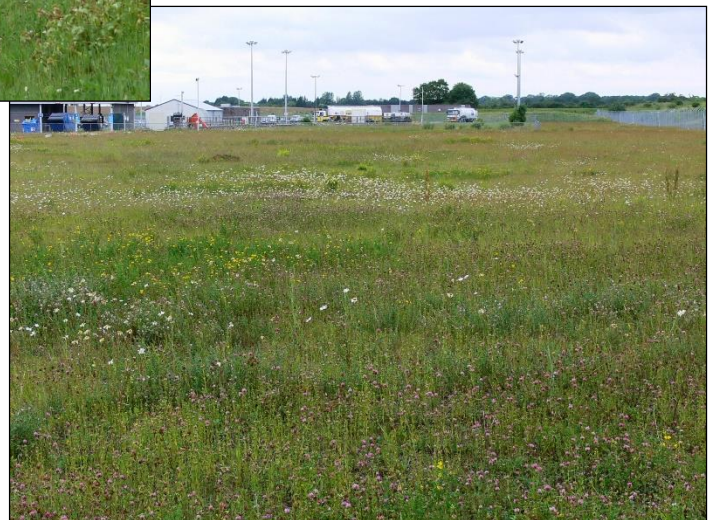
Changes over time

- Nutrients can reduce over 10-15years
- MG5/1 affinities within 10 years
- White clover can reduce in time
- Plants spread
- Vegetation affected by weather – drought 2018

Red (LHS) and white clover (RH) cover

2003	2.00	15.43
2005	10.6	3.14
2007	6.17	2.33
2009	10.33	6.2
2011	21.17	8.57
2012	19.83	2.17
2014	15.17	1.50
2015	15.77	1.20
2016	15.80	0.37
2017	16.50	0.20
2018	1.83	0



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Don’t Forget to Monitor

- Photographs, fixed point – label and date?
- Look/see/what needs to be done
- Assessment – Condition assessment criteria?
- Farm Environment Plan guidance (NE in England)
- Quadrats/transects for butterflies/bumblebees/birds?
- WRITE UP THE RESULTS- at least in the files

What don’t we know?

- Creating wider range of grassland communities
- Variability of establishment & persistence
- Role of mycorrhizal associations
- Factors affecting population fluctuations
- Ability of invertebrates to colonise
- Dealing with high nutrients levels