

COLLECTING SCIENTIFIC KNOWLEDGE FOR CONSERVATION DECISION-MAKING

Sustainable wildflower meadow planning and implementation of rewilding conservation in County Durham

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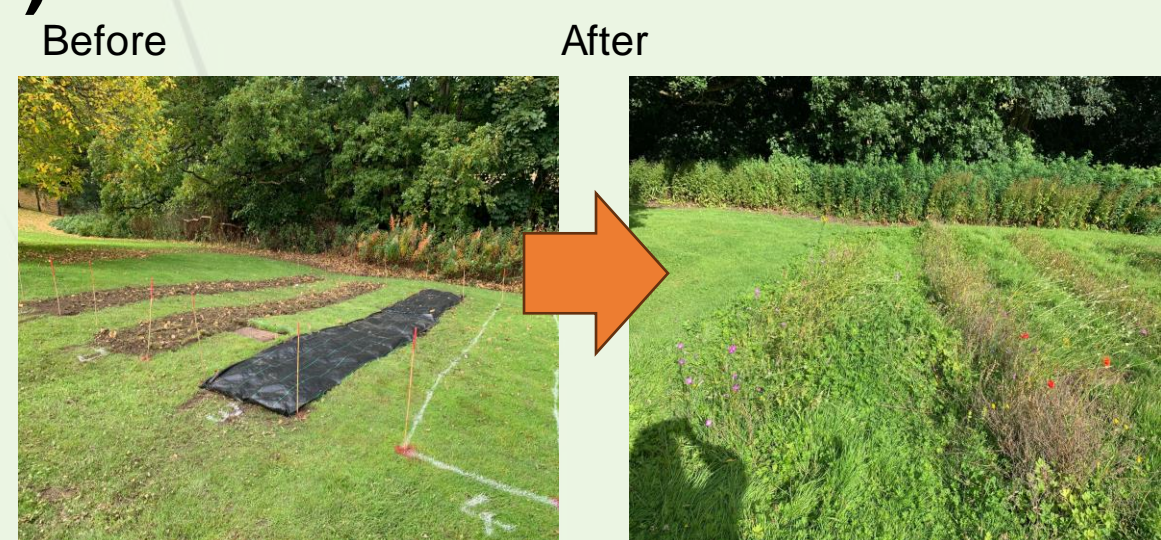
Introduction

Over decades, the importance of natural conservation and conservation studies has been raised to tackle this biodiversity crisis. (National Biodiversity Network, 2019) However, conservation projects are not easily implemented due to the uncertainty of the management and output. (Sanderson et al., 2022) So, scientific experimental knowledge and experience of where, how and when is a key decision-making guide for practical and effective conservation planning. (Grantham et al., 2010)

As County Durham demands further conservation actions for its unique ecosystems alongside urban development, my research focused on collecting and providing scientific knowledge and evidence of wildflower meadow and rewilding conservation in County Durham for future management.

Effective & Sustainable Wildflower Meadow

1) What are the best methods to create wildflower meadows?



Site preparation is key in meadow management. Meadow was created by six different methods such as chemical spray, strimming grasses (Strim), planting plugs (Plantplug), blocking out land with a black cover and removing upper soil (Turf). Turf, splay (R_S) and black-out (R_B) were combined with rotavating in the establishment.

- Huge reduction of annual flowers replaced by perennial flowers
- Higher biodiversity at DWT, R_S, R_B, and R_T

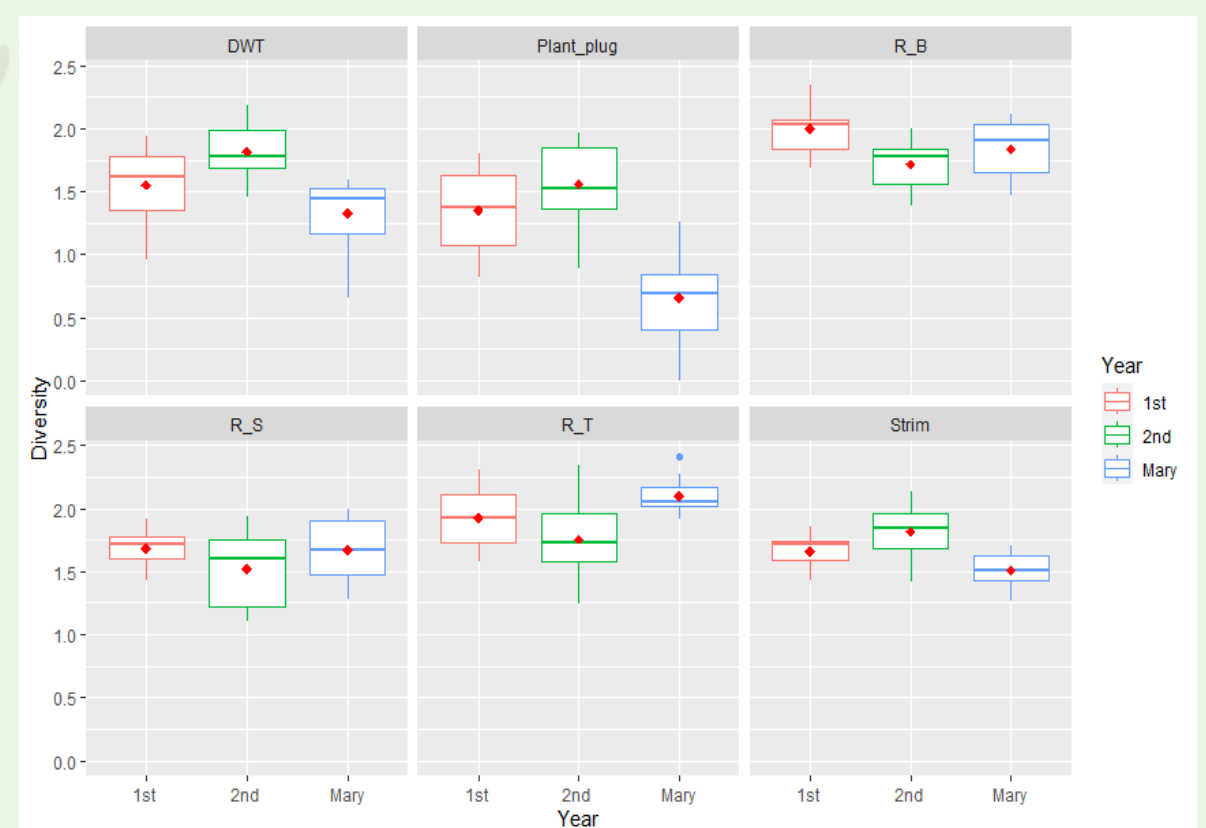


Figure 2 Shannon diversity index of wildflower community among different establishment treatments.

Rotavating and combination with other treatments like splay, and turf block-out have greater biodiversity and sustainability. To maintain the annual flower population, additional sowing of the seeds every year might be useful.

2) Where and what wildflowers should be planted?

This germination trial investigated 45 wildflower species' germination success under different soil fertility, growing conditions, and water availability. They were observed for four weeks and recorded the number of days to germinate to compare germination success and speed. The results provide useful information to identify the right location for introducing wildflower plants and preparing optimal environments.



- Greater germination success and speed in wet, compost-rich soil and inside a greenhouse.
- Faster germination in compost-rich soil and better germination success with compost soil even in dry conditions.

Water availability and temperature of the sites should be the key factors in deciding wildflower meadow introduction sites. Moreover, weed control is more important than soil preparation as high nutrient does not affect their growth, but it can increase competition.

Figure 3 pictures of trays that contain the same wildflower species seeds at the same location in 4th week of the germination trial.



What is rewilding?

Rewilding is the emerging conservation approach which restores lost self-sustainable and ecological function by reducing or minimising human intervention. A self-sustainable ecosystem is mainly supported by three components: trophic complexity, stochastic disturbance and dispersal. Rewilding tries to improve these components by making space and time for nature and bringing back missing keystone species.

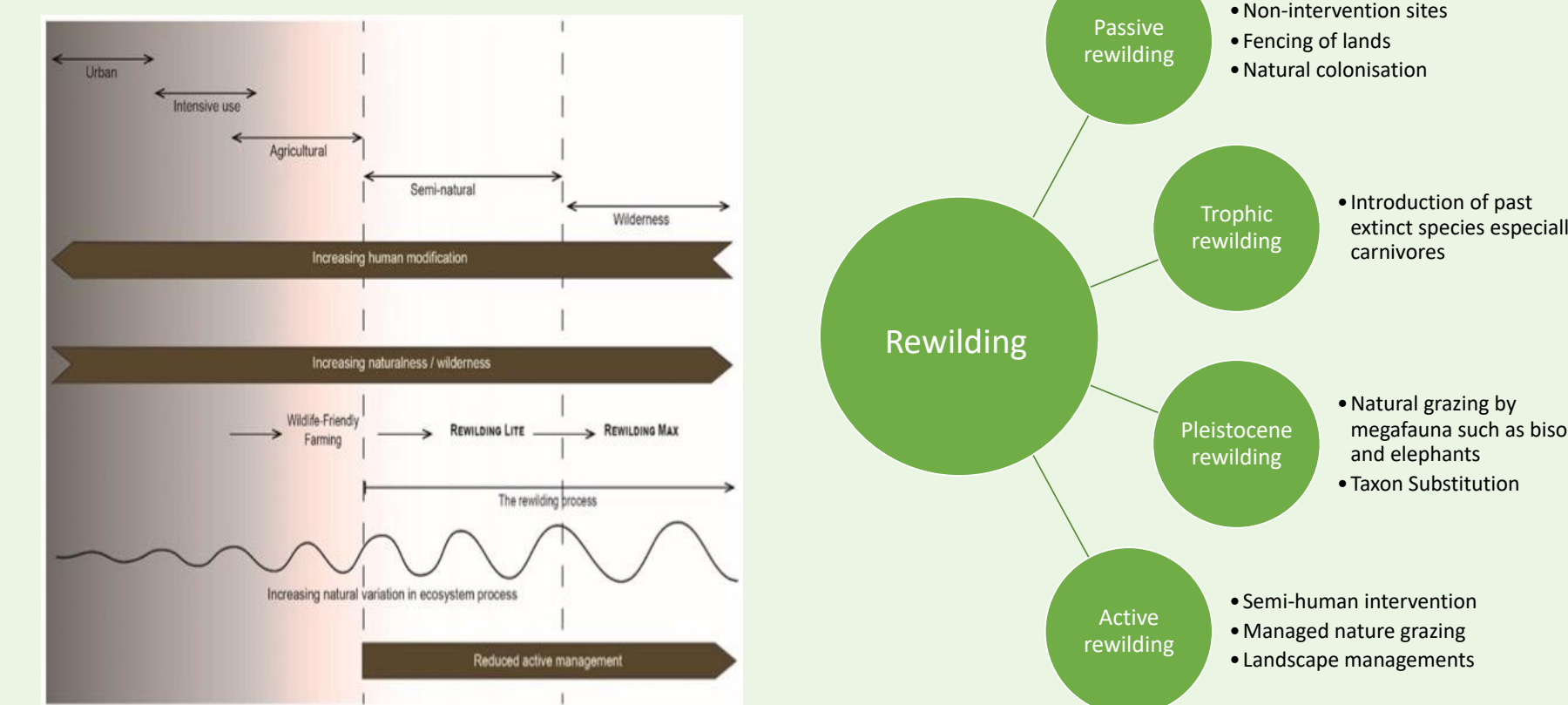


Figure 5. Human management and rewilding conservation (b) Multiple branches and approaches of rewilding

Start rewilding practice in County Durham

Rewilding projects have been implemented around Europe and the UK as a new effective conservation approach. However, there are only two rewilding projects in County Durham. So, this literature review discussed the potential of rewilding implementation in the Durham area on both a big and small scale for biodiversity conservation.

Step 1 Identifying what has been lost in the Durham ecosystem from history

Anthropogenic activities have altered the land and ecosystems completely, so, it is useful to understand what wildlife had key roles in maintaining self-sustaining to achieve rewilding.

From Durham's historical records, there used to be megafauna such as Aurochs, wild oxen and elves, wolves, brown bears, pine marten and beavers in Durham. However, extensive clearance of forests and hunting resulted in the extinction of native animals. Especially, County Durham has only 1.8% of semi-natural woodland and the overall woodland cover is just 6.4%.

Step 2 Evaluating rewilding practices in County Durham and suggestion of approaches

- Reintroduction of mammals**
 - Pine marten: Predation of grey squirrels can help red squirrels' population expansion, but Durham does not have enough suitable woodland habitats.
 - Water voles: Key play for local carnivores and small habitat engineers, but the risk of extinction due to American mink.
 - Beavers: Habitat engineers, but they need large tree cover alongside a river.
- Reintroduction of locally extinct plants**
 - Restore locally specialised interactions
 - Add functional diversity to create a more resilient ecosystem
 - Usually easier to implement than mammal reintroduction
- Passive rewilding**
 - Natural woodland regeneration
 - Vegetation becomes more suited to the local environment for ming diverse and sustainable woodland
 - It is necessary to combine with tree plantation to create habitats for the reintroduction target species
- Active rewilding and rewild land management**
 - Natural grazing with stock density control
 - Stage zero approach for river restoration
 - Rewilding moorland with no-burning and no-cutting
- Urban rewilding**
 - Making a wildlife habitat and nesting sites
 - Creating no-mowing areas
 - Use livestock instead of mowing

Rewilding practices can be used on big and small scales, and they will bring positive impacts on the local system. However, the combination of conventional management and rewilding should be conducted as rewilding methods can be slow and contain many uncertainties.

3) Does rabbit grazing affect wildflowers' establishment and growth?

Wild Rabbits (*Oryctolagus cuniculus*) are causing the impacts on local vegetation. The report evaluated the wildflower foraging pattern of rabbits and its impacts on plants. The pairs of similar matured wildflowers were left with and without nets with camera traps to record the change in maximum height, the percentage of grazed leaves and the frequency of rabbit visits.



Figure 4. The pictures of before and after rabbit grazing and the red circle showed the grazed sites.

- Strong preference for wildflower grazing
- All-or-nothing grazing style, so rabbits eat entire plants and stems causing huge damage to plants
- Significant decrease in height of plants after grazing

Rabbits can cause devastating damage on specific their preferred wildflowers by all-or-nothing grazing style. However, their impacts can be more dynamic as their tamping and burrowing also affect the vegetation.

Conclusion

Overall, this research identified effective wildflower management and establishment methods and the potential future conservation using rewilding practices. This scientific knowledge plays a key role in decision-making and provides valuable information for an evidence-based conservation approach. (Fazey et al., 2006) While scientific literature can inform effective management, many conservation plans remain unimplemented due to a lack of communication and social consideration of the influence of conservation. Therefore, I am aiming to get experience and a better understanding of scientific communication and get involved in real conservation planning summer leadership next year.