How does the impact of grazing on lowland heath compare with other management methods?


Background

- The Policy context
- Systematic review
Sources of evidence

- Evidence that does not meet inclusion criteria (e.g. upland studies)
- Evidence that does meet inclusion criteria:
  - Studies with comparators (i.e. well-designed research studies)
  - Studies without comparators (e.g. monitoring data, poorly-designed research studies)
  - Observations made by heathland managers
Systematic search strategy

- Electronic database searches
- Web searches
Inclusion criteria

- Relevant studies- with a range of outcomes and quality
- With comparators
- Change over time
- Informal monitoring
- Opinion
Search results

- 3431 references bibliographic databases (+ ~100 relevant references from web searches*)
- 92 (<3%) relevant of which 10 have comparators (to date)
- Burning (3), grazing (3), cutting (2), grazing & burning (2)
1. Studies with comparators

## Comparative data: Burning- what can we extract?

<table>
<thead>
<tr>
<th>Reference</th>
<th>Outcome</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>no burning for &gt;20 years</td>
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<tr>
<td></td>
<td></td>
<td>cut 10cm</td>
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<tr>
<td>Barker et al.</td>
<td>Change in Cv cover (33months)</td>
<td>34</td>
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<tr>
<td>Brian</td>
<td>Change in bare ground</td>
<td>-2.412</td>
</tr>
<tr>
<td></td>
<td>Ericoids</td>
<td>4.083</td>
</tr>
<tr>
<td></td>
<td>Ulex</td>
<td>-0.045</td>
</tr>
<tr>
<td></td>
<td>Graminoids</td>
<td>-0.534</td>
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<tr>
<td></td>
<td>Bracken</td>
<td>-0.34</td>
</tr>
<tr>
<td>Bullock and Web</td>
<td>11 years post fire monitoring</td>
<td>Calluna cover</td>
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<tr>
<td></td>
<td></td>
<td>83.4</td>
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<td></td>
<td>Graminoid cover</td>
<td>10.9</td>
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<tr>
<td>Lippe</td>
<td>Change in bare ground</td>
<td>-51.7</td>
</tr>
<tr>
<td></td>
<td>Ericoids</td>
<td>52.8</td>
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<tr>
<td></td>
<td>Graminoids</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Burning

- Post fire successional sequence is validated but why and how does it vary?
- The studies themselves are too varied to tell us!
Grazing

- Grazing can achieve conservation objectives….
- but when where and how should it be applied?
Cutting

- Yes cutting arrests succession....
- But how does it compare to grazing?
2. Studies without comparators

- 82 studies identified without comparators
- Extraction of information from these sources still ongoing
- Are there any monitoring data available?
3. Observations made by heathland managers

- A questionnaire has been developed and is currently being circulated.
- Questionnaire aims to assess impacts on key habitat variables, derived from JNCC Common Standards Monitoring Guidance, EN 271 and EN 497.
- Your help would be appreciated!
Habitat variables

Bare ground (%)
Ericaceous dwarf shrub cover (%)
Growth phase of ericaceous dwarf shrub cover (% in each phase)
Height of ericaceous shrubs
Spatial heterogeneity in ericaceous shrub structure
Ulex cover (%) and height
Graminoid cover (%) and height
Abundance of grass tussocks (% cover or density)
Structural continuity between heather and grass habitats
Forb cover (%)
Bryophyte cover (%)

Habitat variables

Lichen cover (%)
Cover of exotic species (%)
Cover of bracken (%)
Abundance of tree and shrub saplings (% cover)
Presence of accumulated decomposing vegetation or litter layer
Proximity to woodlands
Pond margins; number of ponds and pools present
Dung (type and frequency)
Presence of overgrazing indicators (trampling, paths etc.)
Presence of other disturbance (habitat erosion, presence of drains, fires, use by dog walkers)
Integration of evidence

- Aim is to compare evidence from different sources
- Also to integrate different lines of evidence
- This can be supported by modelling approaches (e.g. Bayesian Belief Networks, BBN)
Development of a heathland BBN

- Bayesian Belief Network provides a tool for modelling relationships between variables as probabilities
- Useful method of integrating different sources of evidence
- Can also be used to support decision-making, by identifying outcomes of interventions
Development of a heathland BBN
Conclusions

- Systematic review methodology can be used to gather information on heathland management whilst minimising bias.
- There is insufficient “high quality” evidence to make firm conclusions about the impacts of grazing on heathland.
- Other sources of evidence, such as experience of heathland managers, are therefore important to collect.
Conclusions

- Bayesian Belief Networks offer the opportunity to integrate and explore different sources of evidence.
- But why do we not have a single experiment that compares cutting, grazing and burning? Should there be one?
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