Beyond Biodiversity
Quantifying the resilience of rewilded freshwater landscapes

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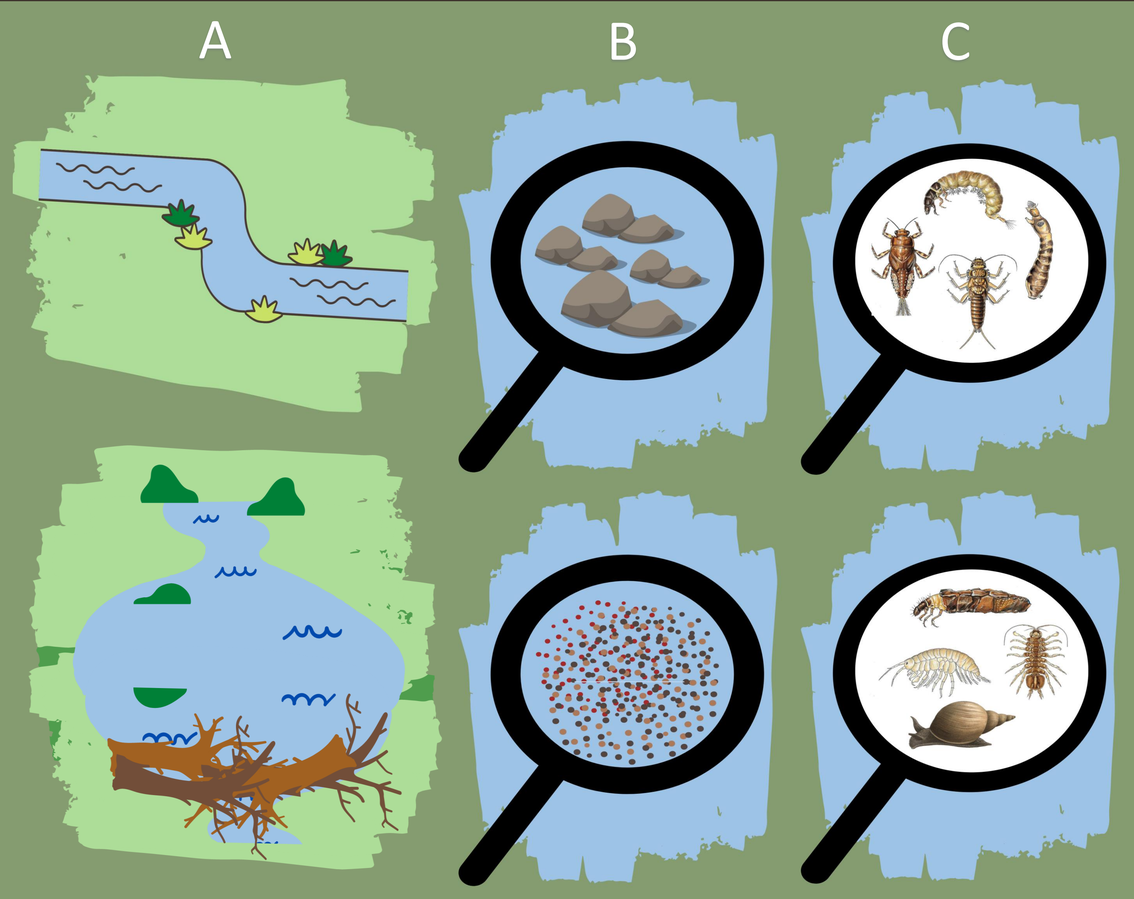
Introduction:

- **Rewilding aims to restore degraded ecological processes, but many projects fail to restore ecosystem functioning.**
- **Studies have assessed success based on changes to biodiversity by calculating species richness. However, the literature now suggests that species functions, which drive ecological processes, should be assessed by calculating functional diversity and redundancy.**
- **Beaver dams create ponds, regulate flows, increase sedimentation, decrease shading and increase emergent vegetation which creates dynamic habitat heterogeneity (A & B).**
- **This project will therefore assess the long-term changes in functional diversity during beaver rewilding across different, temporal and spatial scales, to determine whether changes in functional redundancy improve the resilience of freshwater ecosystems.**

Chapter One

Aim: To assess long term changes in species richness and functional feeding groups to a previously degraded agricultural stream after twenty years of beaver rewilding.

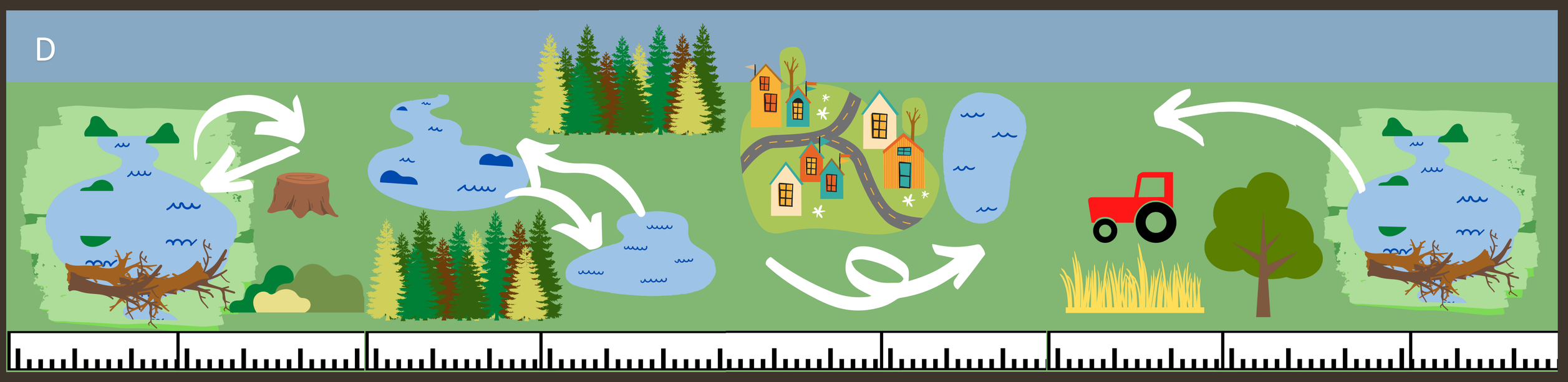
- Law (2016) found that beaver ponds increased the landscape scale biodiversity by 28% compared to unmodified landscapes.
- Functional feeding groups shifted from scrapers and filter feeders (blackfly, mayfly and stonefly typical of rivers) to shredders and collectors (hog louse, shrimp and snails typical of ponds) (C).
- The site has continued to change therefore a series of beaver ponds will be re-sampled and compared to provide a unique investigation of the long term (20+ years) changes to macroinvertebrate biodiversity after beaver reintroductions.



Chapter Two

Aim: To quantify the functional diversity of beaver ponds over time to estimate the change to ecosystem resilience.

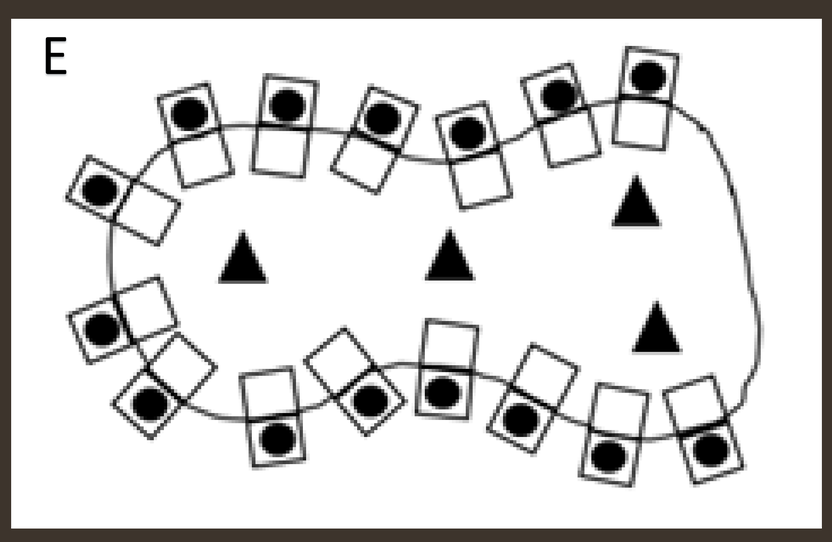
- Methodologies are shifting away from relying on species richness estimations to focus on functional diversity and redundancy when assessing rewilding.
- Functional redundancy, where there are multiple species conducting the same ecological function compared to several species each conducting sperate functions, has been suggested to increase ecosystem resilience and stability.
- The resilience of beaver ponds and unmodified streams will be assessed by comparing the functional diversity present within both habitats across seasons over a ten-year period.



Chapter Three

Aim: To investigate whether rewilded beaver ponds are more functionally diverse, and resilient, than other non-beaver ponds at a landscape scale.

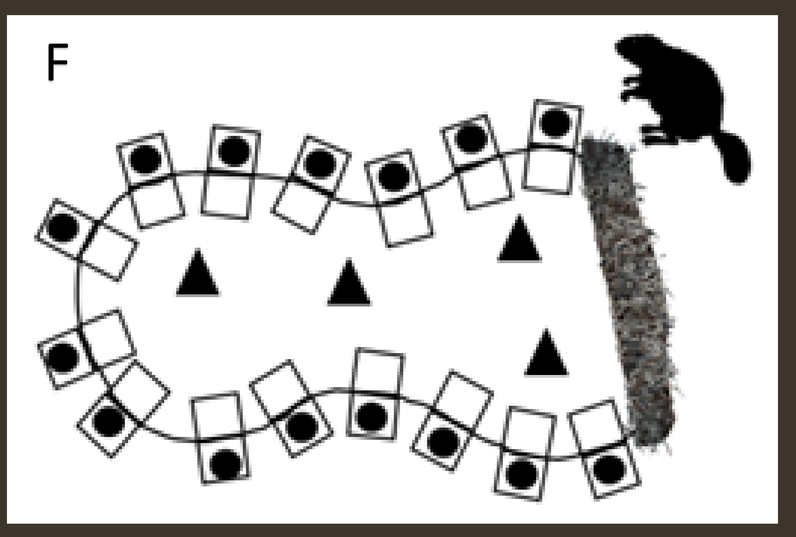
- Beaver ponds can increase landscape diversity and support distinct species compared to unmodified streams.
- No study has yet compared beaver ponds to other ponds within a degraded agricultural landscape (D).
- Important to understand the landscape connectivity and dispersal between beaver ponds and other ponds in the landscape (D).



Chapter Four

Aim: To investigate the difference in aquatic to terrestrial subsidies between beaver and non beaver ponds using stable isotope analysis.

Figure E and F: Experimental design with beaver pond (left) and non-beaver pond (right). Black circles represent pitfall traps for sampling beetles and spiders, black squares are the locations of 1 m^2 quadrats for plant surveys on the terrestrial and riparian side of the pond edge, and black triangles are aquatic emergence traps for measuring aquatic invertebrate productivity which will be rotated between four locations on the pond. Sweeping for aquatic invertebrate will be undertaken in ten locations across each pond.



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