THE UNIVERSITY of EDINBURGH

Job Description

Internship Title: Scots pine resilience to abiotic stress

Department/ School	UK Centre for Ecology & Hydrology (UKCEH), Edinburgh
Reports To	Annika Perry, annt@ceh.ac.uk (UK Centre for Ecology & Hydrology) Thomas Sim, thomas.sim@forestresearch.gov.uk (Forest Research) Joan Cottrell, joan.cottrell@forestresearch.gov.uk (Forest Research) PhD Mentor: James Baker, jbaker@ceh.ac.uk (University of Edinburgh & UKCEH)

Job Purpose

The purpose of this placement project is to evaluate the response of Scots pine to abiotic stress using a common garden experimental glasshouse trial where seedlings are subjected to extreme water availability treatments. The student will be responsible for data collection and preliminary analyses during their placement, culminating in a written report and oral presentation to share their findings with the project team and the wider Ecology & Evolution group at UKCEH. This placement enables the student to gain valuable practical, theoretical and analytical experience in collaboration with experienced researchers and via mentorship by a PhD student and by two Research Associates.

Main Responsibilities

- Perform data collection on Scots pine seedlings as outlined below (50 %)
- Perform preliminary analyses using collected data as outlined below (20 %)
- Assist with maintenance of glasshouse trial (10 %)
- Sample collection and archiving of tissue for baseline and future analyses (5 %)
- Prepare written report (10 %)
- Present findings at UKCEH Ecology & Evolution group meeting (5 %)

Knowledge Skills and Experience (required for the role)

Attribute	Essential	Desirable
Education, Qualifications & Training	- Working towards BSc in Ecology or similar subject	- Statistical training

Knowledge & Experience	- Interest and experience growing plants - Enthusiasm and curiosity for ecology	- Experience in practical data collection, through fieldwork or laboratory experiments - Ability to work in collaboratively and independently

Person Specification

Planning and Organising

- The student will plan their schedule using the timeline described above as a guide.
- Responsible for data collection (training will be provided) for traits described above, report writing and presentation preparation.
- Combining data collection activities and the report/presentation preparation will require careful organisation and commitment to each task.

Problem Solving

- The student will quality control all data collected and repeat measurements where issues are identified.

Decision Making

- The student will work within the project team (including all supervisors and both Research Associates) to feedback progress and decide next steps.
- They will conduct preliminary analyses of data collected each week to dynamically assess the overall health of the seedlings in the trial, and coordinate with the project team to take action (i.e. change duration of treatments) as appropriate.

Key Contacts:

Annika Perry- annt@ceh.ac.uk (UK Centre for Ecology & Hydrology)
Thomas Sim - thomas.sim@forestresearch.gov.uk (Forest Research)
Joan Cottrell - joan.cottrell@forestresearch.gov.uk (Forest Research)
James Baker (PhD Mentor) -jbaker@ceh.ac.uk (University of Edinburgh, UK Centre for Ecology & Hydrology)

In addition to the above, Kit Nemeth & Hattie Barber, Research Associates, UKCEH

Dimensions

Closing date for applications: Wednesday 14th May 2025 (Midnight)
Start date: From: Commencing **30th June 2025 for 8 weeks**
Hours per week and preferred pattern/ restrictions (if applicable): 35 hours per week

Additional Information

Project Outline

Participation in the work of the UK Centre for Ecology and Hydrology (UKCEH) and Forest Research (FR) offers the student a unique opportunity to experience the working environment of two of Britain's leading applied research organisations. UKCEH is a world-

leading independent research institute, carrying out excellent environmental science with impact. Our ambition is to make the world a better place through science addressing climate change, promoting biodiversity, and creating sustainable ecosystems. FR is Great Britain's principal organisation for forestry and tree-related research. The placement will be based at the Bush Estate, to the south of Edinburgh, where both organisations are located. UKCEH and FR have a long history of collaboration and have significant experience designing and monitoring experimental trials (e.g. Beaton et al., 2022) using tree seedlings.
Scots pine (*Pinus sylvestris* L.), the keystone species of Scotland's Caledonian pinewoods, has huge ecological, cultural, social and economic importance. Over many years, researchers have used common garden experimental trials of Scots pine from this region to study adaptive variation in traits including phenology (Salmela et al., 2013), cold tolerance (Salmela et al., 2011), needle characters (Donnelly et al., 2016) and disease resistance (Perry et al., 2016). With climate change, the UK is expected to experience progressively hotter and drier summers, warmer and wetter winters, and an increased frequency of extreme weather events such as flooding and droughts. Scots pines' responses to these challenges have been explored in previous studies (Donnelly et al., 2018) but this project forms part of a larger and long-term project that will contribute to a significant advancement in our current knowledge of this important species' response to extreme weather events.

Project aims

This project aims to use a common garden experimental trial to assess the response of Scots pine to different water availability treatments (drought: no watering; control: watering as required; waterlogging: constant watering) for a period of around 4 weeks (depending on the severity and rapidity of the response). Furthermore, the effect of Scots pine provenance (origin population) on the response to abiotic stress will be evaluated.

Activities

Activities include: i) training; ii) data collection; iii) trial maintenance; iv) preliminary analyses; v) report writing; vi) and presenting work.

Training and data collection. The student will be trained by experienced users in data collection using a range of instruments and techniques. Stress response will be monitored directly by the student using: i) a fluorometer, to measure chlorophyll fluorescence (a simple and efficient in situ method of evaluating the response of plants to environmental stimuli); and ii) visual health assessments (recording needle discolouration). The student will also measure baseline ('pre-treatment') responses of seedlings for other traits that measure the impact of the treatments on: iii) cell damage (assessed through electrolyte leakage conductivity); and iv) growth. These datasets will continue to be added to after the placement is complete (i.e. we will also perform 'post-treatment' measurements to complement the 'pre-treatment' measurements described). The student will furthermore measure soil moisture within each seedling's pot using a hand-held probe at weekly intervals, to track the change in water availability as the treatment progresses.

Trial maintenance. The student will support staff at UKCEH to maintain the trial throughout their placement through watering, weeding and other general maintenance tasks.

Preliminary analyses. The student will be supported to perform preliminary analyses using available data once available. They will use the design of the trial (progeny-provenance trial with ten randomised blocks) to partition observed trait variance and will use these data to estimate narrow sense heritability values. They will also track the stress response of seedlings to the treatment over time and identify whether variation in the response is associated with climate at their home site (local adaptation).

Report writing and presenting work. The student will prepare a short report detailing their methods and results and will present their findings to the UKCEH Ecology & Evolution group.

Placement Timeline

Week 1: Meet team; discuss and read literature on relevant experimental trials and approaches to be used in this project; training on use of fluorometer; training on use of soil moisture probe; training on electrolyte leakage measurements.
Week 2: Perform pre-treatment growth measurements and health assessment; sample tissue to send for carbon isotope analysis; sample pre-treatment tissue for electrolyte leakage baseline; sample pre-treatment tissue for archiving; measure pre-treatment soil moisture.
Week 3: Begin treatments; perform first chlorophyll fluorescence measurements with fluorometer; measure soil moisture; perform pre-treatment electrolyte leakage measurements; assess seedling health.
Week 4: Perform second chlorophyll fluorescence measurements with fluorometer; measure soil moisture; assess seedling health; training on analysis of pre-treatment electrolyte leakage data and pre-treatment growth data.
Week 5: Perform third chlorophyll fluorescence measurements with fluorometer; measure soil moisture; assess seedling health; training on analysis of chlorophyll fluorescence data over three timepoints.
Week 6: Perform final chlorophyll fluorescence measurements with fluorometer; measure soil moisture; assess seedling health; discussions around preliminary analyses and plan for placement report.
Week 7: Prepare report and presentation.
Week 8: Finalise report; present findings at UKCEH Ecology & Evolution group meeting.

Budget

A maximum of £500 towards project costs is available.

Location

UKCEH Edinburgh, Easter Bush Estate, Penicuik, Midlothian EH26 0QB (close to the University of Edinburgh Vet School).

Health & Safety Requirements for the role

None. There will be no chemicals used, and specific training will be provided for use of instruments as required.

Key Job hazard information specific to the role

This role may result in potential exposure to certain hazards as listed below. These will be risk assessed by the school or department, which may require you to participate in, for example, health surveillance or follow other health and safety requirements.

Working in glasshouse and laboratories.

Programme Information

The Research Experience Programme (REPs), funded by NERC, offers paid research opportunities for undergraduate students. The programme is designed to address both demographic and diversity challenges in the environmental sciences, as well as thematic skills gaps, such as quantitative skills.
This is a valuable opportunity to gain hands on research experience, boost your employability, and explore potential pathways into further study or careers in environmental science.

For full details on how to apply and the selection process, please visit our REP webpage

Application Support

The University's Careers service provides a wide range of resources to support your application, including guidance on CVs, cover letters, and interview preparation.
Students undertaking a REP placement will also have the opportunity participate in the Edinburgh Award - a structured programme that helps you reflect on and gain recognition from the University for the skills and attributes developed during your internship.
For more information, you can book an appointment with a Careers Consultant via MyCareerHub.

Eligibility Criteria

To be eligible for a REP placement, applicants must meet **all** of the following criteria:

• Be currently studying towards their first undergraduate degree studies (including integrated Master's degrees) in a UK Higher Education institution, in any science discipline
Note: *Final year students are eligible if they still hold student status at the* ***start of the placement,*** *even if the student graduates during the course of the placement.*

- Be eligible for subsequent NERC PhD funding as defined here:
- A UK citizen who has been living in the UK for at least the past 3 years OR
- An EU citizen with pre-settled or settled status under the EU Settlement Scheme OR
- A non-EU citizen who has obtained the right to remain in the UK - known as 'indefinite leave to remain' (ILR) OR
- An International/EU student currently studying in the UK under a Tier 4 or Student Route Visa with validity until at least September 2025.

REPs **do not** meet the requirements for visa sponsorship. As such, students who are not currently residing in the UK or who do not hold a valid UK visa are not eligible to apply.

You cannot take part if you are a visiting student, or have previously taken part in REP programme.

Privacy Statement

In addition to the University's HR Privacy Information Notice, please read the Student and Graduate Privacy Statement: Internships and work experience programmes to understand how your personal information will be collected, used, and stored as part of the application process.

If you require this document in an alternative format, please email us at: e5dtp.info@ed.ac.uk