Plan Overview

A Data Management Plan created using DMPonline

Title: Competitive and soil nutrient controls of tree seedling establishment and survival in old field succession

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Template: University of Manchester Generic Template

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Project abstract:

Land use change across the UK is trending towards management abandonment which often leaves previously grazed or mowed fields open to secondary succession by trees. Despite a long history of interest in succession, relatively little is known about the regeneration phase of woody colonizers post land abandonment. Such knowledge is crucial to inform future tree planting efforts for successful reforestation that will more rapidly fulfill net-zero carbon targets. Past theory makes predicts that woody colonizer establishment is inhibited by competition with the established herbaceous community and that this resistance to woody establishment by the herbaceous community is increases with soil fertility. I propose testing these predictions with a manipulative field experiment in a previously mowed field that factorially removes competitors, adds nitrogen, and adds phosphorus to plots with transplanted seedlings and seeds of four species of potential woody colonizers. The results will yield insights into which species perform best under what prior environmental (fertilizer) and management (tilled versus abandonment) regimes that can inform better reforestation practice. Finally, I will use trait-based competition models to extend the results for prediction to other woody species used in restoration.

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Copyright information:

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Competitive and soil nutrient controls of tree seedling establishment and survival in old field succession

Manchester Data Management Outline

1. Will this project be reviewed by any of the following bodies (please select all that apply)?

- Funder

2. Is The University of Manchester collaborating with other institutions on this project?

- No - only institution involved

3. What data will you use in this project (please select all that apply)?

- Acquire new data

4. Where will the data be stored and backed-up during the project lifetime?

- University of Manchester Research Data Storage Service (Isilon)
- Other storage system (please list below)

Other storage includes Lynn computers and hard drives.

5. If you will be using Research Data Storage, how much storage will you require?

- < 1 TB

6. Are you going to be receiving data from, or sharing data with an external third party?

- No

7. How long do you intend to keep your data for after the end of your project (in years)?

- 21+ years

Guidance for questions 8 to 13

Highly restricted information defined in the Information security classification, ownership and secure information handling SOP is information that requires enhanced security as unauthorised disclosure could cause significant harm to individuals or to the University and its ambitions in respect of its purpose, vision and values. This could be: information that is subject to export controls; valuable intellectual property; security sensitive material or research in key industrial fields at particular risk of being targeted by foreign states. See more examples of highly restricted information.

Personal information, also known as personal data, relates to identifiable living individuals. Personal data is classed as special category personal data if it includes any of the following types of information about an identifiable living

individual: racial or ethnic origin; political opinions; religious or similar philosophical beliefs; trade union membership; genetic data; biometric data; health data; sexual life; sexual orientation.

Please note that in line with data protection law (the UK General Data Protection Regulation and Data Protection Act 2018), personal information should only be stored in an identifiable form for as long as is necessary for the project; it should be pseudonymised (partially de-identified) and/or anonymised (completely de—identified) as soon as practically possible. You must obtain the appropriate ethical approval in order to use identifiable personal data.

8. What type of information will you be processing (please select all that apply)?

- No confidential or personal data

9. How do you plan to store, protect and ensure confidentiality of any highly restricted data or personal data (please select all that apply)?

- Not applicable

10. If you are storing personal information (including contact details) will you need to keep it beyond the end of the project?

- Not applicable

11. Will the participants' information (personal and/or sensitive) be shared with or accessed by anyone outside of the University of Manchester?

- Not applicable

12. If you will be sharing personal information outside of the University of Manchester will the individual or organisation you are sharing with be outside the EEA?

- Not applicable

13. Are you planning to use the personal information for future purposes such as research?

- No

14. Will this project use innovative technologies to collect or process data?

- No

15. Who will act as the data custodian for this study, and so be responsible for the information involved?

Joshua Lynn

16. Please provide the date on which this plan was last reviewed (dd/mm/yyyy).

2022-11-30

Project details

What is the purpose of your research project?

Questions

- Is tree recruitment and transplant performance more negatively impacted by competition with herbaceous vegetation under high nitrogen and phosphorus availability?
- Does the negative effect of high nitrogen and phosphorus availability under competition for tree recruitment and transplant performance flip to become positive with competitor removal?
- Do the focal tree species with faster growth, more nutrient rich tissues, and larger seeds perform better under herbaceous vegetation competition?

Objectives

- I will transplant seedlings and sow seeds of four focal tree species into a fully crossed factorial experiment that manipulates competition, nitrogen, and phosphorus availability in an old field.
- Questions 1 and 2 are tested with four focal tree species by: a) sowing seeds the focal species across treatments and tracking their germination, survival, and growth; b) transplanting seedlings of the focal species across treatments and tracking their survival, growth, and other performance indicators over the course of the experiment.
- Question 3 is addressed functional trait characterizations of the focal species and their herbaceous competitors followed by trait-based modeling of experimental outcomes.
- Finally, the project will produce 1-2 academic journal articles, a best practice guide for old field reforestation strategies in the UK, and a popular science article encouraging reforestation and promoting the Woodland Trust-supported work.

What policies and guidelines on data management, data sharing, and data security are relevant to your research project?

We will follow The University of Manchester data management policies.

Responsibilities and Resources

Who will be responsible for data management?

Joshua Lynn

What resources will you require to deliver your plan?

The plan can be fully realized using existing data management hardware at the PI's disposal.

Data Collection

What data will you collect or create?

Focal species performance: A single sapling from the glasshouse will be randomly transplanted into one of the four quadrants per plot to assess their responses to treatments. I will measure height, leaf number, and stem diameter at transplant and throughout the experiment to assess growth response to treatments. I will additionally track survival of individuals.

To assess how the focal species recruit in response to the treatments, I will sow 20 seeds per plot per focal species glued to toothpicks in a grid to track germination success, monthly. Successfully recruited individuals will further be tracked for survival and growth in response to treatments.

At the experiments end (2024), I will harvest all transplanted individuals and recruited seedlings, separate their mass into leaf, stem, and trunk organs, then dry and weigh them. This will allow me to analyze focal species differential investment in support and growth organs in response to treatments.

Trait based modeling: I will estimate functional traits of both the competing herbaceous community and the transplanted focal species to parameterize the competitive trait hierarchy hypothesis (CTHH; *8*, *9*). The CTHH will use trait differences between focal species and their competitors (i.e., abundance weighted mean traits of competitors) to predict focal species survival and growth. I will focus on traits related to growth rates (e.g., specific leaf area), competitive ability (i.e., height), and tissue investment (e.g., leaf carbon:nitrogen stoichiometry; *11*) measured using standardize protocols of ref. *12*.

How will the data be collected or created?

Methodology and approach (500 words)
Focal species and glasshouse rearing: I will use four native deciduous pioneer species that range in their nutrient and moisture requirements: Alder (*Alnus glutinosa*), downy birch (*Betula pubescens*), Aspen (*Populus tremula*), and rowan (*Sorbus aucuparia*). Starting in March 2023, I will begin rearing individuals of the focal species in a glasshouse using UK-sourced seed material for the transplant part of the experiment.

Site: The project will be hosted at the Jodrell Bank Observatory on an old agriculture field that has been mowed twice a year for greater than 20 years. The site lies on sandy, well-drained, and slightly acidic soils with a mixture of grassland species typical of a managed old field (e.g., *Plantago lanceolata*, *Arrhenatherum elatius*).

Experimental setup: After initial mowing in April 2023, I will establish the factorial competitor removal x nitrogen x phosphorus addition experiment. Experimental plots will be 1 m2 with treatments randomly assigned within the field. Herbaceous competitors will be removed by digging beneath the soil surface ~5cm to remove existing meristems, which reflects a tilling management regime. Plots will be weeded of herbaceous species monthly. Nitrogen and phosphorus additions will be made at 10 g/m2/year, each, following protocols and suggestions of the nutrient network (*10*). The full factorial setup makes for eight treatment combinations which I will replicate seven times for a total of 56 plots. I will further divide each plot into four 0.25 m2 subplots that will be designated for one each of the focal species.

Documentation and Metadata

What documentation and metadata will accompany the data?

Full meta data will be created to accompany data during collection.

Ethics and Legal Compliance

How will you manage any ethical issues?

By following UM policy.

How will you manage copyright and Intellectual Property Rights (IPR) issues?

Copyright will be owned by the PI, Joshua Lynn.

Storage and backup

How will the data be stored and backed up?

Data will be stored and encrypted on laptops and computers as well as University storage facilities (https://ri.itservices.manchester.ac.uk/rds/).

How will you manage access and security?

Main risks to data security are lost/stolen/damaged computers. This will be mitigated by backing up devices on both external hard drives and university based data storage services: https://ri.itservices.manchester.ac.uk/rds/. All data will eventually be made publicly available, but collaborators will be able to access data by making Opens Science Framework (osf.io) project pages with controlled access. Field data will be carefully handled and entered onto waterproof paper with pictures taken of the data sheets after collection. Then the sheets will be securely transported to the office for immediate digitization and safe storage.

Selection and Preservation

Which data should be retained, shared, and/or preserved?

All of the data will be archived in freely available repositories.

What is the long-term preservation plan for the dataset?

It will be deposited in a public repository.

Data Sharing

How will you share the data?

Via the open science framework (osf.io) and publication.

Are any restrictions on data sharing required?

No.