

## Centre for Forest Protection Diary, October '25 – March '26

Catherine Gudgeon

I was very pleased to be able return to the Plant Health & Adaptation group at Kew for a second research project, this time focusing on ash trees. The PH&A group uses genomics approaches to try and understand how plants adapt to evolving pests and pathogens, focusing particularly on British forest species such as ash, elm, and oak.





Over the course of the past six months, I further developed the skills and knowledge I'd gained over the course of my first internship at Kew, focusing particularly on modelling recombination rates. My research was computational, and involved drawing together different software tools to analyse large genomics datasets in both ash and elm datasets.

My main research project involved creating recombination maps for ash (*Fraxinus excelsior*), using population genetics data. I developed a bioinformatics pipeline which included steps for SNP calling and filtering; haplotype phasing; identification of related/duplicate individuals; estimation of the population-scaled mutation rate; and modelling of population-scaled recombination rates along chromosomes. To run these analyses, I used Apocrita, the high-performance computing (HPC) system at QMUL, developing scripts in Bash, R, and Python. I'm currently investigating ways to improve this approach with more state-of-the-art tools.

I also did some work for the ash pangenome research project, creating data pipelines to calculate LAI scores for several ash genomes. LAI (LTR assembly index) scores are quality metrics which use LTR retrotransposons to evaluate genome assembly continuity.

In addition, I returned to the admixture analysis which I carried out during my last research project at Kew. This was a research project which analysed genomic data from complex hybrid elms, seeking to identify regions contributing to DED resistance. I was able to improve some of my existing scripts, and simplify aspects of the pipeline to make it more straightforward and reproducible for others. This manuscript has now been submitted to DEFRA – it's exciting to see the work coming together!

Finally, the Centre for Forest Protection has also funded some training of my choice, and next week I'll be attending a course about deep learning methods for population genomics and phylogeography. One of the most rewarding aspects of research is getting to learn new skills in a hands-on way.



I've loved my time at Kew and couldn't imagine a more pleasant way to have entered the world of work. My days have been a pleasant mix of tinkering on interesting, real-world problems, chatting with colleagues about research, and taking walks around the botanical gardens. I've been able to see the orchid festival, and look around the recently restored Marianne North gallery, as well as the current Singh twins exhibition, 'Botanical Tales and Seeds of the Empire'.

It's slowly starting to warm up this month – it's always sad to leave just as the gardens are coming into full bloom, but I'm looking forward to whatever comes after Kew!

