

# How does post-industrial land regeneration in the North East contribute to Biodiversity Net Gain in England?



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## Background

- Restoration of former mining sites aims to enhance biodiversity.<sup>[1]</sup>
- However, few studies provide empirical evidence of success, and technical challenges exist to effectively measure losses and gains owing to mining.<sup>[2]</sup>
- New processes and policies are emerging to both encourage and enforce effective conservation action, such as Biodiversity Net Gain under the 2021 Environment Act.<sup>[3]</sup>
- Assessment of measurable biodiversity indicators can be used to monitor levels of recovery and added value provided.<sup>[4]</sup>
- As a habitat-driven approach, there are concerns BNG could neglect important components of ecosystems, such as invertebrates, and will not be effectively monitored or enforced.<sup>[5]</sup>

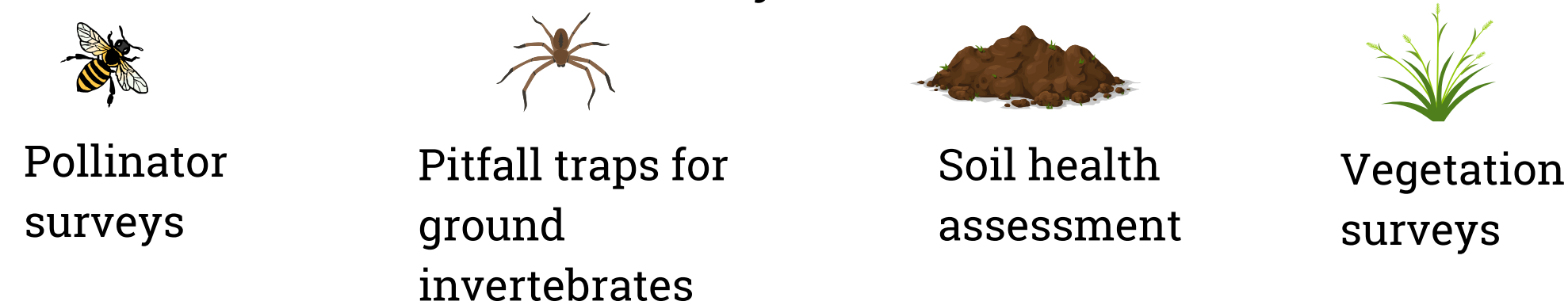


Credit: Rosie McCallum

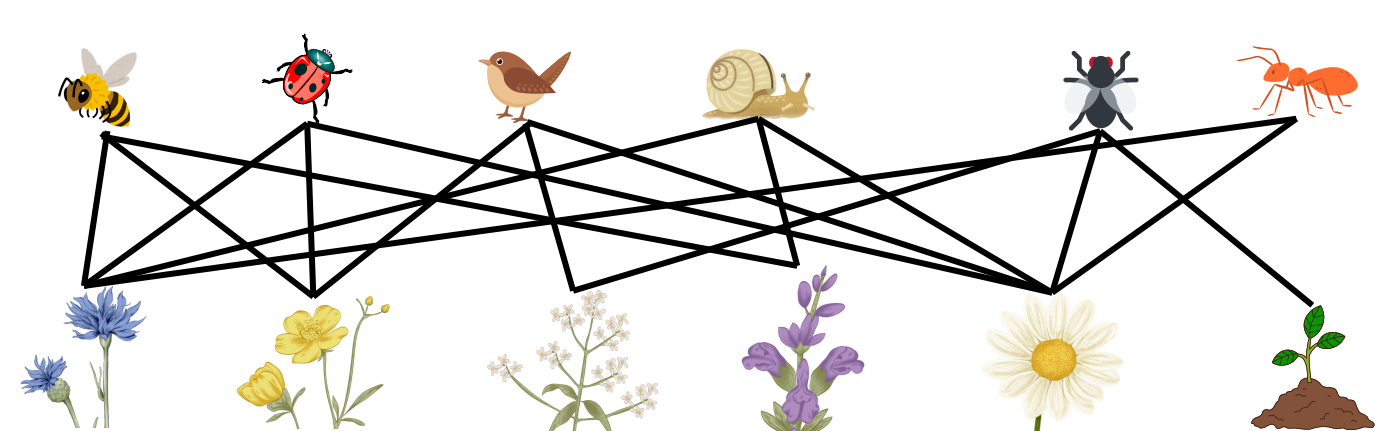
1. Fernandes, K. et al. (2018) "DNA metabarcoding-a new approach to fauna monitoring in mine site restoration," Restoration Ecology, 26(6), pp. 1098-1107.  
2. Sonter, L.J., Ali, S.H. and Watson, J.E. (2018) "Mining and biodiversity: Key issues and research needs in conservation science," Proceedings of the Royal Society B: Biological Sciences, 285(1892), p. 20181926.  
3. Environment Act (2021), c. 30.  
4. Department for Environment, Food and Rural Affairs (2022) "UK Biodiversity Indicators 2022".  
5. Duffus, N. et al. (2024) "Leveraging biodiversity net gain to address invertebrate declines in England" [Preprint].

## Research themes

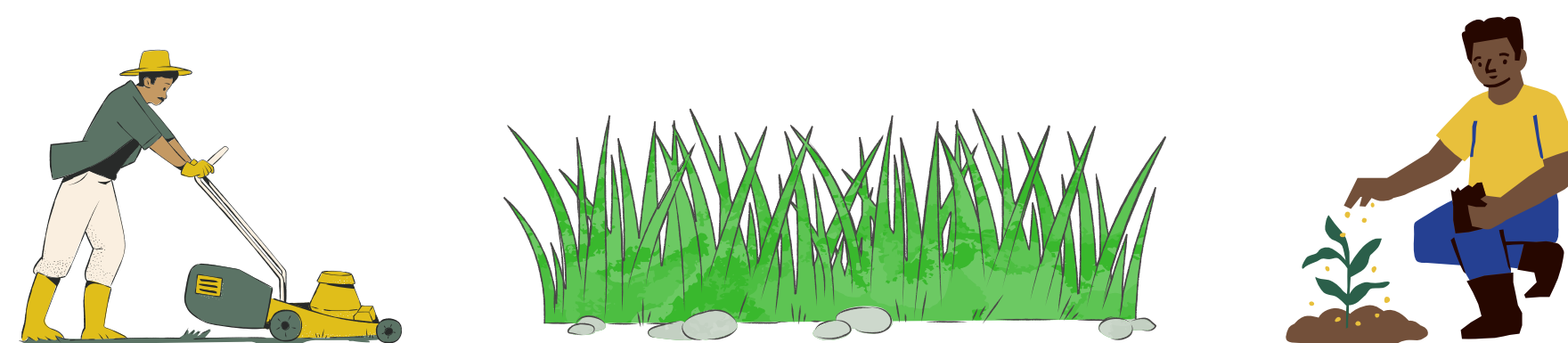
### 1. Measures of biodiversity and BNG



### 2. Ecological complexity and BNG



### 3. Management approach (passive or active) and BNG



## Sites

Two former opencast coal mining sites, now owned and managed by Northumberland Wildlife Trust, at different stages of restoration.

### West Chevington

- Taken into ownership by NWT in 2021.
- More passively managed.



Credit: Rosie McCallum

### East Chevington

- Taken into ownership by NWT in 2003.
- More actively managed.



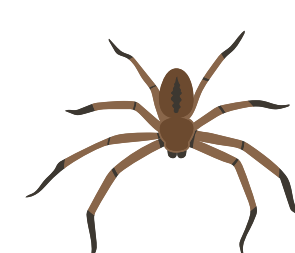
Credit: Rosie McCallum

## Methods



### Pollinator surveys

- Insects visiting flowers along a transect are collected for identification to species level.
- Conducted three times in survey season to account for seasonable variability.



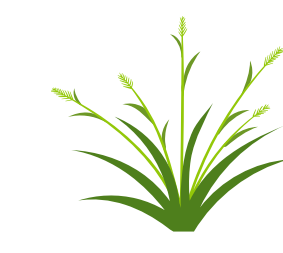
### Pitfall traps

- Traps with potassium chloride solution deployed at 6m intervals along transect for 48 hours.
- Invertebrates in traps identified to species level (focus on Arachnida and Coleoptera).



### Soil health analysis

- Samples taken along transects for lab analysis of:
  - bulk density, texture, and moisture
  - organic matter and carbon
  - nitrogen and phosphorus
- VESS structural analysis



### Vegetation surveys

- Species identification in 1x1m vegetation plots along transects following National Vegetation Classification guidelines.

