INTRODUCTION

Around 90% of European seminatural grasslands were lost during the 20th century, driven primarily by conversion to improved grassland or arable land for agricultural use (Lawton, 2011). In Derbyshire 96% of the seminatural grasslands found in 1860 had disappeared by 1998 (Fuller, 2007; Lawton, 2011)

The complex plant communities of lowland grasslands are an invaluable life support system for insects, pollinators, birds and mammals and have potentially contributed more to UK science than any other ecosystem. Throughout its history, it has provided the building blocks for our ecological knowledge and any other ecosystem, thanks to their high density of UK BAP priority species. Studies have also shown that more complex, diverse botanic communities can increase the effectiveness of other ecosystem services, such as improving carbon sequestration, removing pollutants such as nitrates and even helping with pest control for adjacent farmland (Bullock et al., 2001; Plowden, 2016).

Only since the start of the 21st century has habitat loss been caused by changes in land use slowed down, partly thanks to legal protection on semi-natural grassland, 30% of which is viable SSSs of Special Scientific Interest (SSSIs). In 1995, the Wildlife Trusts, 2018. Evidence shows that habitat in seminatural grassland have changed, and the biggest threats are now nitrogen deposition, fragmentation and lack of adequate conservation management, with only 22% of English non-SSSI grassland found to be in favourable condition (Hewins et al., 2005).

Projects such as the Wildlife Trust’s Living Landscapes initiative and the agri-environment scheme ensure that habitat creation and restoration is strategic, with the aim of reconnecting isolated habitats fragments in order to protect local biodiversity. Over 3,500 of these species-rich grassland have now been created since the launch of the UK Biodiversity Action Plan in 1995 (Lawton, 2010, Wildlife Trusts, 2018).

Although many projects use ecological surveying to determine whether a meadow restoration or meadow creation project is successful, there is often a lack of investment in long-term monitoring and research, which could give important insights into the success of such projects, the best conservation management styles, and how or when to achieve success at all in these communities (Jennett et al., 2019; Plowden et al., 2011).

These are important questions concerning the limited resources available in the conservation sector.

DERBYSHIRE STUDY

This project looks at six different natural lowland meadows in the local area of Derbyshire, all within a comparable character area and sub-division, Derbyshire (Peak District Natural). I have chosen these six species-rich semi-natural meadows and three meadows that were sown 5 years ago, and in summer 2023 completed over 100 square metres to compare plant communities between sites. The sites have varying designations (one as SSSI or potential SSSI, some are not), owners (private or council owned) and management (whether hay-cut or grazed) which may prove to be significant explanatory variables.

Semi-natural grasslands

- The Water Meadow: a privately-owned LWS managed as a traditional hay meadow near Tibshelf with a rich mix of species, in favourable condition
- Hunsheath Meadows: is within a LWS near Ripley, with a rich, complex array of species managed traditionally, although recorded as being recorded as increasing condition
- Carrington Water: a LWS meadow managed by Severn Trent, not designed as a LWS but part of a popular nature reserve. No recorded condition or surveys.

Created meadows

- The Coppice: a Belper Fid (FHS) meadow sown with a seed mix in 2007 with input from the Derbyshire Wildlife Trust. Seen as a success when last surveyed in 2011.

- The Old Sheep Field: a meadow Park (FHS) was created in 2010 with input from Derbyshire Wildlife Trust. A survey in 2020 showed that it did not meet the LWS selection criteria for areas of semi-natural grassland

- The Whittington-Meadow near Tibshelf was re-created in the 1980s and is classified as a potential LWS. Surveys in 1999-2005 did not find sufficient indicator species to designate it as a LWS.

METHODOLOGY

All sites were mapped in QGIS and a grid overlaid in order to select and record survey points using a created rounds sampling technique, with provisions made to reduce edge effects. Sites were visited an equal number of times (with ten 2x2m quadrats recorded on each visit) with the goal of visiting at least five times, which will obtain 50 quadrats for each site. Every species is recorded for each quadrat, as well as perimeter estimated. Statistical analyses will be carried out using R.

LESSONS & CHALLENGES

Supported by the Wildlife Trusts, only around 6% of semi-natural grassland was found to be in good condition. Some overwintering sites were found to be in poor condition, where biomass had declined since the previous visit and the increasing frequency of these sites was a concern. We also have some species pop up rarely such as Thymus lucens and Hypericum hooksianum, keeping the challenge as well as the opportunity to learn the differences between different species, cover & habitats and many other species.

Next steps

It took longer than expected to set up the project this year - including identifying and gaining permissions to access six sites. However, the overall species composition was generally that of an MGS meadow, there was a surprisingly amount of variation between sites - one particularly deep meadow was scattered with Silene flos-cuculi and some dominating tufts of Deschampsia cespitosa. It also seemed to be a haven for carline thistle, which produced some good growth along with the 30-degree temperatures on the days I had set aside for surveying. As a result of the unusually hot couple of months, the meadows were also cut earlier than usual when we expected, which unfavourable weather at the start of the surveying season for the purpose of this study. On the bright side, it was also a haven for butterflies, moths and bees, which I enjoyed learning to identify at the same time. As I work at the Derbyshire Biological Records Centre, I was able to add all of my records to the DBRC database.

Overall, I’m glad to have started working on my final master’s project a year early. It means that I’ll have time to continue surveying in the spring and summer 2023, increasing and improving the number of visits to each site and dealing with any issues in the field. Plus, most importantly, I’ve strengthened my identification skills - meaning I should be better at the surveys next year.

INITIAL RESULTS

Variation in meadow plant communities

Some indicators using R revealed significant differences in the plant communities between each individual site and between the created and semi-natural sites. This chart represents the six sites surveyed and drawn from the plant communities in Alton Towers Park and the Whittington Meadow the most distant from the others, because the standard deviation around each cluster centre for those two sites do not overlap with any other site. These sites are both tradition meadows. The semi-natural meadows were generally closer in community composition to each other (more standardized deviation overlap) - although Belper Coppice is the exception, overlapping with all three semi-natural meadow communities. This suggests Belper Coppice could have the most naturalistic meadow community out of the created grasslands.

Next steps

I plan to start a deeper dive into the academic research on this topic and will begin working on the literature review and the introduction for my paper. I’m also planning to use the data I have gathered so far to write some analysis using RStudio, both to get an idea of what the data is indicating and so that the results of this work is read widely and used as a basis for further research.

Supervision & Support

The project is in under the supervision of Dr. Claire Cushard from Manchester Metropolitan University, with support from the Derbyshire Wildlife Trust. This project has benefited from a BBSR Plant Study Grant based on the projects contribution to a better understanding of the British and Irish flora.