# *COI Update - Monitoring biodiversity responses to peatland restoration*

David Douglas (RSPB), Iain Diack, Ian Crosher & David Glaves (Natural England), Nick Littlewood, Pete Jones (NRW), Mat Buckler (Peak District NP), Emma Goodyer (IUCN), Richard Lindsay (UEL) – and others!

## *Terms of reference*

1. What monitoring is currently undertaken at UK peatland restoration sites?
2. Review the monitoring of biodiversity responses to peatland restoration in the existing literature.
3. Provide a critique of whether current biodiversity monitoring is adequate to allow robust examination of responses to restoration. Where necessary, identify required improvements in monitoring (target taxa, methodologies, timescales).
4. Develop guidance for future monitoring of biodiversity responses to restoration that will yield analysable data

*Photo: IUCN UK Peatland Programme*

# *Monitoring biodiversity responses to peatland restoration*

## Methodology – gathering information

- Core expert group
- Questionnaire survey (limited to biodiversity)
- Literature review
- Face to face meeting of wider expert group

# 1. What restoration monitoring is currently undertaken at UK peatland sites?

*Response to questionnaire survey (n = 12, with 43 monitoring 'elements') – resources*

- Proportion of spend per site allocated to biodiversity monitoring ranged from 0.3% - 37.7%, average 8.9%.
- Excluding the 'highest proportion sites' (37.7% and 5%) yielded a tighter range of 0.3 – 1.1% of total budget/site, average 0.7%.
- Staffing: volunteer effort critical (74% of 'projects'), with project staff accounting for 65% and contractors only 21%.

***Comparison against 3 recent/current LIFE projects***

*"……actions (C actions) must lead to a measurable improvement of the conservation status of the species/habitats or the biodiversity problem targeted by the project. Monitoring these effects should take place throughout the project…."* (LIFE Guidelines for Applicants 2016).

- Anglesey & Llyn Fens LIFE project (2007-2013): biodiversity monitoring 0.7%.
- New LIFE for Welsh Raised Bogs (2017-2021): all ecological/hydrological monitoring 3.5%.
- Marches Mosses Raised Bog Restoration Project: all ecological/hydrological monitoring 2.5%.

# 1. What restoration monitoring is currently undertaken at UK peatland sites?

*Response to questionnaire survey (12 returns covering 43 monitoring elements)*

- Wide range of monitoring activities, covering 8 broad taxonomic groups.
- Monitoring frequency similarly varied: vegetation 1 - 5/6 years, invertebrates 1-5/6 years, mammals, reptiles and amphibians annual only, birds 1-10 years. Within season/year frequency also varied.
- Extent to which 'indicator' species are used quite variable – *Sphagnum* monitored in 5/6 blanket bog and 3 / 4 lowland raised bog projects.
- Range of methodological approaches varied: 4 main types across the 11 vegetation studies, with 5 for invertebrates and 6 for birds.
- Post restoration monitoring variable – though is cited for 67% of the monitoring elements.
- Have methodologies changed substantially during projects? Yes for 11 out of the 43.
- Funders only stipulated a focus on a specific taxonomic group/attribute class in 3 out of the 43 elements.

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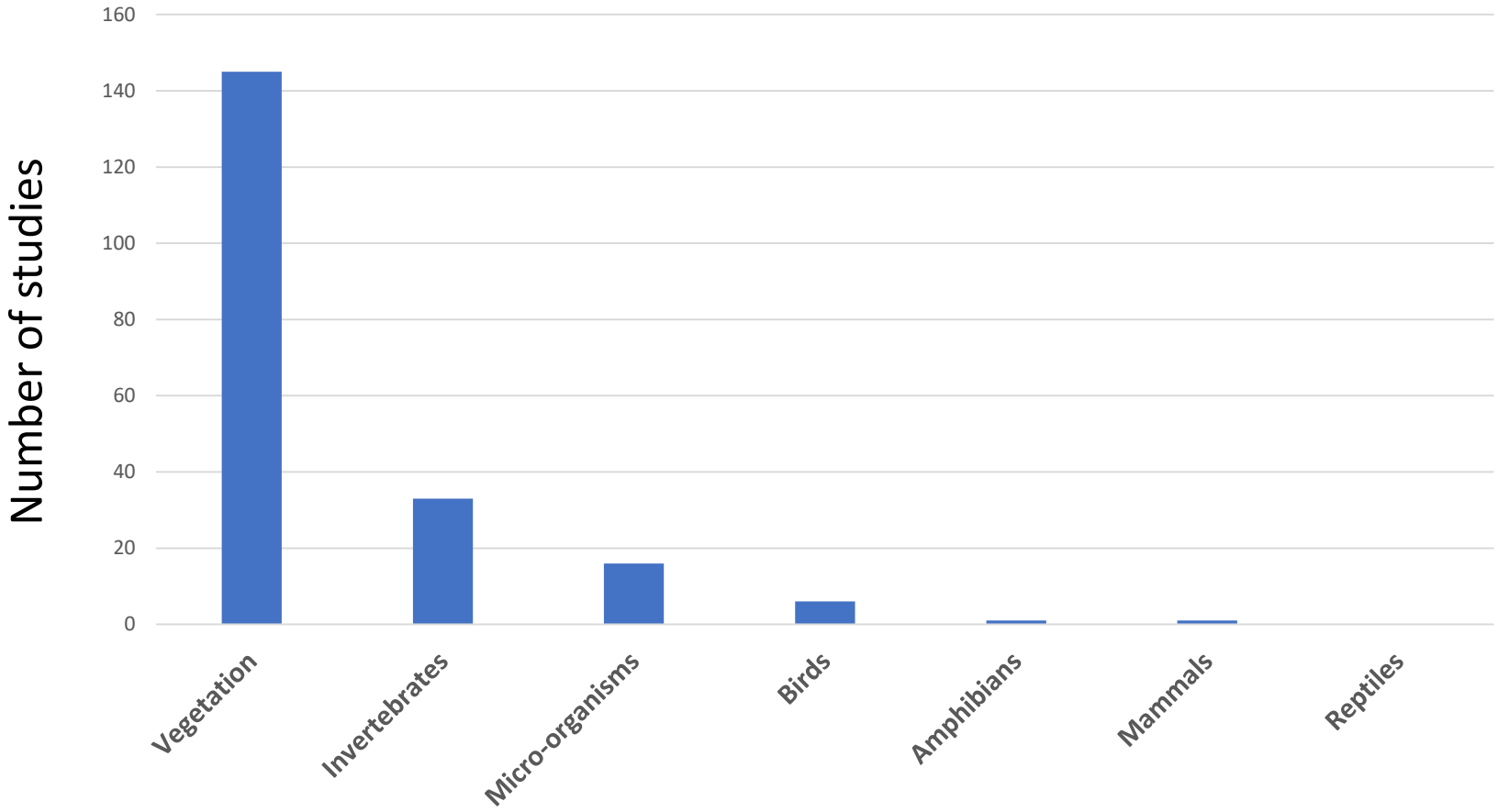
# 2. Review the monitoring of biodiversity responses to peatland restoration in the existing literature.

- Defined question of interest: “How does biodiversity respond to restoration”.
- Initial suite of 822 papers identified and narrowed down to 179 studies – full analysis to be published.



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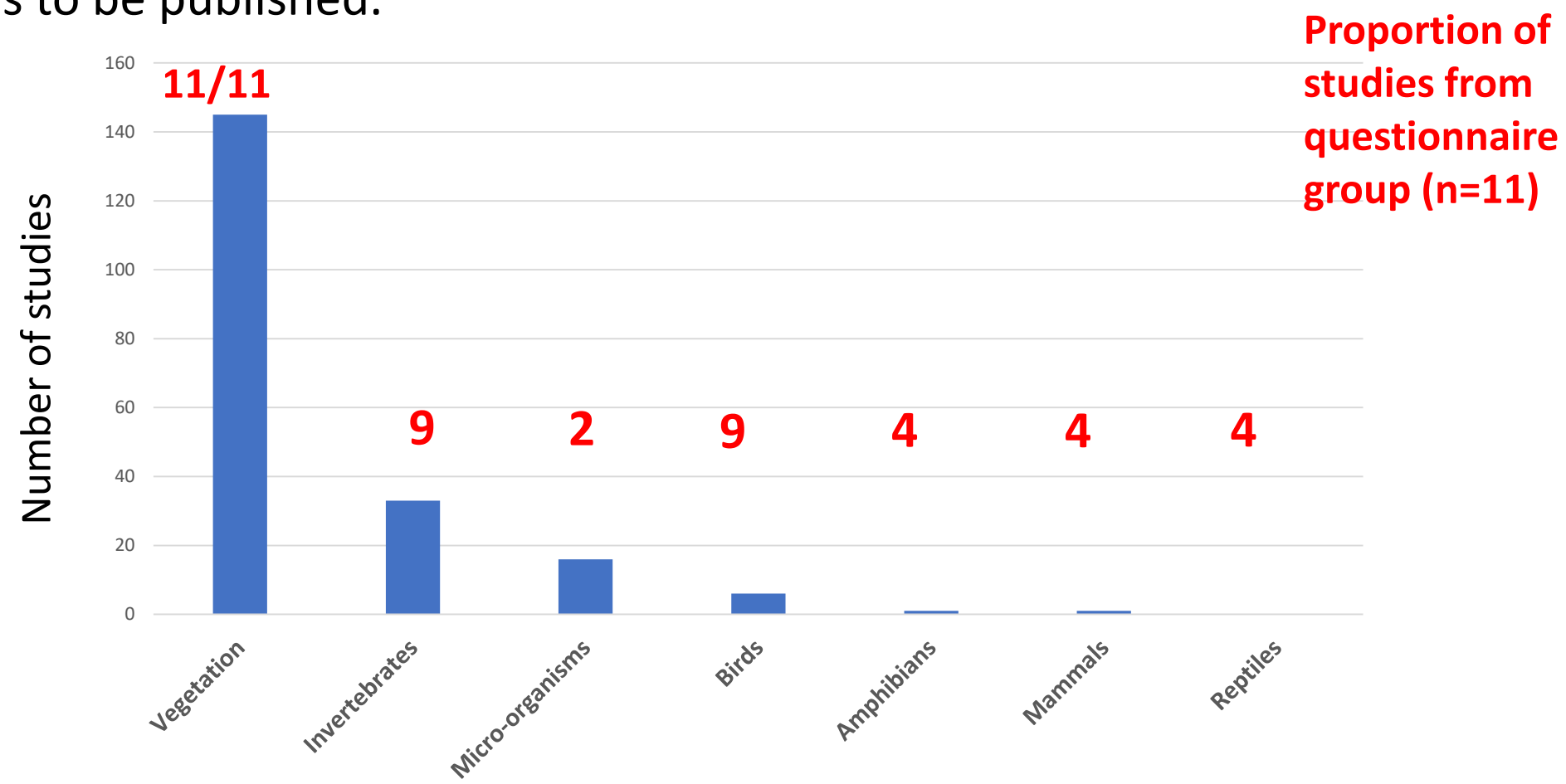

# 2. Review the monitoring of biodiversity responses to peatland restoration in the existing literature.

- Duration of studies very variable.
- Observed responses in relation to expected trajectories are not always consistent across sites.
- Wide range of methodological approaches used.

| Group | N | Study duration (yrs) | Response: none/ -ve/ inconsistent | Response: +ve | Attributes employed |
|---|---|---|---|---|---|
| Microbes | 14 | 1 - 63 | 5 | 9 | Species abundance, biomass, function, community response |
| Birds | 6 | 9 - 19 | 1 | 5 | Species abundance, N breeding pairs, community response. |

**3. Is current biodiversity monitoring adequate to allow robust examination of responses to restoration?** *Focussing on taxa, methodologies, power, timescales*.

***Timescales***. Short duration of many studies a clear limitation (funding!).

"*Successful restoration must meet the goal stated by the U.S. National Research Council (NRC, 1992): 'to emulate a natural, functioning, self-regulating system that is integrated with the ecological landscape in which it occurs'. It will encompass returning the ecosystem to the structure, function, trophic organization, and biodiversity characteristic of its type".*

*"Reflecting the timescales involved in restoring peatland function, monitoring will be required over several decades*" (Gorham & Rochefort, 2003).

# 3. Is current biodiversity monitoring adequate to allow robust examination of responses to restoration?

## *Study designs & sampling methodology*

| | BACI | CI | BA | A | O | Total |
|---|---|---|---|---|---|---|
| | Before-After-Control-Impact | Control - Impact | Before - After | After only | Other | Responses x no of 'taxa' |
| Number | 4 | 4 | 6 | 9 | 20 | 43 |

Response to question "are data sufficiently robust to test biodiversity responses?"

- Vegetation 7/11, invertebrates 2/9, birds 4/9

# 4. Develop guidance for future monitoring of biodiversity responses to restoration that will yield analysable data

***Requirement for standardisation***

"Due to the lack of any common monitoring protocol across peatland restoration sites in the UK, we relied on perceived effectiveness, rather than a standardised measure of observed effectiveness. Future peatland restoration projects should consider adopting a common protocol for recording changes"

(Artz *et al*. (2018). *Peatland restoration – a comparative analysis of the costs and merits of different restoration methods* . ClimateXChange Report

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# 4. Develop guidance for future monitoring of biodiversity responses to restoration that will yield analysable data

***Definition of objectives***

- The restoration goals and objectives of the project need to be agreed and defined before the monitoring techniques are selected, and before any restoration work starts (NE report)

***Funding***

- Better resourcing: (i) higher proportion of funding allocated to monitoring, (ii) funders to identify a clear requirement for monitoring – and invest in standardisation, (iii) post-restoration monitoring becomes the norm.

***Earth observation***

- Need to adopt ground-based methodologies that are better integrated with EO.

***Duration***

- longer term data monitoring protocols should be prioritized to support more in-depth cost benefit analysis over the full life-time of rewetting to stable condition (Artz et al., 2018).


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***Co-location***

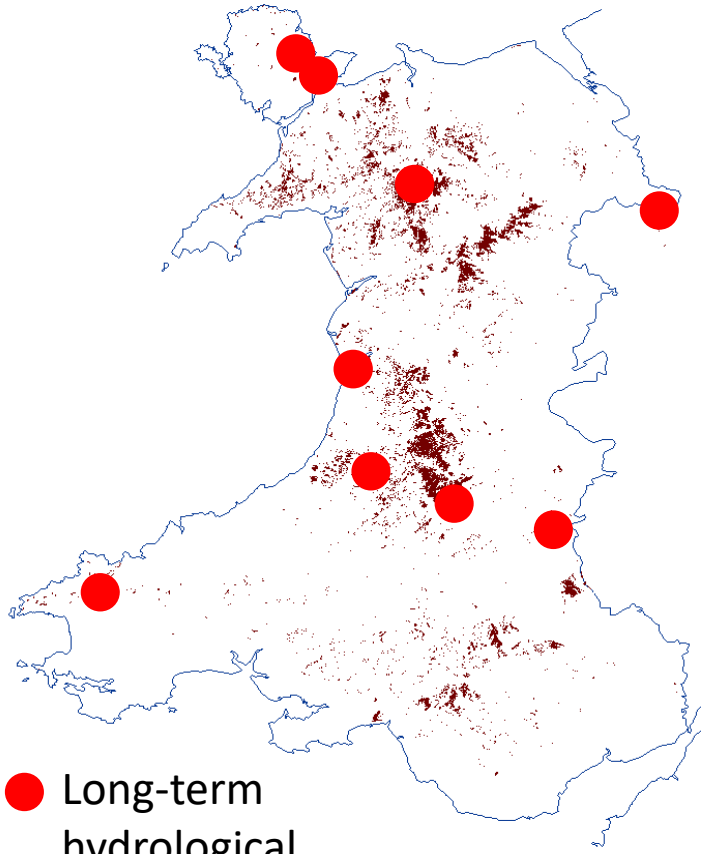
- Are the benefits of co-location (e.g. hydrology and biodiversity) reflected in designs?

***Rigour & clarity in describing ecological context***.

- Lindsay *et al* (2014 – *IUCN Briefing Note no 2*) "The majority of recent scientific literature does not provide adequate ecological descriptions of the sites under investigation".

***Standardisation of methods***.

- Use of indicators (e.g. Sphagnum cover) to track recovery in meeting pre-determined targets or 'milestones' at set time intervals along a 'trajectory' towards 'favourable condition'.
- Use of BACI or at least CI or BA designs with a minimum of 1 year (season) pre-restoration monitoring.
- Better standardisation of techniques for taxon/attribute groups.
- Overall requirement for a tapered suite of methodologies – from basic to exemplar.



Long-term hydrological monitoring of peatland sites

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# 4. Develop guidance for future monitoring of biodiversity responses to restoration that will yield analysable data

***Coordination*** - biodiversity monitoring at UK peatland restoration sites is co-ordinated to ensure:-

1. consistency of approach,
2. data validation & adherence to data standards,
3. sharing of data between parties and across platforms,
4. efficient storage and use of data, including meta-analyses and the development of products such as EO techniques and models.
5. To enable better understanding of inter-site differences in response across comparable contexts.
6. To minimise obvious duplication of effort

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