



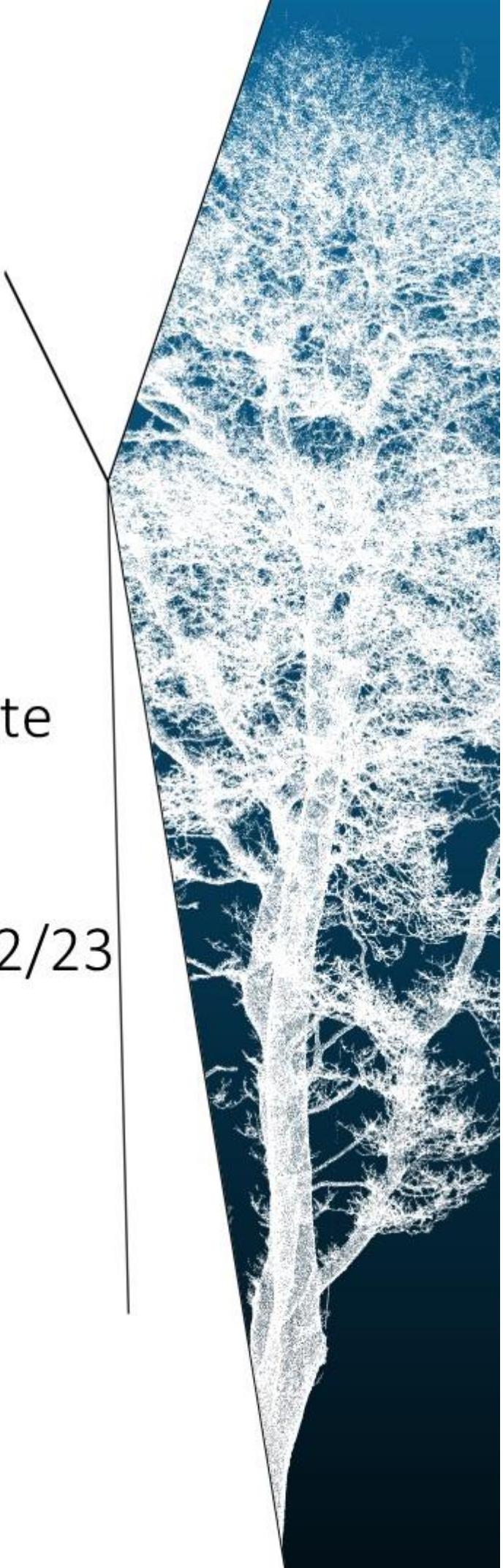
UNIVERSITY OF
BIRMINGHAM

BIFOR

BIRMINGHAM INSTITUTE OF FOREST RESEARCH

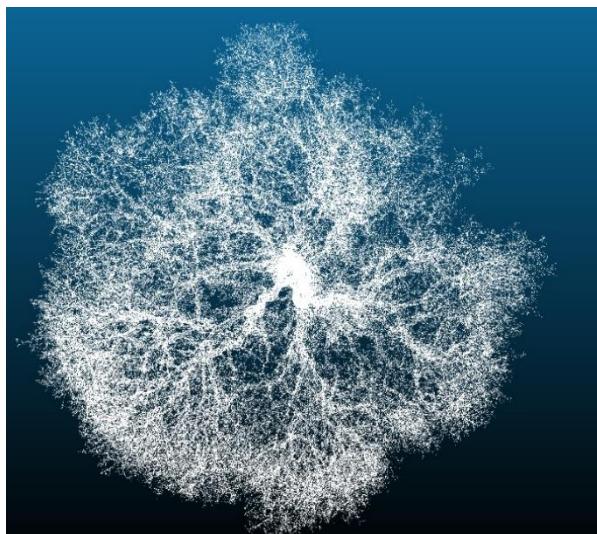
Birmingham Institute
of Forest Research
(BIFoR)

Annual Report 2022/23



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Images on cover and above are LiDAR scans of an oak tree at BIFoR FACE by Klaske van Wijngaarden

As we head into this next academic year, BIFoR celebrates its 10-year anniversary! The momentum of BIFoR is incredible, when we consider that, just 10 years ago, tree research in the UK was underfunded and had a reputation for being too difficult! The breadth of knowledge of landscapes was disappearing fast. BIFoR has helped changed this!



Our total funding, over 10 years, into forest related research is over £49 million.

Our Vision

BIFoR will be an internationally leading Institute that will address fundamental and interrelated challenges related to climate and environmental change and the resilience of trees to invasive pests and diseases.

Annual Meeting

The theme this year was 'Trees in Time.' Posters and recordings of many of the talks are available on our [website](#). This meeting is becoming a feature in people's calendar and praised for the depth and breadth of information shared. The focus of our next annual meeting, on 4 and 5 July 2024, will be 'Communities.'

Conferences & Papers

Our [Research Portal](#) lists all our research outputs: there were **62 new research outputs** in 2022/23 and the number of FACE-related papers is growing quickly. Our team have been disseminating results at international and national conferences. We had our greatest number of talks accepted at the European Geosciences Union in 2023 and look forward to running 4 sessions at the IUFRO 2024 World Congress conference in June and 3 sessions at EGU 2024.

Funding

In 2022/23 BIFoR brought in over £4.9 million towards research related to trees, woodlands & forests.

People

The Institute continues to thrive and attract global talent. A further 10 academics have joined our team of 81 academics:

Dr Alice Gauthey, Royal Society Research Fellow joins from EPFL, Switzerland - does long-term acclimation to eCO₂ enhance negative impacts of drought and heat on mature oak trees?

Dr Anna Gardner, early-career data synthesis researcher - working with data from the [BIFoR FACE](#) research facility.

Dr Anne Kairu, Newton International Fellow - governance of natural resources, carbon offset standards, and sustainability.

Dr Marine Cambon, Treescapes Research Fellow - host-microorganism interaction and microbiota with a focus on Acute Oak Decline.

Dr Liling Chang, Assistant Professor, joins us from Harvard University - responses of terrestrial ecosystems to climate change, elevated atmospheric CO₂ and disturbance events.

Dr Maria-Laura Ciusa, Research Associate - how new strains of pathogens emerge and evolve on trees.

Dr Joe He, postdoctoral Researcher - [MEMBRA](#) project.

Dr Lisa Lamberte, Research Fellow – the relationship of tree diversity and microbial diversity to ecosystem functionality.

Dr Beth Pettifor, Research Associate – investigating host-pathogen interactions in declining oak trees.

Dr Diego Marquez, postdoctoral researcher – CO₂ diffusion in leaves.

Doctoral Research

Joining the team in 2023 are: **Rachel Calder** (fungal communities), **Zachary Chu** (biodiversity dynamics), **Naya Desai** (quantifying ecosystem services from urban trees), **Shomari Healey** (ecosystem demography modeling), **Teddy Hunter** (forest music), **Naina Korotania** (phage cocktails to treat bacterial diseases of trees), **Rachel Mailes** (forest diversity and carbon); **Sophie Powell** (eCO₂ microbial diversity), **Andrea Vadillo Dieguez** (bacterial cherry canker).

Forest Edge Scholars

Our £1m Leverhulme Trust funded scholarship enabled 18 doctoral researchers to commence study, of whom 8 have now graduated.

Education & Outreach

There has been a **60% increase** in the number of school visits to BIFoR FACE thanks to new Education and Outreach officer **Sam Dobbie**. Schools have also visited campus. In total we have engaged with over 1000 pupils and 500 teachers. Sam has developed 17 fully resourced curriculum linked activities for use in school classrooms and sent out tree growth measuring kits ([BIFoR in a Box](#)) to 95 secondary school in the UK and Dubai.

Our research themes are:

- 1. Climate** - impact of climate & environmental change on woodlands
- 2. Health** - The resilience of trees to invasive pests & diseases
- 3. Global** - big data approaches across space & deep time
- 4. Urban Forests & Interdisciplinary** - Understanding the wider importance of trees & forests to human & non-human actors

Climate

The BIFoR Free Air Carbon Dioxide (CO₂) Enrichment (FACE) facility investigates the full spectrum of ecological, physiological, pathological, and biogeochemical responses of a woodland under elevated CO₂, (eCO₂) including: tree growth; photosynthesis; carbon allocation to tissues, defence, and belowground; nutrient acquisition; disease; and food web changes.

BIFoR FACE is now in its seventh year and has continued to out-perform expectations, delivering elevated CO₂ concentrations at, or very near to, the target of +150 ppm above the local ambient. In 2024, we will bring a new, more sustainable supply of CO₂ to the experiment, with thanks to **RenEco** who recover high purity CO₂ from food waste. Switching to the new supplier has a dual benefit – financial and reducing our carbon footprint.

Last year we reported that our studies show CO₂ uptake by the dominant oak trees through photosynthesis was increased by 23%, leaf nitrogen increased in line with leaf carbon, and stomatal conductance decreased. This year, another exciting story emerges: accelerated conversion of soil nitrogen into forms trees can use, which strongly affects how mature temperate forests respond to elevated atmospheric CO₂. Furthermore, this year we found evidence that eCO₂ enhances susceptibility to the fungi causing powdery mildew disease.

Global



Global Engagement Lead for BIFoR **Vincent Gauci, Sami Ullah** and **Adriane Esquivel Muelbert** visited the (nearly completed) Amazon FACE facility and co-organised a successful workshop in Brazil, leading to an active community of researchers.

Adriane will also be co-investigator for a new **NERC-NSF** funded project to improve the understanding of the drivers and causes of mortality of large tropical trees.

In November 2023 the University launches the Birmingham Brazil Institute & [Chico Mendez Chair](#).

Juliano Sarmento Cabral's group focuses on biodiversity dynamics across scales using mechanistic models. Recently developed simulation tools include metabolic models for species distributions dynamics under environmental change.

Drs **Nick Kettridge** and **Laura Graham** continue vital research with a new £2.5m grant [IDEAL UK Fire: Towards informed decisions on ecologically adaptive land management for mitigating risk in fire prone landscapes](#).

Urban Forests and Interdisciplinary Research

Emma Ferranti & Deanne Brettle continue their support to the [Trees Design and Action Group \(TDAG\)](#).

The latest TDAG publication in the 'First steps' series focuses on [First Steps in Urban Water](#). **James Levine** was awarded a UK Treescapes fellowship- data-driven approaches to tree planting.

Health

Tree health research at BIFoR continues to grow from strength to strength. The team grew by 25%.

Plant-pathogen-interaction and microbiology

Rob Jackson's lab focuses on studying bacterial pathogens of trees in the UK and also one overseas territory in St Helena. The team have been busy with data collection and the 5 PhD students who commenced in 2021 now move towards writing up and publishing.

Megan McDonald's group focuses on fungal pathogen and symbiont biology. For example, looking at relationships between certain types of fungi and root rot pathogens. **Graeme Kettles**' lab is working towards understanding the molecular mechanisms that underpin oak resistance to fungal and bacterial diseases. They also investigate how fungi and bacteria interact with each other in the oak tree microbiome, and subsequent health-related consequences.

Microbial Ecology

James McDonald's group focuses on Acute Oak Decline and microbiomes. The scale of the research effort is outstanding - 350 trees across 30 sites sampled in the UK.

Priming / immunity

Estrella Luna Diez's group focuses on priming in trees – an increased sensitivity to certain stimuli due to prior experience. The team have identified a defence elicitor that enhances resistance to powdery mildew which is not affected by elevated CO₂.

Plant Physiology

Christine Foyer was named 4th on the list of [Best Science and Agronomy Scientists](#) in 2023.

Florian Busch's group focuses on fundamental photosynthetic processes and how they acclimate under changing environments. The team investigates CO₂ diffusion inside leaves and its impact on photosynthetic carbon uptake.

Going Forward

Our priorities through academic year 2022/23 are below with a short response:

Reflect and act upon the recommendations from the Vice Chancellor Internal Review Panel.

We have implemented several changes, including changes to our BIFoR Board representatives to encourage greater cross college interactions, improved targeting of communications, and development of a proposal for Masters teaching.

Provide evidence of equality, inclusivity and culture change for greater scientific coherence.

Our 'Trees in Time' conference had a good balance of speakers in terms of gender and increased number of BAME speakers compared to previous years, the organising committee included two disabled members.

Support early career staff to apply for prestigious research fellowships (e.g., UKRI-FLF, Royal Society, Leverhulme Trust, NERC, BBSRC) to work in BIFoR

Marine Cambon and James Levine were both awarded Treescapes Fellowships.

Alice Gauthey comes to us from EPFL (Switzerland) on a Royal Society Fellowship.

Maximise scientific and wider societal reach of high-quality science outputs

Three 2023 papers have been published in journals with Impact Factor >10

Send at least two ECRs on exchange visits to overseas field and laboratory forest research laboratories to expand the geographic scope and impact of the research of BIFoR

Amy Webster visited St Helena Island research Institute; Carolina Mayoral visited University of Bologna, Italy;

Manon Rumeau and Nine Douwes Dekker both visited EucFACE at Western Sydney University.

Secure and/or apply for another large research grant (UKRI) as well as standard grants (UKRI, Leverhulme Trust, Horizon Europe, NSF-UKRI, etc.) incorporating interdisciplinary approaches where possible.

In addition to the successful bids listed in appendix 6 we also submitted 19 grant applications of a value greater than +£200,000, and up to £6,250,000. Bid currently awaiting decisions:

NERC Large Grant – PI Rob MacKenzie, CTH₂O

ERC Advance Grant – PI Sami Ullah, N-FACE

NERC Standard Grants – PI Vincent Gauci, DefMet

UAE Environment Ministry – PI Stefan Krause, Mangrove FACE

LUNZ Research Project – PI Laura Graham

Continue to develop and trial innovative teaching materials for new undergraduate and forest taught masters

Additions are being made to the [Virtual BIFoR FACE resource](#) including adding in all of the published results so far and creating i) a virtual mangrove ii) a virtual Ruskin Land to highlight the depth and breadth of research at the Institute.

Promote the science case for potential funding for the continuation of CO₂ fumigation at BIFoR FACE beyond a decade

We have prepared the science case for 'where next?', to be assessed by our External Advisory Group. We are actively seeking philanthropic donations, and UK government support.

Continue international engagement and presence in scientific conferences

BIFoR was well represented at the UK Plant Health Conference. We will lead on 4 special sessions at the International Union of Forest Organisations (IUFRO 2024 conference.



An example of one IUFRO World congress special sessions that BIFoR will lead.

Establish a hub for global forest dynamics and ecology research incorporating different existing data streams and supporting new field collections and/or investigations

A BIFoR Global business case has been developed.

Build stronger links across the colleges within UoB - organise i) Engineering and Physical Sciences (EPS) away day for the Head of School and academics to BIFoR FACE ii) a Chemistry school away day to BIFoR FACE

Senior members of the University have visited BIFoR FACE in 2022/23 including Vice Chancellor Adam Tickell, PVCs Stephen Jarvis, Deborah Longworth and deputy PVC Dominique

Improve upon how we as an Institute measure 'Impact'

Setting up the new BIFoR research portal site has increased our understanding of our impact. The images right & below are an example of the information we can now obtain.

Wider audience reach

2020-2022

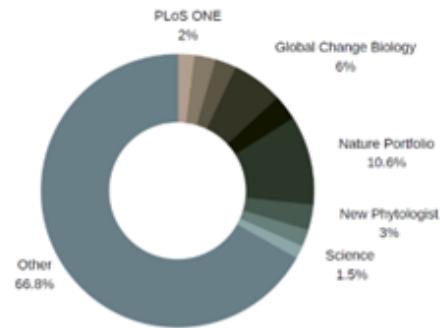
141 articles published in news outlets nationally and internationally with a total potential audience of over **43,100,000** people

Articles published in outlets such as:
The INDEPENDENT
Mail Online **Science** **BBC RADIO**
The Guardian **THE TIMES**

Plan for COP28 engagement via the University of Birmingham -Dubai campus node.

BIFoR launched 'Future Forests' a set of curriculum linked resources to amplify student voice around climate change. Using the resources, pupils are encouraged to add to a digital woodland, highlighting the causes, effects and solutions to key issues affecting forested landscapes worldwide. Jerry Pritchard has actively engaged schools within Dubai to take part and have their voices heard in the Green Zone at COP28. This feeds into a wider project looking at youth perceptions of sustainability in the UAE BIFoR will be represented in person at COP28 in the Green Zone.

Where are the peer-reviewed papers published?



While continuing our successful efforts across the areas above, our priorities for academic year 2023/24 are:

- Develop our interdisciplinary research, targeting large grant opportunities when they arise
- Increase curation facilities for medium-long term storage of samples taken from FACE and other experiments
- Recruit at least one more academic to develop BIFoR-related research
- Recruit at least two more PhD students on BIFoR-related projects through UK or international funding
- Support the new BIFoR ECR to establish a new research programme related to FACE experiment
- Maximise impact at the International Union of Forest Research (IUFRO) World Congress 2024

Education focused priorities

- Develop a new MSc Forest course for launch in 2025
- Overcome access barriers, widen participation and provide immersive learning experiences that reflect the breadth and depth of research at the institute
- Increase meaningful collaboration between researchers and school pupils

BIFoR at a glance

64

doctoral researchers over 10 years with 18 now graduated and in the workplace or further research.



1007 hours of volunteering

Our team contributes to important policy documents, like the UK Forestry Standard.

We sit on important science advisory groups such as the UK government's Trees and Woodlands Science Advisory Group.

Key results from the first 6 years of elevated levels of carbon dioxide at BIFoR FACE



390

written research outputs over 10 years with 62 in 2022/23.
Over 17,254 citations

Awards went to:
UK Sustainability Award
BIFoR FACE team
David Hannah -AGU Fellow
Kris Hart - Papin Prize
Deanne Brettle & Sam Dobbie - Birmingham Award
Thomas Downes - Apprentice of the Year

36,000 views of BIFoR videos online
61,000 views of the BIFoR FACE Facility virtual tour
30,000 average page views on website every year
4,532 followers on socials X and Instagram

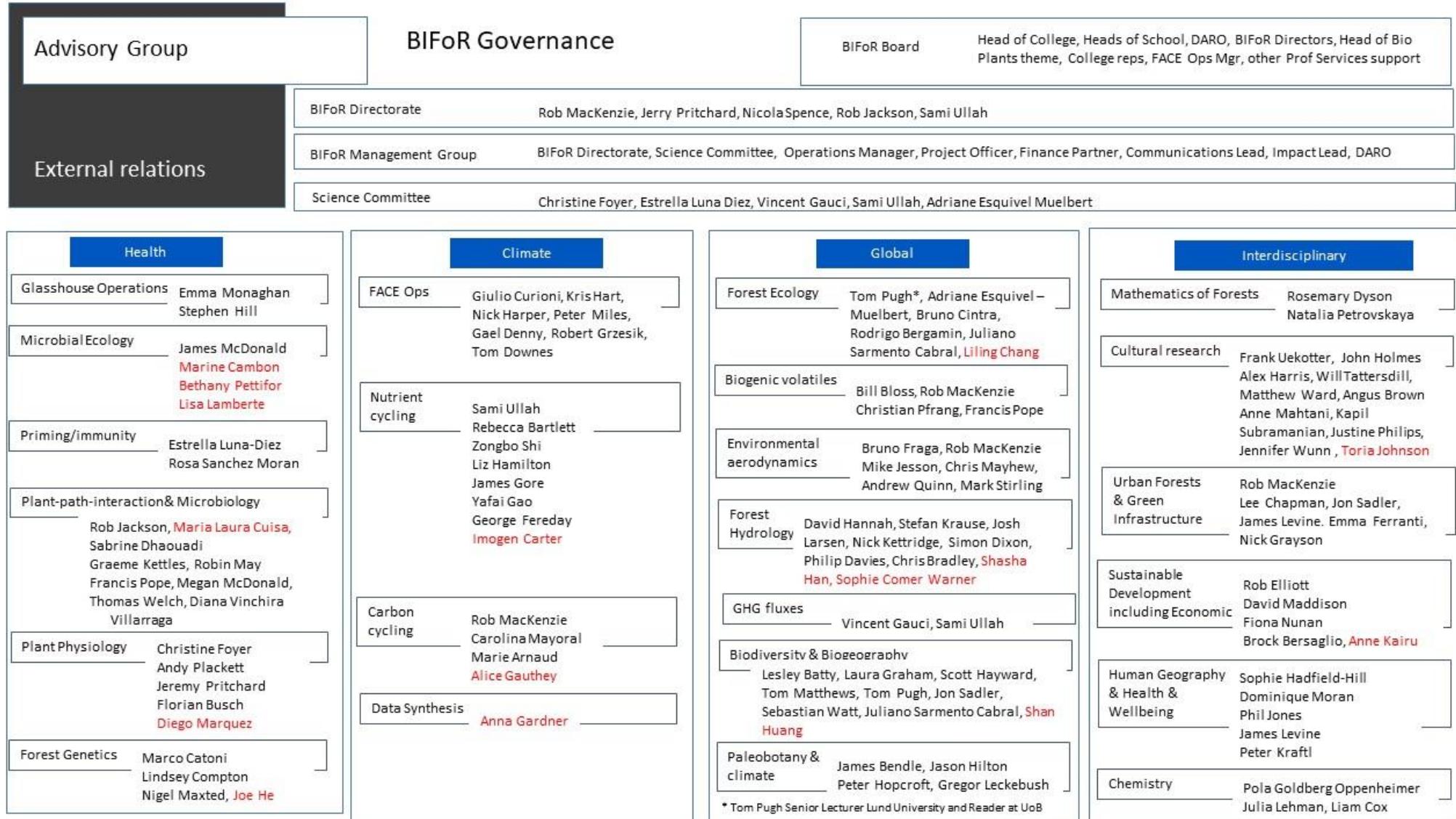
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Appendix 1 People

Organisational diagram of BIFoR - new 2022/23 additions to the team / structure are in red. Many research areas will cross the themes.



BIFoR Advisory Group Members

Chaired by Prof. William Bloss, Head of College of Life & Environmental Sciences
Prof. Bradwell, Honorary Professor Immunology University of Birmingham
Dr Alice Broome, Project Leader for Protected Species, Forest Research
Dr Anna Brown, Head of Tree Health and Contingency, Forestry Commission England
Dr Clive Elphick, independent Director with the National Grid Gas Place and National Grid Electricity Transmission Plc, on the Board of the Environment Agency.
Dr Jeanette Hall, Woodland Advisor, Scottish Natural Heritage
Prof. David Johnson, Chair in Microbial Ecology, University of Manchester
Prof. Richard Norby, University of Tennessee, USA
Prof. Sir Ghillean Prance, formerly Director of Royal Botanical Gardens KEW
Prof. Malcolm Press, Vice Chancellor, University of Manchester
Prof. Nicola Spence, Chief Plant Health Officer, Defra and University of Birmingham

BIFoR Directors

The Directors of BIFoR are Professors Rob Jackson, Rob MacKenzie, Jeremy Pritchard, Nicola Spence and Sami Ullah.

BIFoR Board

Chair of the BIFoR Board is Prof. William Bloss, Head of College of Life & Environmental Sciences
Gary Bilham (Development and Alumni Relations Office - DARO)
Prof. Richard Butler (College of Life and Environmental Sciences - GEES)
Dr Emma Ferranti (College of Engineering and Physical Sciences)
Lesley Ann Ford (College of Life and Environmental Sciences)
Prof. Christine Foyer (College of Life and Environmental Sciences)
Dr Eva Frickell (College of Life and Environmental Sciences - Biosciences)
Prof. Vincent Gauci (College of Life and Environmental Sciences - GEES)
Nicola Goodall (College Finance)
Prof. David Hannah (College of Life and Environmental Sciences)
Dr Kris Hart (College of Life and Environmental Sciences)
Prof. John Holmes, (College of Art and Law)
Prof. Rob Jackson (College of Life and Environmental Sciences - Biosciences)
Dr Toria Johnson, (College of Art and Law)
Amy Kendrick (Director of Operations - College of Life and Environmental Sciences)
Dr Estrella Luna Diez (College of Life and Environmental Sciences - Biosciences)
Prof. Rob MacKenzie (College of Life and Environmental Sciences - GEES)
TBC (College of Social Sciences)
Dr Jon Oldfield (College of Life and Environmental Sciences - Head of School GEES)
Prof. Jeremy Pritchard (College of Life and Environmental Sciences - Biosciences)
Peter Tierney (College Finance)
Prof. Sami Ullah (College of Life and Environmental Sciences - GEES)



BIFoR Director Nicola Spence (left) and PVC for Education Deborah Longworth (right) who used our unique canopy access system to ascend to the treetops during a visit.

BIFoR Management Group

Prof. Rob Jackson Chair (College of Life and Environmental Sciences - Biosciences)
Dr Adriane Esquivel Muelbert, (College of Life and Environmental Sciences - GEES)
Prof. Christine Foyer (College of Life and Environmental Sciences)
Prof. Vincent Gauci (College of Life and Environmental Sciences - GEES)
Dr Kris Hart (College of Life and Environmental Sciences – GEES)
Dr Estrella Luna Diez (College of Life and Environmental Sciences - Biosciences)
Prof. Rob MacKenzie (College of Life and Environmental Sciences – GEES)
Prof. James McDonald (College of Life and Environmental Sciences – Biosciences)
Dr Megan McDonald (College of Life and Environmental Sciences – Bioscience)
Prof. Jeremy Pritchard (College of Life and Environmental Sciences - Biosciences)
Prof. Nicola Spence (Defra and Honorary Professor at the University of Birmingham)
Prof. Dr Sami Ullah (College of Life and Environmental Sciences - GEES)
Peter Tierney (Finance)
Deanne Brettle Secretary (College of Life and Environmental Sciences - GEES)

BIFoR Science Committee

Dr Adriane Esquivel Muelbert (College of Life and Environmental Sciences – GEES)
Prof. Christine Foyer (College of Life and Environmental Sciences - Biosciences)
Prof. Vincent Gauci (College of Life and Environmental Sciences - GEES)
Dr Kris Hart (College of Life and Environmental Sciences – GEES)
Dr Estrella Luna Diez (College of Life and Environmental Sciences - Biosciences)
Prof. Sami Ullah (College of Life and Environmental Sciences – GEES)

BIFoR Professional Service Staff

Deanne Brettle - Project Officer
Gael Denny - Field Technician BIFoR FACE facility
Thomas Downes - Apprentice Engineer
George Fereday – Research Technician, FACE underground
James Gore – Research Technician, QUINTUS
Robert Grzesik – Senior Research Technician, QUINTUS
Nicholas Harper - Senior Engineer FACE facility
Dr Kris Hart - Operations Manager
Stephen Hill – Wolfson Glasshouses
Peter Miles - Field Technician BIFoR FACE facility

International visiting scientists in 2023/2024

Dr Shoaib Amjad visiting Assistant Professor from Women University AJ&K Bagh
Dr Tobia Baskin, visiting from University of Massachusetts
Dr Megha Kaviraj, UK-India Fellow
Prof Humberto Marotta visiting Assistant Professor from Fluminense Federal University, Brazil

Honorary members of the Institute

Dr Shoaib Amjad visiting Assistant Professor from Women University AJ&K Bagh
Prof. Jonathan Drori - Honorary Professor of science communication.
Prof Richard Harrison – Wageningen University & Research
Dr Debbie Hemming – Scientific Manager, Vegetation-Climate Interactions group, Met Office
Prof. Richard Norby – Honorary Professor BIFoR FACE

The number of academic members of staff affiliated to BIFoR has continued to grow. The Institute is open to University of Birmingham staff and students whose research interest is related to the natural science, social science or cultural relevance of forested landscapes.

College of Engineering and Physical Sciences

Academic Staff

Prof. Mark Sterling
 Dr Emma Ferranti (**College Rep. for BIFoR**)
 Dr Andrew Quinn
 Prof. Phillip Davies
 Dr Rosemary Dyson
 Dr Bruno Fraga
 Dr Mike Jesson
 Dr Chris Mayhew
 Prof. Pola Goldberg Oppenheimer
 Dr Natalia Petrovskaya

Doctoral Researchers

Kieran Clark
 Nicholas Cork
 Bradly Deeley
 Neya Desai
 Dee Phillips
 Bruno Santos

College of Arts and Law

Academic Staff

Dr Angus Brown
 Prof. Alexandra Harris
 Prof. John Holmes (**College Rep. for BIFoR**)
 Dr Toria Johnson (**College Rep. for BIFoR**)
 Dr Annie Mahtani

Postdoctoral Researcher

Dr Kapil Subramanian
 Dr Justine Philips

Doctoral Researchers

Dion Dobrzynski
 Teddy Hunter
 Thomas Kaye

College of Social Sciences

Academic Staff

Prof. David Maddison
 Dr Allan Beltran
 Dr Brock Bersaglio
 Prof. Robert Elliott
 Prof. Fiona Nunan

Postdoctoral Researcher

Dr Anne Kairu

Doctoral Researchers

Harriet Croome
 Maria Teresa Gonzalez Valencia

College of Life and Environmental Sciences

School of Biosciences

Academic Staff

Dr Florian Busch
 Dr Marco Catoni
 Dr Lindsey Compton
 Prof. Christine Foyer
 Dr Scott Hayward
 Prof. Rob Jackson
 Dr Graeme Kettles
 Dr Estrella Luna Diez
 Prof. James McDonald
 Dr Megan McDonald
 Prof. Nigel Maxted
 Prof. Robin May
 Dr Andrew Plackett
 Prof. Jeremy Pritchard
 Dr Juliano Sarmento Cabral

Honorary Staff

Prof Jon Drori
 Prof Nicola Spence

Postdoctoral Researcher

Dr Maria-Laura Ciusa
 Dr Sabrine Dhaouadi
 Dr Anna Gardner
 Dr Joe He
 Dr Lisa Lamberte
 Dr Carolina Mayoral
 Dr Diego Marquez
 Dr Beth Pettifor
 Dr Rosa Sanchez Lucas
 Dr Diana Vinchira-Villarraga

Doctoral Researchers

Octavia Bradley
 Rachel Calder
 Zachary Chu
 Emily Grace
 Katherine Hinton
 Naina Korotania
 Vanja Milenkovic
 Sophie Powell
 Mark Raw
 Andrea Vadillo Dieguez
 Amy Webster
 Jiaqi Wei

School of Geography, Earth and Environmental Sciences

Academic Staff

Dr Rebecca Bartlett
Dr Lesley Batty
Dr James Bendle
Prof. William Bloss
Dr Chris Bradley
Dr Liling Chang
Dr Lee Chapman
Dr Julian Clark
Dr Simon Dixon
Dr Adriane Esquivel Muelbert
Prof. Vincent Gauci
Dr Laura Graham
Dr Nick Grayson
Dr Sophie Hadfield-Hill
Dr Liz Hamilton
Prof. David Hannah
Prof. Jason Hilton
Dr Peter Hopcroft
Dr Phil Jones
Prof. Nicholas Kettridge
Prof. Peter Kraftl
Prof. Stefan Krause
Dr Joshua Larsen
Dr Gregor Leckebush
Dr James Levine
Prof. Rob MacKenzie
Dr Thomas Matthews
Dr Dominique Moran
Dr Christian Pfrang
Prof. Francis Pope
Dr Tom Pugh*
Prof. Jon Sadler
Prof. Zongbo Shi
Prof. Sami Ullah
Dr Sebastian Watt

*Tom Pugh Senior Lecturer Lund University and Reader at UoB

Honorary Staff

Prof Rich Norby
Dr Shoaib Amjad

Postdoctoral Researcher

Dr Rodrigo Bergamin
Dr Bruno Cintra
Dr Yafei Gao

Doctoral Researchers

Rehab Almutairi
Alex Armstrong
Gemma Baker
Hector Carmago
Xinshi Cheng
Estelle Darko
Nine Douwes Dekker
Katy Faulkner (Warwick)
Xianbang Feng (Exeter)
William Hagan Brown (Plymouth)
Grace Handy
Shomari Healey
Laura James
Fatima Khan
Thomas King (Lancaster)
Novalia Kusumarin
Yanzhi Lu
Nicholas Lugg
Rachel Mailes
Nigar Parvin
Sue Quick
Andrea Rabbai
Manon Rumeau
Klaske van Wijngaarden
Bridget Warren
Hye in Yang (Max Planck Inst)



The BIFoR Annual Conference planning team

L-R: Bruno Cintra, Sam Dobbie, Andy Plackett, Deanne Brettle, Sabine Dhaouadi
Rob MacKenzie and Jason Hilton

School of Psychology

Academic Staff

Dr Ali Mazaheri

Appendix 2 Doctoral Research

We welcomed 9 new PhD students in 2021/2022 and a further 8 students commenced in September 2023. The ^ symbol denotes students who will carry out their research at BIFoR FACE.

The * symbol denotes student is funded through the Forest Edge Doctoral Scholarship Programme



^Rachel Calder - Role of fungal communities in carbon and nutrient cycling in forest soils under elevated atmospheric CO₂ concentrations.

Fungi play vital roles in woodland ecosystems, notably as decomposers and as mycorrhizal symbionts of plants. Changes in the composition and functioning of fungal communities could therefore have significant repercussions for the wider ecosystem. This CENTA-funded project aims to investigate how fungal communities respond to elevated CO₂ levels at BIFoR FACE, with a particular focus on the possible implications for nitrogen cycling. Though an initial enhancement of net primary productivity (NPP) is expected as CO₂ levels rise, it is thought that this effect may be short-lived as soil nutrients are likely to become limiting. In temperate woodland ecosystems, nitrogen is the primary limiting nutrient. Ectomycorrhizal fungi form beneficial associations with many tree species, including oak. These fungi are able to acquire nitrogen from pools that are less accessible to plants and transfer it to their hosts, potentially alleviating nutrient limitation for the trees, although it is also possible that ectomycorrhizae may exacerbate nitrogen scarcity by sequestering a large proportion of the limiting nutrient in their own biomass rather than transferring it to their plant partners. This project will explore these questions by investigating the composition and functioning of soil fungal communities under atmospheric and elevated CO₂ in the FACE woodland. Supervisors: Dr **Megan McDonald** (Bio) and Prof **Sami Ullah** (GEEs)

Zachary Chu - Biodiversity dynamics across environmental gradients and under impending environmental change.

Global biodiversity is already being altered by anthropogenic threats such as land-use and climate change, while varying naturally along latitudinal, elevational, and vertical gradients. To better predict how these drivers of change interact to impact biodiversity, mechanistic modelling will be used. This will simulate the environmental changes behind these drivers, how the underlying physiological and demographic processes and biotic interactions of biological communities are affected, and the resulting impact on populations. Vascular epiphyte communities, which are plants growing on other plants non-parasitically, will be modelled due to their significance, making up 10% of all plant species. They are also relatively understudied compared to other taxa, yet provide valuable ecosystem services such as water regulation, soil formation in the canopy, and carbon sequestration.

Supervisors: Dr **Juliano Sarmento Cabral** (Bio), Professor **Alexandre Antonelli** (Kew Gardens), Dr **Diana Bowler** (UKCEH)

Naya Desai - Quantifying ecosystem services from urban trees.

As climate change is the most pressing challenge faced by modern-day society, it is imperative to find viable solutions that build resilience to the already onset effects of climate change such as extreme weather whilst conjunctly reducing greenhouse gases that are effectuating the problem. Urban areas, in specific, are impacted disproportionately due to the concentration of people and infrastructure. Thus, this project aims to quantify the crucial role that urban trees play in climate mitigation and climate adaptation. Trees sequester carbon, reduce heat vulnerability by providing shade and locally reducing heat via evapotranspiration, and intercept rainfall reducing the risk of surface-water flooding during heavy rainfall events. Trees also modify local atmospheric chemistry; they produce Volatile Organic Compounds (VOCs) which react with urban pollutants such as NO_x from road transport emissions to produce ozone. Trees can also trap heat and pollution beneath their canopies, locally increasing overheating risk and air pollution. The benefits and disbenefits of trees are poorly quantified due to a lack of observations at tree canopy level, and the difficulties of translating such in-situ measurements made around individual trees (of a specific size, species, and growing conditions) into information that can be used at multiple scales across our cities to support decision-making. Therefore, this project will apply novel machine learning techniques to quantify the role of urban trees in climate adaptation and mitigation in an urban environment.

Supervisor: **Emma Ferranti** (EPS)

^Shomari Healy - How much carbon will forests take up in the future.

Climate change has been happening at an unprecedented rate due to human activities and the concentrations of greenhouse gases in the atmosphere continue to rise. It is widely known, however, that land surfaces can mitigate global warming by removing around 30% of anthropogenic CO₂ emissions mainly through enhanced photosynthesis. The capacity for this enhanced terrestrial uptake to continue in the future is highly uncertain, however, when predicted using current terrestrial biosphere models. Using the Free-air CO₂ enrichment (FACE) experiment at the Birmingham Institute of Forest Research (BIFoR) and an ecosystem demography model, I aim to help to provide more reliable predictions of ecosystem processes in the future and determine how temperate forests will sequester carbon moving forward under different scenarios.

Supervisors: **Dr Liling Chang** (GEES), **Dr Joshua Larsen** (GEES)

Teddy Hunter – Forest music

Further details to be confirmed

Supervisor: **Annie Mahtani** (College Arts and Law)

Naina Korotania (started earlier in 2023) - Development of phage biopesticide to control bacterial diseases of trees. Naina won an Applied Microbiology International PhD Studentship.

Supervisor: **Robert Jackson** (Bio)

Rachel Mailes - Exploring conservation co-benefits to biodiversity and carbon storage and sink capacity across forests to improve practice.

Further information: Conservation of global forests is at the center of the climate and biodiversity crisis prevention efforts. Forests play a fundamental role in mitigating climate change, absorbing around 1/3 of anthropogenic emissions, but are also home to 80% of terrestrial biodiversity. Modern forest management is mainly directed at protecting and increasing carbon stocks to mitigate climate change, often assuming biodiversity will be simultaneously protected as a co-benefit. While there is evidence for a positive relationship between these variables in tropical forests at large scales, recent studies suggest this may not be the case for temperate forests. This project will assess the dynamics of the carbon-biodiversity relationship in the UK and how this may impact policy and net-zero targets. Supervisors: **Dr Adriane Esquivel Muelbert**, **Dr Laura Graham**, **Dr Tom Matthews** Prof. **Matthew Heard**.

^Sophie Powell - The effect increasing CO₂ levels have on tree microbial diversity. Understanding the impact of climate change and elevated CO₂ concentration (e[CO₂]) on tree microbial diversity.

UK woodland provides many benefits including supporting rich biodiversity, enhancing the economy, and playing a key role in culture and well-being. However, plant pathogens threaten many valuable trees, and susceptibility to disease is hypothesised to increase as climate change progresses. e[CO₂] is believed to impact tree physiology and metabolism, which may cause alterations in the abundance and composition of plant exudates. This will alter the structure, diversity and thereby function of tree microbiomes. To understand this metabolomic analysis, microbial culturing, and community profiling of bacteria and fungi will be conducted using oak leaves and soil collected from BIFoR-FACE. This will decipher whether e[CO₂] has an impact on the diversity of oak microbial communities. Typically plant microbial communities play a key role in improving plant immunity so research will also aim to identify how individuals and the entire microbial consortia interact with different pathogens to understand how disease susceptibility and biocontrol may change with e[CO₂].

Supervisors: Dr **Mojgan Rabiey** (Warwick), Prof **Robert Jackson** (Bio) and **James McDonald** (Biosciences)

Andrea Vadillo Dieguez - To investigate the molecular basis of bacterial cherry canker pathogenesis through integrative omics approaches, including transcriptomics, metabolomics, and effector protein function analysis.

Bacterial cherry canker affects the phyllosphere, especially the leaf, fruit, and woody tissues of sweet cherry (*Prunus avium* L.) causing up to 75% of plant death in young orchards. The main causal agents of cherry canker are *Pseudomonas* pv. *syringae* (Pss), Ps pv. *morsprunorum* Race 1 (Psm1) and Psm Race 2 (Psm2). No successful control method is known and currently, there is no durable resistant cultivar to this disease. This project aims to use integrative omics like plant transcriptomics, metabolomics and bacterial effector function analysis to understand the following: what is the plant immune response of sweet cherry towards the main pathogenic *Pseudomonas* *syringae* strains Pss, Psm1 and Psm2; how is the plant immune response altered in sweet cherry when infected with effector and toxin deletion mutants of Pss9644; and what is the function of the effector proteins of Pss9644 in different cherry tissues. The outcome of this project would be an important step forward towards a better understanding of this disease which can be beneficial for breeding purposes.

Supervisors: Prof. **Rob W. Jackson** (Bio), Dr **Graeme Kettles** (Bio)

Ongoing Doctoral Research

Climate

- **^Rehab Almutairi** - funded by the Saudi Arabian Government. Rehab is evaluating the response of oak seedling growth to drought and elevated CO₂; and how drought and elevated CO₂ affect nutrient availability. Supervised by Prof. **Sami Ullah**, Prof. **Nick Kettridge (GEES)** and Prof. **Jeremy Pritchard (Biosciences)**
- **^Alex Armstrong** - Effects of atmospheric Nitrogen pollution on Soil Carbon Storage and Greenhouse Gas Emission from Forests Soils. Supervised by Prof. **Sami Ullah (GEES)** & Dr **Liz Hamilton (GEES)** [Poster 2023](#)
- ***^Nine Douwes Dekker** – Greenhouse gas emissions from soils under elevated CO₂. Supervised by Prof. **Sami Ullah (GEES)**, Prof. **Vincent Gauci (GEES)** & Prof. **Rob MacKenzie (GEES)** [Poster 2023](#)
- **^Katy Faulkner** - looking at the resistance and resilience of forest soil microbial communities and greenhouse gas emission to extreme weather events and a high CO₂ world. Supervised by Prof. **Gary Bending (Warwick)** and Prof. **Sami Ullah (GEES)**
- **^Xianbang Feng**, funded by Chinese Scholarship Council and based at Exeter University. Xianbang's

research is focused on productivity of mycorrhizal biomass and its implications for carbon and nutrient cycling at BIFoR-FACE. Supervised by Prof. **Iain Hartley** at Exeter University, and co-supervised by Prof. **Sami Ullah** and Dr **Liz Hamilton** and Prof. **Rob MacKenzie**, University of Birmingham.

- **^William Hagan Brown** - Climate Change Impacts on Forest Canopy Temperatures: From Mechanisms to Implications. Supervised by **Sophie Fauset** (Uni. Plymouth), Prof. **Ralph Fyfe** (Uni. Plymouth), Prof. **Emanuel Gloor** (Uni. Leeds), and Prof. **Rob MacKenzie** (BIFoR).
- **^Grace Handy** - Impact of CO₂ rise on root, leaf and wood production: the future of tree C allocation. Supervised by Dr **Marie Arnaud** (GEES), Dr **Adriane Esquivel Muelbert** (GEES) and Prof. **Rob MacKenzie** (GEES) in collaboration with Forest Research and the Met Office.
- ***^Laura James** – ‘Talking’ trees; the impacts of ozone and elevated CO₂ on chemical communication networks. Supervised by Dr **Christian Pfrang** (GEES), Dr **Robbie Girling** (Reading) and Prof. **Rob MacKenzie** [Poster 2023](#)
- ***Fatima Khan** – Tree water isotopes at BIFoR FACE facility. Supervised by **Joshua Larsen** (GEES)
- **^Thomas King**, based at Lancaster University: Ecophysiology of plant volatiles under elevated carbon dioxide. Supervised by Dr **Kirsti Ashworth** (Lancaster - retired) and Prof. **Rob MacKenzie** (GEES)
- **^Novalia Kusumarini**, Funded by the Indonesian Government. Novalia is investigating differences in the chemistry of root exudates of newly planted nitrogen-fixing alder (*Alnus* spp.) and non-nitrogen fixing oak (*Quercus* spp) saplings in the Mill Haft catchment adjacent of BIFoR-FACE. Supervised by Prof. **Sami Ullah**, Prof. **Iseult Lynch** (GEES) & Dr **Liam Cox** (Chemistry).
- **^Sue Quick** - Tree-soil-water relations under elevated CO₂. Supervised by Prof. **Stefan Krause** (GEES) and Prof. **Rob MacKenzie** (GEES) [Poster 2023](#)
- ***^Mark Raw** - Priming of defence in an elevated CO₂ world. Supervised by Dr **Estrella Luna Diez** (Bio) and Dr **Scott Hayward** (Bio)
- **^Andrea Rabbai** - Trends in soil moisture and temperature dynamics in juvenile forests align to those of mature forest from the time of canopy closure. Supervised by Prof. **Stefan Krause** (GEES), Prof. **Nicholas Kettridge** (GEES) and Prof. **Sami Ullah** (GEES)
- **^Manon Rumeau** - Exploring the effects of elevated CO₂ on free living N fixation as well as on other N cycle processes. Supervised by Prof. **Sami Ullah** (GEES) & Prof. **Rob MacKenzie** (GEES) [Poster 2023](#)
- ***^Klaske van Wijngaarden** - Woody carbon dynamics of the trees at the BIFoR FACE and EucFACE experiments. Supervised by Dr **Tom Pugh** (GEES), Dr **Josh Larsen** (GEES), Prof. **Ben Smith** (Western Sydney University (WSU) Prof. **Belinda Medlyn** (WSU) [Poster 2023](#)

Health

- ***Kieran Clarke** - Study and Fabrication of Rapid Engineered Spectroscopic Technology (FoRESTech) for Identification of Filamentous Pathogens in Leaves. Supervised by Prof. **Pola Goldberg Oppenheimer** (Chem Eng) and Dr **Estrella Luna Diez** (Bio) [Poster 2023](#)
- **Emily Grace** - Analysis of phage that infect oak pathogens and the dynamics of phage population changes and bacterial community change in a disease lesion. Supervised by Prof. **Rob Jackson**. [Poster 2023](#)
- **Katherine Hinton** - Examining risk of new disease outbreaks in a diseased population using ash as a model. Supervised by Prof. **Robert Jackson** (Bio) Dr **Megan McDonald** (Bio), Prof. **Richard Bugs** (Kew Gardens) [Poster 2023](#)
- **Vanja Milenkovic** - Examining the impact of soil on tree health and disease progression. Supervised by Prof. **Robert Jackson** (Bio) and Prof. **Vincent Gauci** (GEES). [Poster 2023](#)
- **Amy Webster** - A study of tree disease on the Island of St Helena. Supervised by Prof. **Rob Jackson**. [Poster 2023](#)
- **Jiaqi Wei** - Evaluating the threat of *Xylella* on UK trees. *Xylella fastidiosa* is a bacterium that is endemic to Central America. Supervised by Prof. **Robert Jackson** (Bio) and Dr **Graeme Kettles** (Bio). [Poster 2023](#)

Global

- **Octavia Brayley** - A study of the adaptations, ecological impacts, and future distribution of an invasive insect species on Signy Island (Antarctica). Supervised by Dr. **Scott Hayward** (School of Biosciences), Prof. **Sami Ullah** (School of Geography, Earth and Environmental Sciences), and Prof. **Pete Convey** (British Antarctic Survey).
- **Estelle Darko** - Research into forest diversity, dynamics, and resilience globally. I will be performing analyses at large-scales using data from forest inventory networks such as RAINFOR to investigate the effects of forest dynamics on diversity. Supervised by Dr **Adriane Esquivel Muelbert** (GEES), Dr **Tom Matthews** (GEES), Dr **Laura Graham** (GEES), Dr **Tom Pugh** (GEES and University of Lund), Prof. **Oliver Phillips** (University of Leeds), Dr **Carolina Tova** (Kew Gardens), and Dr **Lindsay Banin** (UKCEH).
- **Xinshi Cheng** – Xinshi is studying seed plant diversity and evolution from a systematic investigation of exceptionally well-preserved fossils seeds from the late Permian of China. Supervised by Prof. **Jason Hilton** (GEES) and Dr **Andy Plackett** (Bio)

Interdisciplinary

- ***Gemma Baker** – Life on the edge: New tools to track animal-forest trophic interaction across intact to degraded ecosystems. Supervised by Dr **Sarah Greene** (GEES), Dr **James Bendle** (GEES) and **Lydia Greene** (Duke Lemur Centre, Duke University [Poster 2023](#) d)
- **Nicholas Cork** – A study into optimised stewardship of Green Infrastructure along linear transportation corridors under changing climatic conditions. Supervised by Dr. **Emma Ferranti** (School of Engineering) and Prof. **Andrew Quinn** (School of Engineering)
- ***Harriet Croome** - understanding how elephant behaviours have changed with wildlife conservation initiatives in Mukogodo Forest. Supervised by Dr **Brock Bersaglio** (International Development Department (IDD)), Prof. **Fiona Nunan** (IDD) [Poster 2023](#)
- ***Thomas Kaye** - The Forestry of Writing. Supervised by Prof. **Alexandra Harris** (English), Dr **Matthew Ward** (English)
- **Yanzhi Lu** - The potential of urban trees to remove air pollutants, carbon and heat: a large-scale analysis based on Google Street View. Supervised by Dr **Christian Pfrang** (GEES), Dr **Emma Ferranti** (Chemical Engineering), Prof. **Lee Chapman** (GEES)
- **Nigar Parvin** – Urban heat island impact on human health of Dhaka Megacity, Bangladesh. Supervised by Dr **Emma Ferranti** (Chemical Engineering)
- **Dee Phillips** - A study of the greenhouse gas emissions and efficiency of woody constructed wetlands for wastewater treatment in conjunction with industry stakeholders. Supervised by Prof. **Philip Davies** (School of Engineering) and Dr **Joshua Larsen** (GEES)
- ***Bruno Santos** - Wastewater treatment trees: can forests filter helps solve our wastewater crisis? Supervised by Prof. **Philip Davies** (School of Engineering) and Dr **Joshua Larsen** (GEES)

Submitted and / or graduated 2022/2023

- ***Maria Teresa Gonzalez Valencia** - Using satellite and house price data our research will identify the size and persistence of the impact of pure information effect on the perception of forest fire risk. Supervised by Prof. **David Maddison** and Dr **Alan Beltran Hernandez**
- ***Bradly Deeley** – Mathematics of biological invasion of plant species poses a major threat both to the ecosystem and the economy. Supervised by Dr **Natalia Petrovskaya** (EPS) and Dr **Rosemary Dyson**
- ***Dion Dobrzynski** - Forest Ecology in Fantasy Fiction: Mobilising the Imaginative Resources of Fantasy Fiction for Living with Forests. Supervised by Prof. **John Holmes** (English), Prof. **Jon Sadler** (GEES) and Dr **Will Tattersdill** (English)
- **Kerryn Little** - Predicting Future Fuel (Vegetation) Water Moisture Content and Associated Wildfire Danger Across Temperate Europe. Supervised by **Nick Kettridge** (GEES).

- **^Sophie Mills** – The effect of elevated CO₂ on primary biological aerosol (bioaerosol) production, in particular pollen and fungal spores, in woodlands. Supervised by Prof. **Francis Pope** (GEES) and Prof. **Rob MacKenzie** (GEES)

Graduated prior to 2021

- **Nezha Acil** - global forest dynamics – storm related tree mortality and its influence on global forest cycling. Supervised by Dr **Tom Pugh** (GEES) and Prof. **Jon Sadler** (GEES)
- **Sijeh Asuk** - Population ecology and phenological responses of food-producing forest trees to climate change: implications for rural food security. Supervised by Dr **Tom Pugh** (GEES), Prof. **Nick Kettridge** (GEES) & Prof. **Jon Sadler** (GEES)
- **^Aileen Baird** - Fungal biodiversity. Supervised by Prof. **Francis Pope** (GEES) & Prof. **Robin May** (Bio)
- **^Ed Bannister** - environmental aerodynamics of the BIFoR FACE site. Supervised by Dr **Xiaoming Cai** (GEES) and Prof. **Rob MacKenzie** (GEES)
- **Alfred Bockarie** – charcoal research Africa. Supervised by Prof. **Rob MacKenzie**
- **^Liam Crowley** - Insects as key drivers of change in woodland systems under climate change. supervised by Dr **Scott Hayward** (Bio), Prof. **Jeremy Pritchard** (Bio) and Prof. **Jon Sadler** (GEES)
- **^Anna Gardner** - Leaf physiology under elevated CO₂. Supervised by Prof. **Rob MacKenzie** (GEES), Prof. **David Ellsworth** (WSU) and Prof. **Jerry Pritchard** (Bio)
- **Lavinia Georgescu** - Machine learning to find patterns and relationships regarding droughts and forests at a biogeographical level. Supervised by Dr **Tom Pugh** (GEES)
- **Vilane Goncalves-Sales**, Satellite monitoring of deforestation and the role of clouds in Maranhão
- ****Ben Howard**, Coppice management to reduce nutrient loads in forest streams. Supervised by Prof. **Stefan Krause** (GEES), Prof. **Nick Kettridge** (GEES), Prof. **Sami Ullah** (GEES) and **Ian Baker**
- ***Polly Jarman** - Young people's experiences of and learning in urban woodlands. Supervised by Prof. **Peter Kraftl** (GEES) and Dr **Sophie Hadfield-Hill** (GEES)
- ***Jennifer Knight** - Exploring the desirability of forest landscapes in a natural flood management context. Supervised by Dr **Steve Emery** (GEES) and Dr **Simon Dixon** (GEES)
- **^Anthony Hyacinth** - Plant volatile compounds under elevated CO₂. Supervised by Prof. **Rob MacKenzie** (GEES) and Prof. **Francis Pope** (GEES)
- **Jennifer Kirby**, High resolution leaf fall monitoring and low adhesion forecasting using hemispherical Near-infrared imagery. Supervised by **Lee Chapman** (GEES)
- **^Angeliki Kourmouli** - Soil respiration & biogeochemistry at BIFoR FACE – supervised by Dr **Rebecca Bartlett** (GEES), Dr **Liz Hamilton** (GEES), Prof. **Iain Hartley** (Exeter) & Prof **Zongbo Shi**
- ***Eszter Toth** - Focus on Cognition: Can forests balance the brain? Supervised by Dr **Ali Mazaheri** (Psychology) and Prof. **Jane Raymond** (Psychology)
- ****Bridget Warren** - Development and application of novel ecological and environmental proxies-based leaf wax lipids. Supervised by Dr **James Bindle** (GEES) and Dr **Florian Busch** (Bio)
- **^Clare Ziegler** - Quantitative modelling of root growth and carbon allocation bridging theory and experiment. Supervised by Dr **Iain Johnston** and Dr **Rosemary Dyson** (Maths)



Dr **Jenny Knight** (right) is now General Manager for Stump up for Trees. Dr **Aileen Baird** is now Senior Conservation Officer for Fungi with Plantlife, Dr **Jenny Kirby** teaches Geography A level and returns to FACE with her students, Dr **Anna Gardner** rejoins the Institute in January 2024, currently with **Exeter University**. Other students have also moved onto postdoctoral positions such as Dr **Bridget Warren** (Open University), Dr **Angeliki Kourmouli** (Lancaster), Dr **Polly Jarman** (Northampton), Dr **Ben Howard** (Imperial) and **Sijeh Asuk** (Loughborough).

Appendix 3 BIFoR Education and Outreach

Key conferences BIFoR have received invited speaker / keynote speaker invitations in 2022/23 to:

International Plant Health Conference, opening keynote speaker and side event

European Geosciences Union (EGU)

British Society of Plant Pathology (BSPP)

British Ecological Society Annual meeting (BES)

CONFOR show September 2023

Annual Conference of the Constructed Wetlands, October 2023, Dee Phillips, was awarded Best Poster by an Early Career Professional" for the poster entitled "Wastewater treatment and greenhouse gas emissions: herbaceous vs woody horizontal constructed wetlands"

There have been roughly 740 visitors to the BIFoR FACE Facility in 2022/23. The table below lists some of the larger group visits.

Date	Name of group visiting BIFoR FACE
4 September 2022	Staffordshire Women's Institute
5 October 2022	St Peter's Academy School
October 2022	Academics from Faculty of Forestry & Wood Technology, Mendel University in Brno, Czech Rep./ Forestry & Game Management Research Institute (FGMRI) ,
11 November 2022	Staffordshire University Staff and students
24 January 2023	Amazon FACE and FCDO office
2 March 2023	Exeter University
3 March 2023	Forestry Commission CEO and Director of Services
29 March 2023	Defra Trees Team
19 April 2023	UoB undergraduate (GECS and Human Sciences)
19 April 2023	UoB Senior Central Services Team
19 April 2023	National Trust local group
27 April 2023	French school visitors
28 April 2023	UoB Undergraduate students (EVS and Geography year 2)
3 May 2023	Biosciences staff and students
4 May 2023	University of Nottingham Undergraduate students
4 May 2023	Royal Forestry Society Education members
11 May 2023	Supergen Workshop – Novel crops and forestry species as sources of industrial biomass
18 May 2023	Forest Education Network England
18 May 2023	University of Nottingham Academics
8 June 2023	CENTA Doctoral Training Programme students
12 June 2023	Severn Trent Water Ecology team

Date	Name of group visiting BIFoR FACE
19 June 2023	Editor of Geosciences Publication
20 June 2023	Rodaston College
21 June 2023	BIFoR Advisory Group members
29 June 2023	Members of Stafford Borough Council
6 July 2023	Members from University Senior Team
7 July 2023	Defra/Forest Research / Forestry Commission
21 July 2023	Small Woods Association
13 September 2023	Royal Society Biology curriculum group
13 September 2023	University of Birmingham, College Board (LES)
26 September 2023	Sparsholt College
3 October 2023	Kings High School
3 October 2023	Tolga Aktas
4 October 2023	University of Birmingham, Development of Alumni Relations team

In 2022/ 2023 we have also been host to external stakeholder meetings on campus including: Tree Council meeting (30 March 2023), Action Oak (14 June), Institute of Chartered Foresters (15 June 2023), Treescapes meeting (23 June 2023). In 2024 we will host the annual meeting of the Forest Research Plant Health Team.



Geography undergraduate students on a visit to BIFoR FACE

Appendix 4 Social media and other grey literature

In 2023/24 the media team estimate the BIFoR related stories reached over 9.5million people. Some of the press releases and articles are included here:

BIFoR research picked up for press release

Title	Related research output
Seeing the Unseen: Birth and Death of Tree Roots Under a Future Atmosphere	https://doi.org/10.1016/j.scitotenv.2022.158661
Extreme El Niño weather saw South America's forest carbon sink switch off	https://doi.org/10.1038/s41558-023-01776-4 , estimated reach 2,348,435
Forests carbon mitigation role threatened by triple risk study	https://10.1126/science.abp9723
Forest trees find a new watery 'sweet spot' when CO₂ is high	https://doi.org/10.1111/nph.18618
Good for soil, grim for the air: more than third of fertiliser use breaking emissions thresholds	https://doi.org/10.1071/EN23010

Other BIFoR research in the news

Title	Details
Hot and dry conditions in UK causing unprecedented extreme wildfire danger	University of Manchester press release from collaborators on UK Fire Danger Rating System
Hot leaves: Viking Bursary 2023 winner	Royal Forestry Society website, article regarding funding given to a PhD student completing research at BIFoR FACE
A Tolkien Weekend in Bewdley: Glimpses of Other Worlds	Press release about an event supported by BIFoR's John Holmes and Dion Dobrzynski
Has the Amazon reached its 'tipping point'	An article in New York Times Magazine
Thinktank visitors challenged to escape the forest	An article about BIFoR's education and outreach resources
Forest Researchers launch citizen science projects	An article about BIFoR's STEM resource 'BIFoR in a box.'
Work of many hands builds confidence in climate projections and UK-Brazil science cooperation	An article about UK-Brazil cooperation as Amazon FACE launches
Out of the frying pan of deforestation...into the fire of climate change?	An article by Rob MacKenzie and Juliano Sarmento Cabral

Other BIFoR blog / LinkedIn articles

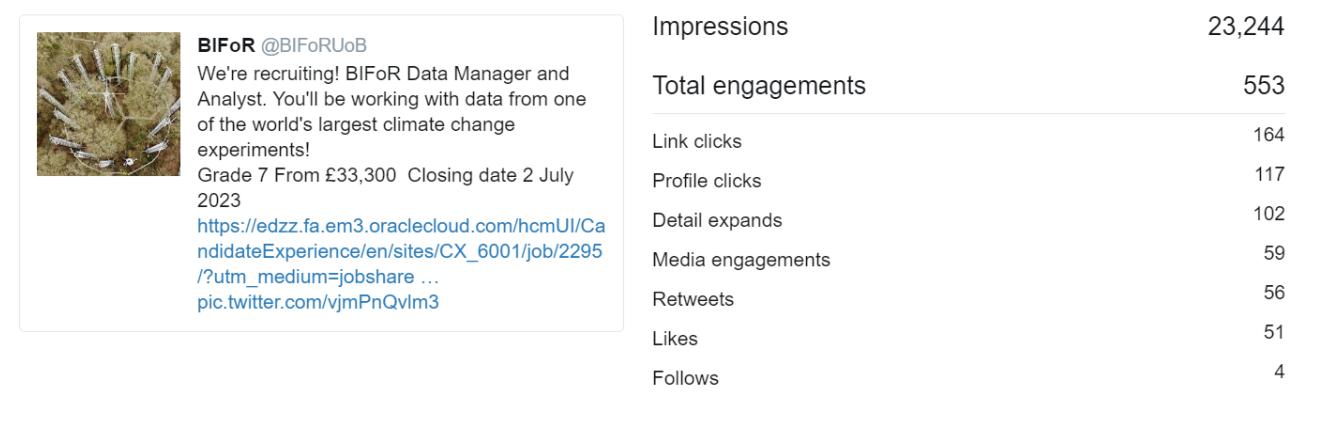
Title	Details
Artificial Intelligence and Low-cost Sensors in Ecology: A Pollen Case Study at BIFoR-FACE	An article by Sophie Mills on the Ecological Continuity Trust blog site
Bear on Tour	An article by Adriane Esquivel Muelbert on the BEAR blog site regarding their mascots trip to BIFoR FACE
Planting Trees for A Changing Climate	An article on the Ecosulis blog
How can scientists glimpse the future state of our woodlands?	An article by Ecosulis (9,771 followers)
Climate change, plants and plant pests	An article on APHA Science Blog (Defra)

YouTube videos

Title and link	Context
BIFoR Future Forests	Max, an undergraduate student demonstrates how to deliver a BIFoR Future Forests pitch.
The threat posed to us by wildfires in the UK and the Great Fuel Moisture Survey	Dr Kerryn Little explains about the citizen science project to find out more information on wildfire risks in the UK
How do plants communicate wirelessly?	PhD student Laura James put this video together for Chemistry and Green Week
The Near Miss effect of Forest Fires	Mini lecture, by Maria Teresa Gonzalez Valencia for target audience of A level / GCSE students
Fantasy forests in a time of ecological crises	Mini lecture, by Dion Dobrzynski for target audience of A level / GCSE students
From branch to forest to globe	Mini lecture, by Klaske van Wijngaarden for target audience of A level /GCSE students
Corridors for Transport and Nature	Mini lecture, by Nicholas Cork for target audience of A level /GCSE students
Greenhouse Gases and Water Treatment with Trees/Plants	Mini lecture, by Dee Phillips for target audience of A level /GCSE students
History affects Tree Water Usage	Mini lecture, by for target audience of A level /GCSE students
Nitrogen cycle in forest under elevated CO₂	Mini lecture, by Manon Rumeau for target audience of A level /GCSE students
Forest Diversity, dynamics and resilience in a changing world	Mini lecture, by Estelle Darko for target audience of A level /GCSE students

Tweet activity

X



Top tweet of 2023!

Appendix 5 Policy and advice

Thanks to honorary Professor **Jon Drori**, awareness of BIFoR is being strengthened through his many speaker engagements through 2022/23.

The University of Birmingham is committed to engagement across civil society and BIFoR participates enthusiastically in this. BIFoR Director and Defra Chief Plant Health Officer, Prof. **Nicola Spence**, advises the BIFoR team on effective engagement with policymaking.

Deanne Brettle is a trustee of the Birmingham TreePeople

Adriane Esquivel Muelbert is a member of the science panel for Amazon FACE and is leading a policy brief for them on Amazon tipping points that will be launched at COP28. Adriane has also led a policy brief on Forests and Global change written for the UK government and organised by the University of Birmingham

Emma Ferranti chairs the West Midlands Climate Change Adaptation Steering Group, the national Infrastructure Operators Adaptation Forum and is a member of the West Midlands Forests and Woodlands Advisory Committee (WM FWAC) and the FWAC Urban Forest.

Christine Foyer sits on the Board of the Sustainable Nutrition Scientific Board

Scott Hayward leads the Royal Entomological Society Climate Change Special Interest Group (SIG)

Josh Larsen sits on the scientific advisory panel of the UK Beaver Trust.

Estrella Luna Diez Representative on the National Tree Improvement Strategy Steering Committee

Rob Jackson President of the British Society of Plant Pathology (BSPP). **Rob MacKenzie** chairs the Trees and Woodlands Science Advisory Working Group (TaW-SAG).

Jeremy Pritchard chairs the Royal Society of Biology curriculum committee.

Sami Ullah continues on the Nutrient Management Expert Group at Defra.



Christine Foyer, Rob Mackenzie and Sami Ullah visited the EU parliamentary offices in November 2022 to meet with key stakeholders. The image above was taken at the follow up meeting in November 2023 as part of a One Health Fair event.

Appendix 6 Funding

The following awards were achieved in academic year 2023/ 2023

Title	Lead HEI	Principal Investigator	Funder	Total Value	Value to UoB
IDEAL UK FIRE: Toward Informed Decisions on Ecologically Adaptive Land management for mitigating UK FIREIDEAL	University of Birmingham	Nicholas Kettridge (Geography) and Laura Graham	NERC highlight	£2,035,153.00	£1,035,153.00
CARMINE - Climate-Resilient Development Pathways in Metropolitan Regions of Europe	Romanian Met Office	Emma Ferranti	UKRI Horizon Europe Underwriting – Innovate UK	EURO 12,000,000	£675,000
Biodiversity solutions for climate change mitigation	University of Birmingham	Adriane Esquivel-Muelbert	Brazilian Ministry of Science and Technology (MCTI)	£600,000	£600,000
Amazon Biodiversity Syntheses (Sinbiam).	University of Birmingham	Adriane Esquivel-Muelbert	Brazilian Ministry of Science and Technology (MCTI)	£600,000	£600,000
BIFoR RenEco Scholarship Programme (6 PhD scholarship 2 per year)	University of Birmingham	Kris Hart	RenEco BIFoR Scholarship	£600,000.00	£600,000
Does long-term acclimation to eCO2 enhance negative impacts of drought and heat on mature oak tree?	University of Birmingham	Alice Gauthey	Royal Society International Fellowship	£419,000	£419,000
Gigante: Quantifying and upscaling the causes and drivers of large tree death	University of Birmingham	Adriane Esquivel-Muelbert	NERC-NSF (via NSF)	\$1,500,000	£244,862
WM-CRVA (West Midlands Climate Risk and Vulnerability Assessment)	University of Birmingham	Emma Ferranti / Bill Bloss	NERC	£200,000	£200,000
Software and CO ₂	University of Birmingham	Kris Hart	RenEco donation	£150,000.00	£150,000
Development of phage biopesticide to control bacterial diseases of trees	University of Birmingham	Rob Jackson	Applied Microbiology International PhD studentships	£115,000	£115,000
AFFORE3ST aims to demonstrate the potential of a data-driven approach to the planning of tree planting for quantifiable ecosystem services. .	University of Birmingham	James Levine	Treescapes fellowships	£50,000	£50,000
Developing Oak Seedling Microcosms to Enhance the Design of Protective Synthetic Microbial Communities Against Pathogens.	University of Birmingham	Marine Cambon	Treescapes Fellowship	£31,969	£25,575

Title	Lead HEI	Principal Investigator	Funder	Total Value	Value to UoB
RNA-seq analysis of seasonal gene expression in oak	University of Birmingham	Andrew Plackett	UKRI Talent and Stabilization fund	£17,580	£17,580
Engagement with the EU	University of Birmingham	Sami Ullah Christine Foyer	QR funding	£14,000.00	£14,000
Understanding the functioning and composition of ecological communities from functional traits.	University of Birmingham	Adriane Esquivel-Muelbert	CAPES	80K BSD	£13,000
FACE infrastructure	University of Birmingham	Kris Hart	UoB College Estates Approval Process (CEAP)	£9,766.92	£9,767
The Tree of Knowledge (ToK): communicating the complexity of forest resilience.	James Hutton Institute	Estrella Luna-Diez	Treescapes Call 3	£100,000	£7,890
Brazil and Amazon workshops	University of Birmingham	Adriane Esquivel-Muelbert and Sami Ullah	The British Council	£6,898.00	£6,898
The impact of summer 2022 on street trees	University of Birmingham	Emma Ferranti	EPSRC (via RECLAIM network)	£5,000	£5,000
Hydraulic traits' acclimation and wood formation at different FACE sites	INRAE France	Kris Hart	French Research Agency - ANR	5,000 Euros	£4,318
Bioscan project to complete DNA analysis of BIFoR insect samples	University of Birmingham	Kris Hart	Ecological Continuity Trust	£3,000	£3,000
To attend the LICOR conference in USA	University of Birmingham	Nicholas Harper	MI Talent conference and skills Fund	£2,148	£2,148
Building Capacity for BIFoR outreach with schools	University of Birmingham	Samantha Dobbie	UoB Public Engagement Fund	£2,000	£2,000
Novel squirrel trap to reduce management costs by 80%	University of Birmingham	Kris Hart and Alex Malkin	DEFRA Farming Innovation Fund run by UK Research and Innovation. Research Starter	£56,000	£1,000
Take a walk among time travelling trees	University of Birmingham	Sam Dobbie	UoB public Engagement Fund	£500	£500
Totals					£4,901,691