CFP Internship Diary October 2023 – March 2024

October

The first weeks of my Centre for Forest Protection (CFP) internship involved exploring Alice Holt (AH). I also completed mandatory Forest Research (FR) training and installed software such as R and GIS. I downloaded the raw environmental data needed for my ash dieback modelling work from online sources like the Centre for Environmental Data Analysis (CEDA) and Ordnance Survey Data Hub.

There were opportunities to meet the wider team working in the Physical Environmental Sciences research group at FR by assisting with fieldwork. My first Site visit was to Rogate (Scots pine) Level 2 Site (part of the Integrated Forest Management Program) to install ten Nature 4.0 Tree Talkers. This novel technology is a valuable tool for forest monitoring, allowing hourly measurements of tree parameters and environmental variables to be taken simultaneously (for example, sap flow, canopy light transmission and stem diameter variation)[1].

Installing a Tree Talker onto a Scots pine

Rain exclusion shelters at Little Snoring - these had been removed when I visited the Site. We were looking at the recovery of the trees from drought. Photo source: https://bacterialplantdiseases.uk/bac-stop/

At the end of the month, I visited the Little Snoring woodland Site in Norfolk. The oaks at this Site were involved in a drought experiment, with some of the trees previously being covered by rain exclusion shelters. One aspect of the oak BAC-STOP project at the Site is determining the role of drought and nutrient stress on oak health, disease establishment, and the oak microbiome. We were interested in taking soil and litter samples from around control trees and trees that had been ring barked (complete/nearly complete loss of bark from around the circumference of a tree trunk). We also took samples from trees previously under the rain exclusion shelters to see how the trees may recover and how results compare to the baseline year. We added KCl (Potassium Chloride) to soil samples from 0 – 20 cm depth. KCl is a common extractant for inorganic nitrogen and exchangeable acidity. The extracts were filtered using syringes and filters into test tubes and were then stored in fridges at AH for analysis.

November

For part of October, I had been working remotely. I found this challenging, but by November, I had moved closer to AH and could commute into the office most days. I could use the facilities, was able to network with a variety of FR staff and enjoyed the social side of working – including attending Pilates, craft club and board game evenings.

Enjoying a board game evening after work

Early in November, there was an invitation to attend the FR Tree Health Conference at Northern Research Station (NRS). This experience was a

[1] https://www.sciencedirect.com/science/article/pii/S1574954121002247

highlight of the internship, and it was fascinating to learn about the work undertaken by the wider FR team. The conference improved my understanding of other tree pests and diseases and how my work relates to other FR research. The two-day event focused on five major themes: Horizon Scanning/Preparedness, Surveillance, Emerging Pests/Outbreak Response, Plant Health Behaviours, and Management/Adaptation. There was an opportunity to tour some of the lab facilities at NRS, meet the other CFP intern based at FR, and explore Edinburgh in the evenings.

Visiting Edinburgh for the FR Tree Health conference held at NRS

Later in the month, I attended another hybrid conference online. The Association of Applied Biologists (AAB) Creating Canopy conference/FraxNet Network meeting (University of Nottingham) focused on the following themes: urban canopies, natural processes, planting new productive woodlands, a climate of change and what grows with what. I heard from speakers at FR and researchers from various universities/research institutions. The FraxNet meeting on the final day was insightful to learn more about ash dieback genetic/resistance research and additional ash threats such as emerald ash borer. I found the talk 'Ash dieback – consequences for biodiversity and mitigation strategies' from Ruth Mitchell (The James Hutton Institute) especially interesting. I discovered that ash supports 995 species and that this tree species has unique functioning compared to other native deciduous tree species in the UK – further highlighting the importance of this species and the need for further ash dieback research.

CO^2 flux measurements at Pepper Wood Site

At the end of the month, I visited Pepper Wood to assist with sampling for a ground preparation (undertaken on new planting/restocking sites to aid tree establishment) project. Adjacent to the woodland, there was a control plot and three ground preparation plots in the field investigating mob grazing (an intensive rotational system that sees high stocking densities of livestock moved regularly) by sheep, chain harrowing and turf stripping treatments. I helped use portable LI-COR[2] equipment (consisting of a gas analyzer, chamber, and temperature probe) for CO^2 flux measurements. This data, with the data from other months, will be used to explore fluxes in soil respiration over time and across the different treatments. I also used 'Lolly' software to download data from temperature dataloggers at the site.

Spatial modelling (Baddeley, 2010) and soil classification (Kennedy, 2002) reading

December

This month, I focused on working with Scottish soil data from The James Hutton Institute using R. I used R to match the Scottish soil classes to Forestry Commission (FC) soil codes. It was a challenge to work with big, complex data. However, it was rewarding learning about different soil types across Great Britain. I also began thinking about including ash dieback observations within my spatial modelling. After further reading, using the 'spatstat'

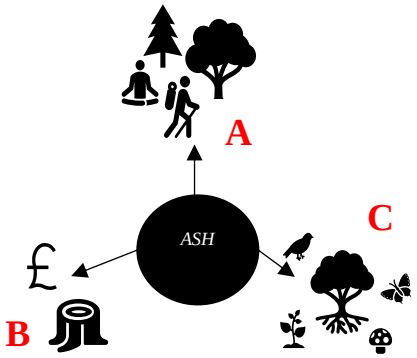
[2] https://www.youtube.com/watch?v=1EkkB8JaIzQ

package in R for Point Process Models (PPM) seemed a useful modelling option - since I would be working with ash dieback observation data (occurrence only, not considering disease severity).

January

After winter break, I practised my R skills using the 'datacamp' resource. I also read more papers to improve my understanding of ash dieback. These activities benefited my internship project progress, and by the end of January, I had produced a draft literature review for my project. Learning about the benefits of ash was a motivator for my project. My review helped improve my written communication skills. I received feedback about writing up my project methods effectively and the value of storing environmental data information in a metadata document.

Sampling at Northmoor SRF Site



Healthy ash trees are important components of the landscape; they can provide A) benefits to human well-being; B) economic benefits through the timber industry and other ecosystem functions; C) ecosystem benefits and support biodiversity

I also visited Northmoor – a short rotation forestry (SRF) site, where I assisted with litter and soil sampling. There were four blocks at the site, with each block containing stands of 10 different tree species (sycamore, Italian alder, red alder, silver birch, sweet chestnut, ash, hybrid larch, Rauli, hybrid aspen, Sitka) and a control stand. We sampled at 3 points per stand, taking a 40x40 cm quadrat litter sample and a 0 – 20 cm deep bulk density / fine roots sample with a bulb planter at each. I also helped using a soil auger to take soil samples for chemical analysis at various depths of 0 – 20 cm, 20 – 40 cm, 40 – 60 cm and 60 – 80 cm.

February

At the end of February, I visited Kew Gardens for the CFP symposium and an intern day. The CFP symposium offered a fantastic opportunity to network with researchers at FR and Kew. There was also the chance to give a short presentation about my CFP internship experience and project progress/findings. Although I was slightly apprehensive before, it was a confidence boost to give an in-person presentation at the event (previous presentations I had given were all online), answer questions and have engaging discussions about my research. The intern day at Kew showed us the research work conducted by the organisation. We visited the herbarium, which holds over seven million preserved vascular plant specimens and the mounting room, where new dried and pressed specimens are attached to a herbarium sheet of archival-quality paper. We watched the process of glueing the specimen and an identification label that tells you many details about the specimen, including the origin, collector, family, genera, botanical name, and plant description. After this tour, we had time to explore the gardens and visit the orchid festival.

Visiting the mounting room, herbarium and orchid festival at Kew Gardens with the other CFP interns

March

On the 1st of March, we had an intern day at AH. It was fun to spend another day with the other two interns and learn more about the laboratory facilities at AH. In the morning, we visited the tree health diagnostic lab, the entomology/taxonomy lab, the molecular lab, and the mobile lab. We visited the Straits (Carbon Flux Site) and an experimental plot in the afternoon. It was interesting to see the AH (oak) Level 2 site and compare this with the Rogate (Scots pine) Level 2 site I visited at the beginning of my internship. It was also impressive to see the scale of the flux tower, which measures long-term carbon dioxide flux in the woodland.

The flux tower located in the Straights Inclosure within AH Forest

Near the beginning of March, I completed my final day of soil sampling at the third SRF Site at Mill Farm, Peterborough (after sampling at Northmoor in January and Carlshead, Whetherby SRF Site in February). It was interesting to see how the soil conditions and tree growth varied between the three sites.

For my last month as an intern, I worked on finishing up my ash dieback spatial modelling project. I spent time investigating the effects of different environmental factors in my ash dieback models and improved sections of my ash dieback review, including my methods section.

I wanted to do this CFP internship to develop my research skills and gain new career experiences. My project has improved my general R skills and specific spatial modelling skills. I have found this rewarding, and I hope to continue expanding my R skills and knowledge in future research. My internship has been an excellent chance to network with researchers across FR and Kew, including the other two CFP interns. I have made new contacts, and it has been valuable to learn about the different research and career journeys each has had. This internship diary highlights experiences beyond my spatial modelling project, including chances to help with fieldwork and learning opportunities at conferences. I have also had opportunities to practise giving presentations, a valuable transferable skill. My internship has improved my confidence to pursue further research, and I am excited about finding a role or PhD that continues to develop my R and conservation skills.

Centre for Forest Protection

CFP INTERNSHIP TIMELINE

02/10/23

Starting work at Alice Holt and exploring the arboretum

03/10/23

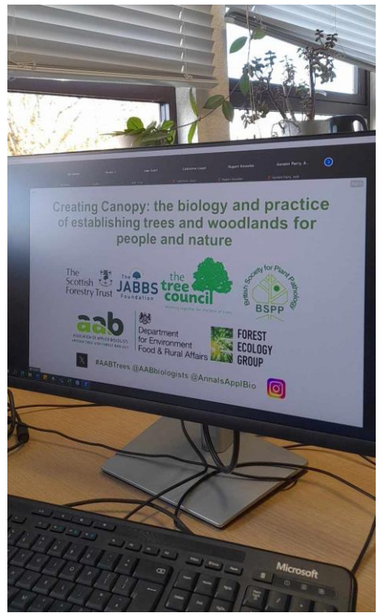
Installing tree talkers at Rogate (Scots pine) Level 2 Site

01/11/23

Soil Sampling at Little Snoring Woodland (oak tree treatments were control, ringbarked and drought)

08/11/23 - 09/11/23

Attending the Forest Research Tree Health Conference at NRS



27/11/23 – 29/11/23

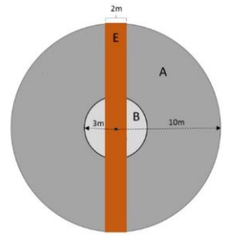
Online Creating Canopy conference and FraxNet Network workshop

30/11/23

Measuring soil respiration at Pepper Wood

17/01/24

Soil and litter sampling at Northmoor Short Rotation Forestry (SRF) Site



31/01/24

Surveying at Langley Wood Natural Colonisation Site. Set up sampling plots - recorded all tree species and DBH of all trees >7cm within 10m radius plot A & recorded the species of all young trees with a DBH between 4-7cm in subplot B. Finally, we walked transect E and recorded dead wood with DBH >7cm – dead wood type (fallen/snag/stump), decay class, length and DBH.

05/02/24 – 07/02/24

Soil and litter sampling at Carlshead SRF Site (found my calling taking bulk density samples)!

07/03/24

Soil and litter sampling at Mill Farm SRF Site

28/02/24 – 01/03/24

CFP symposium and CFP intern activity days including visits to Kew Gardens and Alice Holt (oak) Level 2 Site

Forest Research