

UNIVERSITY OF BIRMINGHAM | BIFOR

BIRMINGHAM INSTITUTE OF FOREST RESEARCH (BIFOR)



Annual Report 2018

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page 4 and page 8 (bottom of page), Rick Thomas (University of Birmingham)
page 7, fungi identification by Aileen Baird (University of Birmingham)
page 7, invertebrate identification by Liam Crowley (University of Birmingham)

Cover image: one of 116 masts which help deliver carbon dioxide to 3 patches of oak woodland at the BIFoR Free-Air Carbon Enrichment (FACE) facility. The masts also enable access to the canopy for tissue sampling and measurements of leaf physiology.

Directors' Introduction, Professors Rob MacKenzie, Jeremy Pritchard, and Nicola Spence

In our busiest year since 2014's inauguration there have been many highlights, not least the visit of HRH Prince Charles to the BIFoR Free Air Carbon Dioxide Enrichment (FACE) facility in [July](#) 2018.

Feedback from our royal guest, accompanying government ministers, and senior advisers confirmed our belief that the FACE facility is becoming a flagship for the renaissance of UK forest science. The royal visit was only one of 70 stakeholder visits to the BIFoR FACE facility in 2018 (Appendix 3), such is our commitment to working with the whole sector.

[BIFoR FACE](#) successfully completed its second growing season under elevated carbon dioxide. It shows every sign of delivering the ground-breaking science for which it was conceived, as described in presentations to the January 2019 annual [BIFoR Science Community Meeting](#).

Key appointments within the Schools of Geography Earth and Environmental Sciences (GEES) and Biosciences have increased the number of academic staff who associate themselves with BIFoR to almost [100](#) (Appendix 1).

In 2018, we welcomed: as Honorary Professor and a Director of the Institute, Nicola Spence; academic staff Prof Jeff McDonnell, Dr [Graeme Kettles](#), Dr [Joshua Larsen](#), Dr [Estrella Luna-Diez](#), Dr [Christian Pfrang](#); [research fellows](#) Dr Jingxi (Galene) Luo (Mathematics Impact Fellow), Dr Carolina Mayoral, and Dr Daijun Liu; and visiting academics from Tianjin Key Laboratory of Water Environment and Resources; Dr Xiaolong Liu and Dr Li Bai. Our heartfelt thanks and warm wishes go with those colleagues moving on from the Institute: Prof

Michael Tausz, Dr Sabine Tausz-Posch, and Dr Phil Blaen.

Early in 2019 we will welcome Profs Vincent Gauci (GEES), Christine Foyer (Biosciences) and research fellow Dr Adrienne Esquivel Muelbert (GEES). At the time of writing, adverts are out for a Chair in Forest Pathology, a Senior Lectureship in Tree Physiology, a sample and data curator, and a fieldwork assistant for the FACE site.

The number of BIFoR doctoral (PhD) students continues to grow (page 11). We now have 23 PhD students across the Institute, 3 of which will graduate in 2019. The first cohort of Leverhulme funded [Forest Edge](#) Doctoral Scholarship Programme (DSP) students have started and another 5 or 6 are currently being sought. The students join a vibrant and growing intellectual forest research community across the University's Colleges. Doctoral researchers have already represented us very well at conferences in 2018, winning prizes along the way.

BIFoR featured prominently in 2018 bids to renew doctoral training programmes (DTPs) of the Natural Environment Research Council. The Forest Edge programme (page 14) will act as a bridge between Birmingham-led [CENTA2](#) and the [ENVISION](#) DTP, providing coherent doctoral training for forest science in the UK for the first time.

Our contribution to research and scholarly debate continues to be significant. 2018 saw 3 journal articles published in the first-rank of general science journals (i.e., the *Nature* family, *Science*, PNAS), another 35 published in top disciplinary international peer-reviewed journals, and 37 contributions to workshops, seminars, and conferences (Appendices 2 and 3 for the full lists).

Some of the forested landscapes of greatest interest for their social, environmental and economic benefits are in and around cities. So, BIFoR is delighted to be part of the £5M West Midlands Air Quality Improvement Programme. [WM-Air](#) is supported by [NERC's](#) Regional Impact from Science of the Environment (RISE) initiative and aims to support the improvement of air quality and associated health, environmental and economic benefits in the West Midlands. One of the eight project strands focuses on how urban trees and other green space can improve air quality when integrated properly with transport and the built environment.

NERC have also awarded the first grant to utilise BIFoR FACE. Led by colleagues in University of Manchester, this £0.8M study of tree and soil food webs establishes FACE as [research infrastructure of international importance](#), and links the Institute to a major droughting facility in France.

Other funding bodies continue to provide transformational support to the Institute. The Wolfson Foundation have very generously pledged £1M towards the refurbishment of glasshouses on the University of Birmingham campus.

This funding will enable us to pursue our research around tree disease and tree health (page 20), including studies under elevated CO₂. £0.2M from John Powell will enable public engagement with the research in the glasshouses through a bespoke interpretation space and classroom.

Support from the John Horseman Trust now exceeds £0.3M, fully supporting a PhD student, a fieldwork assistant, and cutting-edge research equipment.

All these new staffing and funding initiatives outlined above bode well for BIFoR in 2019 and focus our minds on the imperative now to deliver on the research challenges entrusted to us by our backers. We hope that this annual report provides a glimpse of that delivery of outcomes and offers a foretaste of even more to come.

Image taken from a drone of the BIFoR FACE facility



BIFoR Free-Air Carbon Dioxide Enrichment (FACE)

Year 2 of BIFoR FACE once again saw three 30-metre-wide plots of mature oak forest immersed in an atmosphere with elevated carbon dioxide (CO₂), adding 150 ppm (parts per million) to current values of just above 400 ppm, a roughly 38% increase, which the entire globe is likely to see by about 2050 in spite of the best efforts at [Paris](#) and [Katowice](#).

The '[sci-fi forest](#)' or '[forest of the future](#)' steadily achieved its performance even during the international CO₂ shortage in 2018. Treatment plots received their elevated CO₂ for 96.7% of the maximum operational time possible.

BIFoR-FACE is a so-called '2nd generation' forest FACE site. BIFoR-FACE is only the second such facility worldwide, and the only one in the Northern Hemisphere.

We are very grateful to CO₂ suppliers Air Liquide for understanding the importance of security of supply to BIFoR FACE. The agility and ingenuity shown by the BIFoR FACE technical team during the shortage has been recognised by their short-listing in the 2018 [BUAFTA's \(page 18\)](#)



Air Liquide deliver another 30 tonnes of CO₂ to the BIFoR FACE facility. Supplies arrive once or twice per day during the growing season.

Further improvements to the research site were completed during 2018 including the instrumentation of the four meteorological towers (met masts). The woodland is now heavily instrumented; visitors, like [BBC One Show's George McGavin](#), are amazed to see as they walk through that "everywhere you turn there is a science experiment".



N₂O soil flux equipment was interfaced with the CO₂ flux equipment in 2018.

A video of a what it is like to be inside a FACE array is available on our [website](#). Instrumentation in the FACE arrays include: dendrometer bands, CO₂ sensors, leaf litter traps, leaf litter decomposition bags, moth traps, pitfall traps, malaise traps, PAR sensors, soil moisture probes, rain gauges, temperature and humidity sensors, soil respiration instruments, camera traps, equipment to measure sap flow, planted up oak saplings, areas sectioned off for microbial sampling.

During a visit you might also find scientists taking soil samples, observing fungi fruiting bodies, collecting insects from the top of the canopy, collecting live leaf tissue samples, taking images of root systems, gathering up

seeds and nuts and using bespoke canopy access system to make measurements of photosynthesis and stomatal conductance (see pages 7 to 8).

Results from the 2017 growing season have been analysed and are in the process of being written up for publication.

Early results have been presented at 7 science workshops and conferences.

Our education and laboratory space, the Long Barn, has also been put to good use this year, hosting 14 education visits and many more meetings. Live data streams and teaching resources from BIFoR FACE are now available (page 10)



One of four instrumented met masts to measure air flow into, out of and over, the forest



The canopy access system is designed so no previous experience of climbing is required.



Outside the Long Barn



Ground floor of Long Barn



High school students

Scientific Activity at BIFoR FACE

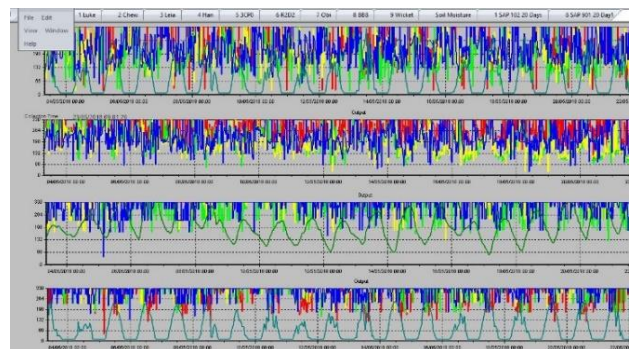
January 2019, sees the 3rd national BIFoR community meeting. The science activity underway at BIFoR FACE is shared through a series of presentations and posters available on our website at <https://www.birmingham.ac.uk/research/activity/bifor/get-involved/Third-annual-BIFoR-community-meeting.aspx>



Taking measurements of photosynthesis and stomatal conductance at the height of a defoliation event



Measurements of sap flow



Example of live data – sap flow and associated parameters



Fungi identification, by Aileen Baird



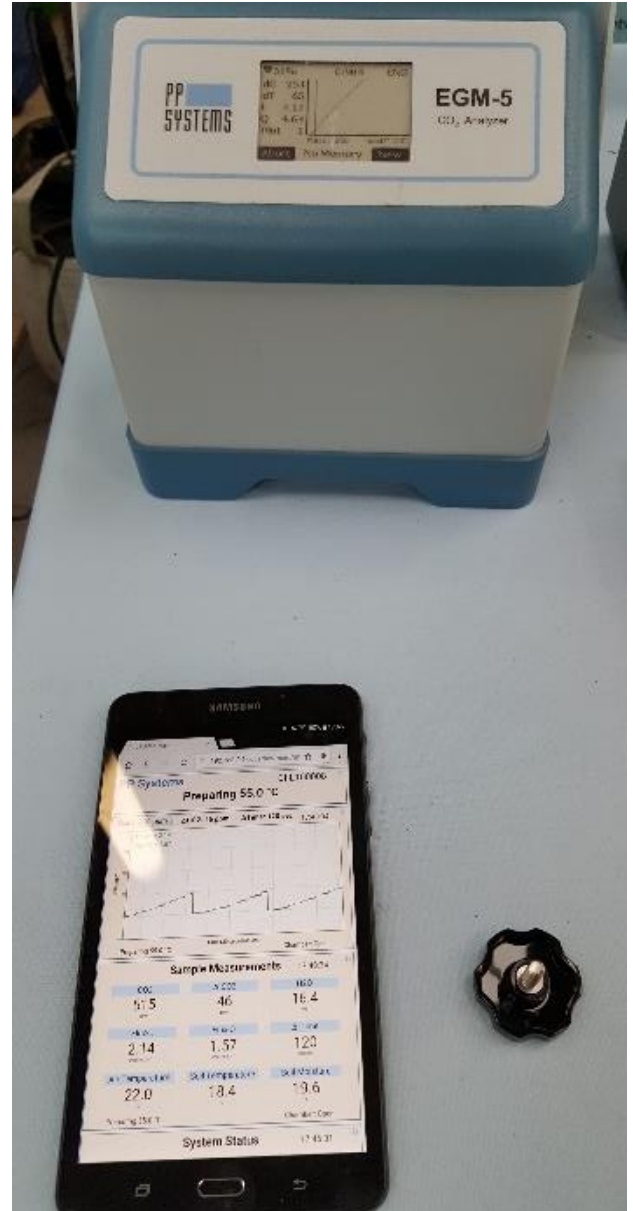
Invertebrate identification by Liam Crowley



Malaise trapping forms part of the monthly invertebrate sampling which contribute to the long-term ecological measurements taking place at the site



Soil respiration kit ready for deployment



Portable CO₂ gas analyser, streams live data on a phone app



Georeferenced Orthomosaic photo stitched from multiple images taken with a lightweight drone. This photo, taken by Rick Thomas, was used to assess the pattern of herbivory during a winter moth attack in spring 2018.

Research Collaborators at BIFoR FACE

Throughout 2018 we have continued to work closely with national and international research collaborators, strengthening collaborations with the Amazon FACE, Exeter University, Forest Research, Met Office, Silixia, and Universities of Bristol, California Davis, Gloucester, Helsinki and Southampton, Swansea, Western Sydney and the Open University. Future collaborations are sought more details are available on our [website](#). New collaborations for 2018 include:

University of Lund

Dr Scott Hayward has established a new collaboration with Lund's Dr Dan Metcalfe to investigate the impact of elevated CO₂ on insect herbivory in woodland systems. Work includes image analysis of leaf litter samples to quantify herbivory and the impact of extreme biotic disturbance events – as occurred with the major Oak defoliation event during spring 2018.

University of Keele

Dr Sami Ullah of University of Birmingham continues to develop the collaboration with University of Keele working with Dr Aleksandar Radu. Ongoing research on the development of low-cost ISE sensors established the selectivity of sensors for mineral N in soils at BIFoR-FACE. With a newly funded Newton Fund project (2019-2020) involving Universidad Nacional de Ingenieria in Peru, the next phase of this research will develop ISE for continuous in situ point sensing of mineral N in soils at BIFoR-FACE.

University of Manchester

The first NERC £800k standard grant with substantial BIFoR FACE involvement focuses on how the forest litter layer changes in response to elevated carbon dioxide. This grant also marks our first collaboration with a European forest facility: the [O3HP oak drought facility](#) at Observatoire Haute Provence. Professor Dave Johnson leads the project.

Imperial College London

During summer 2018, Imperial College London masters student Tomas Leigh, supervised by Prof Colin Prentice spent time at BIFoR FACE making measurements using our unique canopy access system. Tomas was looking at the control of leaf temperature, and investigating whether reduced stomatal conductance at elevated carbon dioxide results in warmer leaves (or not).

Doctoral Research Collaborations

In 2018, three new doctoral students from other universities started research at the BIFoR FACE facility.

University of Lancaster - Thomas King, supervised by Dr Kirsti Ashworth (Lancaster) and Prof Rob MacKenzie (Birmingham) (page 11)

Western Sydney University - Richard Hill supervised by Dr Jonathan Plett and Prof Ben Brown (Birmingham)

University of Warwick - Katy Faulkner supervised by Prof Gary Bending (Warwick) and Dr Sami Ullah (Birmingham) looking at the resistance and resilience of forest soil microbial communities and greenhouse gas emission to extreme weather events and a high CO₂ world.

Director's Education Report, by Professor Jeremy Pritchard

BIFoR has catalysed some game-changing education initiatives at the University of Birmingham. We have developed a number of teaching materials around the water and carbon cycles which are being embedded both in the GCSE curriculum and our own undergraduate teaching. We are designing a series of internet dashboards, which will support these initiatives and provide a live window on the work of BIFoR and climate change to the public.

During 2018, we hosted **14 educational visits** to the BIFoR FACE facility. Including three summer school visits (two of them international).

The new-for-2017 module "[Critical Issues for 21st Century Ecosystems](#)" was well received by students in 2017/18. Take-up for 2018/19 has increased to 88 students.



Students visit the BIFoR FACE facility

There are now **23 PhD students** completing research related to forested landscapes and 15 PhD students are working on research directly linked to the BIFoR FACE facility (pages 11 and 12)

In 2018, we had **9 masters students** complete research at the BIFoR FACE facility. We were pleased to host a summer placement student through the NERC [Research Experience Placement](#) scheme and two students on the [Nuffield Research Placement](#).

Three undergraduates completed summer placements with BIFoR. Indeed, during 2018 student volunteering with BIFoR has gone from strength to strength. We are grateful to the [Alumni Impact Fund](#) who provided us with

funds for engaging with students, which enables us to provide appropriate clothing, provide subsistence, travel costs and additional resources for field work. Further details of this can be found on a [video](#) available via our student BIFoR Blog <https://biforuob.wordpress.com>

In 2018, over **1,300 hours of volunteering** were recorded. That's over 54 person-days of effort, equivalent to $\frac{3}{4}$ of a full-time research assistant!



Volunteers shadow PhD students, help in the field, assist in laboratory work (e.g., identifying insects from pitfall traps), process soil samples, and sort and weigh leaves. Student volunteering has categorised more than **1,200 camera trap videos**, measured the area of **1,800 leaves**, and processed **600** of images of fungi!

On 3 April 2018 (start of the second season of elevated CO₂ at BIFoR FACE), a live hook-up between the University of Birmingham School and the Operations Team at the facility took place. The students enjoyed looking at the live data and learning more about BIFoR prior to their planned visit to BIFoR FACE in July 2018. We were delighted to host 3 other high schools during 2018.

Professional Services staff at BIFoR FACE hosted a week's work experience to two high school children. Also since September 2018 the team have hosted a local volunteer for a day-per-week college work placement, giving a total of **24 person-days of vocational training**.

133 student volunteers

88 students on the new undergraduate module

15 BIFoR FACE doctoral students

14 educational visits to BIFoR FACE

Doctoral level study – new commencements

In 2018 we welcomed 11 new PhD students:

*denotes these students are part of the Forest Edge Doctoral Scholarship Programme (page 14)

Nezha Acil: global forest dynamics. Supervised by Tom Pugh and Jon Sadler

Ed Bannister: environmental aerodynamics of the BIFoR FACE site. Supervised by Xiaoming Cai and Rob MacKenzie

Richard Hill: Cotutelle/Dual Award based initially at EucFACE, Western Sydney University. Supervised by Jonathan Plett and Ben Brown)

*Ruben Foquet: Mangrove forest conservation and restoration: what are the keys to success? Supervised by Anne Van Loon, Stefan Krause and Fiona Nunan

*Ben Howard: Coppice management to reduce nutrient loads in forest streams. Supervised by Stefan Krause, Nick Kettridge, Sami Ullah and Ian Baker (Small Woods Association)

*Polly Jarman: Young people's experiences of and learning in urban woodlands. Supervised by Peter Kraftl and Sophie Hadfield-Hill

Thomas King: based at Lancaster University: Ecophysiology of plant volatiles under elevated carbon dioxide. Supervised by Kirsti Ashworth (Lancaster) and Rob MacKenzie

*Jennifer Knight: Exploring the desirability of forest landscapes in a natural flood management context. Supervised by Steve Emery and Simon Dixon

Aleksandra Kulawska: Root exudation and nutrient dynamics under elevated CO₂. Supervised by Zongbo Shi, Sami Ullah, Rob MacKenzie, and John Grace (Edinburgh University)

*Eszter Toth: Focus on Cognition: Can forests balance the brain? Supervised by Ali Mazaheri and Jane Raymond

*Bridget Warren: Development and application of novel ecological and environmental proxies based leaf wax lipids. Supervised by Yvette Eley and James Bendle

Doctoral study

PhD students continuing BIFoR-related research or who graduated in 2018:

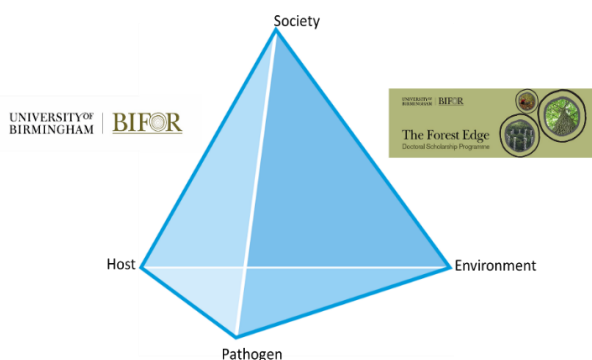
- **Aileen Baird**, Fungal biodiversity, supervised by Dr Francis Pope and Prof Robin May
- **Alfred Bockarie**, Air pollution emissions from charcoal production and use, supervised by Dr Eloïse Marais (Leicester), Prof Rob MacKenzie and Prof Roy Harrison
- **Liam Crowley**, Insects as key drivers of change in woodland systems under climate change, supervised by Dr Scott Hayward, Prof Jeremy Pritchard, Prof Jon Sadler
- **Ed Eaton**, Stem respiration under elevated CO₂, a joint PhD between BIFoR and Forest Research, supervised by Prof Rob MacKenzie and Prof Michael Tausz
- **Anna Gardner**, Leaf physiology under elevated CO₂, supervised by Prof Rob MacKenzie, Prof Jerry Pritchard, and Prof Michael Tausz
- **Vilane Goncalves-Sales**, Satellite monitoring of Deforestation and the role of clouds in Maranhão, supervised by Prof Robert Elliott and Prof Eric Strobl, University of Birmingham Business School.
- **Anthony Hyacinth**, Plant volatile compounds under elevated CO₂ – supervised by Prof Francis Pope and Prof Rob MacKenzie
- **Jennifer Kirby**, High resolution leaf fall monitoring and low adhesion forecasting using hemispherical near-infrared imagery, supervised by Prof Lee Chapman and Dr Vicky Chapman (Met Office). Industry sponsor, Rail Safety and Standards Board.
- **Angeliki Kourmouli**, Soil respiration and biogeochemistry at BIFoR FACE – supervised by Dr Rebecca Bartlett, Dr Liz Hamilton (Gloucester) Dr Iain Hartley (Exeter University) and Dr Zongbo Shi
- **Sue Quick**, Tree-soil-water relations under elevated CO₂ – supervised by Prof Stefan Krause and Prof Rob MacKenzie
- **Clare Ziegler**, Quantitative modelling of root growth and carbon allocation bridging theory and experiment, supervised by Dr Iain Johnston and Dr Rosemary Dyson
- **Yiting Zhang**, Urban morphology and ecosystem services: a historico-geographical study of fringe belts and urban green spaces in Birmingham, UK, graduated in 2018, and is looking to continue her urban studies.

BIFoR PhD students are committed to public engagement and dissemination of their work.

- **Aileen Baird** and **Liam Crowley** helped to organise a successful “[Pint of Science](#)” event in central Birmingham in May 2018
- **Aileen Baird** wrote an excellent [article](#) in the “Society for Applied Microbiology” magazine and took part in [Brilliant Club](#) designing and teaching a course based on her research at BIFoR.
- **Sophie Comer-Warner’s** PhD thesis on greenhouse gas emissions from streambed environments, has already yielded four first-authorship papers (two more in process) and three co-authored papers and she is currently continuing her successful research career at the US Geographical Survey (USGS) in Virginia.
- **Liam Crowley**, won first prize for his talk, Royal Entomological Society Annual Meeting.
- **Anna Gardner** had a great deal of positive feedback for her [article](#) in *The Biologist* magazine of the Royal Society of Biology.
- **Angeliki Kourmouli** was winner of Best Poster at the Royal Society of Chemistry Environment Group, early career meeting.
- **Sue Quick** gave a presentation at the [Joint Conference on Forests and Water](#) in Chile, Sue successfully obtained funding from the British Ecological Society and the University of Birmingham’s [Institute for Global Innovation](#) (IGI) for this conference.
- **Clare Ziegler** wrote an article for [Botany One](#) and gave an invited talk at the [Oak Ridge National Laboratory, USA](#)
- **A team of PhD students** showcased BIFoR FACE research at the Malvern Festival of innovation. Around 650 school children (years 7, 8 & 9) attended the event.

Forest Health Research

The BIFoR plant health team now consists of four core members, with several other staff contributing. Our forest health agenda is led by one of the Directors of BIFoR, [Prof Nicola Spence](#), in a part-time adjunct to her primary role as Defra Chief Plant Health Officer. She is supported by: Dr Tom Pugh, Reader in Biosphere-Atmosphere Exchange; and Dr Estrella Luna-Diez and Dr Graeme Kettles, both Lecturers in Plant Pathology, who provide complementary expertise that will bring curiosity-driven science into solutions for real forest tree problems. To continue to strengthen this area we are, at the time of writing, seeking a full-time Professor of Forest Pathology to pursue a game-changing 'moon shot' programme of research.



Research progress

The [Treemort](#) led by Tom Pugh is now well underway. New team members Daijun Liu, Adriane Esquivel Muelbert, and Nezha Acil are in-post and work with partners at University of Leeds, Wageningen, Universidad de Alcalá, and Univerza v Ljubljani and many others across the world is gathering pace. First results from the project showed that harvest absolutely dominates tree death in landscapes across Europe (Schelhaas et al., 2018*) and the next step is to extend the analyses globally and break down the drivers more thoroughly.

*Schelhaas M-J, Fridman J, Hengeveld GM, Henttonen HM, Lehtonen A, Kies U, et al. (2018) Actual European forest management by region, tree species and owner based on 714,000 re-measured trees in national forest inventories. PLoS ONE 13(11): e0207151. <https://doi.org/10.1371/journal.pone.0207151>

Dr **Estrella Luna-Diez** is a plant pathologist who studies the sophisticated immune system of plants in order to exploit fully their in-built capacity to resist disease. In particular, she works with priming of defence, a phenomenon that can be understood as a “plant vaccine”. Using her extensive experience in plant models and crops, such as Arabidopsis and tomato, Estrella will now implement her work in forest tree pathology. Estrella is strongly committed to work towards environmental protection and her work within BIFoR will allow the development of her research group in translational Plant Pathology.

Dr **Graeme Kettles** is a molecular plant pathologist with interests covering recognition of pathogen effectors by plant immune sensors, the role of secreted proteins in microbe-microbe interactions and the impact of climate change on plant defence signalling. He received his PhD from the John Innes Centre in 2012, before postdoctoral appointments at the University of California (Riverside,) and Rothamsted Research. At Birmingham, Graeme will expand his research program to investigate how lessons learned in crop plants can have impact for the protection of oak trees and forests from some of their most damaging pathogens. He is also keen to understand how oak genomics can be harnessed to advance tree disease resistance under field conditions.

Upcoming Symposium: [‘Thinking Higher’](#), Birmingham, 11th July 2019

Estrella and Graeme are organising a symposium on forest tree pathology, entitled “THINKING HIGHER: Towards biosecurity of forest trees”. The meeting will bring together an international community of experts with the overall aim of promoting global biosecurity of forest trees. The symposium has received financial support from the British Society for Plant Pathology and the Spanish Embassy in the UK and other sources of funding are being sought.

Leverhulme Forest Edge Doctoral Scholarship Programme, Professor Rob Mackenzie and Dr Simon Dixon



Single Organising Principle: 'to determine to what extent Forest existence, form, and function emerge from detailed interactions within and across scales, from molecules, to individual organisms, to communities and societies'.

The Forest Edge Doctoral Scholarships programme will offer 20 Leverhulme Doctoral Scholarships at the University of Birmingham from 2018 - 2020. It will act as a bridge between Birmingham-led [CENTA2](#) and the [ENVISION](#) DTP, providing coherent doctoral training for forest science in the UK for the first time. The first cohort of students commenced in October 2018 (page 11)

Projects involving joint supervision across schools or colleges are encouraged. This Doctoral Scholarship Programme (DSP) will coalesce around our single Organising Principle (above)

Projects align with the following themes:

- A. Values and meanings
- B. Change drivers and resilience
- C. Communication cascades

Cutting across these themes are two further, cross-linking, perspectives:

- i. Scales of space and time
- ii. Complexity

and social scales determine the functioning of forests? To what extent can we safely alter communication within and across scales to promote beneficial outcomes?

Projects advertised for 2019	First supervisor
Identifying tipping points regulating greenhouse gas emission from soils at two forest free air co2 enrichment experiments	Dr Sami Ullah
Atmospheric water plumes; mapping water transport through the forest canopy using distributed sensor networks	Dr Nicholas Kettridge
Tree-sewage symbiosis for healthy forests and people	Prof Philip Davies
Managing resilience of a temperate forest to future climate change with a nutrient bent	Dr Zongbo Shi
Investigating the Impact of Volatile Organic Compounds Released by Plants in Response to Biotic and Abiotic Stressors under ambient and elevated CO ₂ conditions (VOC-Plant-Stress-CO ₂).	Dr Christian Pfrang
Tracing the water trees use, and when they use it, as they get more CO ₂ : implications for coping with water stress	Dr Josh Larsen
The impact of forest roads on the rate of biological invasion	Dr Natalia Petrovskaya
The role of retrotransposon mobilization in forest trees genome adaptation.	Dr Marco Catoni
Language and landscape: the cross-linguistic perspective on 'forests'	Dr Alice Corr
The Near Miss Effect of Forest Fires	Prof David Maddison

Strategic Stakeholder Engagement

Communications and Public Engagement with Research

The visit of HRH Prince Charles on 24 July 2018 generated **702 news stories** across all media. Those stories reached 22.75 million people and resulted in a news value to the University of £2.1M.

During the day of the royal visit a further 46 guests were given guided tours of the facility, including: Lord Gardiner, Parliamentary Under Secretary of State for Rural Affairs and Biosecurity; UK Tree Champion, Sir William Worsley; Professor Nicola Spence, the Chief Plant Health Officer for DEFRA; Lucia Sainz De Mier, the CEO of Air Liquide; Ian Dudson CBE KStJ, the Lord Lieutenant of Staffordshire.



In May, BIFoR exhibited at the Norbury Canal Festival and spoke to many hundreds of passerbys who had been wondering what “those strange metal structures in the forest were”. We followed this up with 2 open days at BIFoR FACE and have hosted several local groups such as the Women's Institute and a Farmer's Discussion Group.

Through 2018 we hosted 70 tours of the BIFoR FACE Facility, for those who are just interested and for those we hope will become research collaborators (see Appendix 3).

The UK-USA Air Quality Workshop organised by the Environment Agency and US Environmental Protection Agency was held at BIFoR FACE on 12-13th November 2018. Along with a tour of BIFoR FACE, the 25 delegates were introduced to [First Steps in Urban Air Quality. A Trees and Design Action Group \(TDAG\) Guidance Document](#) (see page 15).

Our newsletters — ‘[Bud Burst](#)’ and ‘[Last Leaf Fall](#)’ — are circulated to over 700 people and are also available online.

Videos about BIFoR are available through our BIFoR playlist on YouTube <http://ow.ly/4s8130i3V5P> Our website (www.birmingham.ac.uk/bifor), Twitter account, (@BIFoRUoB) and Instagram (/BIFoRUoB) maintain our lively social media presence, which continues to grow thanks to our PhD students and volunteers. Popular was the #insectadvent by @Liam_M_Crowley



25,668 total page views of our [website](#)

5,119 views of BIFoR FACE [facility video](#)

1,325 followers on twitter

231 peak of page views on our [website](#) in one day

Focus on Green Infrastructure



Dr James Levine, BIFoR Ambassador for the Built Environment



Strategic green infrastructure can provide effective barriers to pollution from vehicles, markedly reducing the public's exposure at the roadside. Amongst urban practitioners, however, there has been some confusion surrounding the ways in which vegetation affects air quality. Practical techniques to quantify the impacts of proposed interventions have been missing. BIFoR is changing this.

Rob MacKenzie and James have been awarded three successive Innovation grants from NERC to develop a quantitative **Green Infrastructure for Roadside Air Quality (GI4RAQ)** Platform, and to increase understanding of the effects of vegetation in this regard amongst public and private-sector stakeholders concerned with the design of our urban realm. They have scoped the GI4RAQ Platform through consultation with more than 25 key individuals (via one-to-one interviews and a prototyping workshop at the UoB) and its co-design with end-users will begin in earnest in spring 2019.

James is working with Transport for London (and the Greater London Authority) to develop their first evidence-based approach to 'GI4RAQ'

Dr Emma Ferranti NERC Knowledge Exchange Fellowship



[First Steps in Urban Air Quality](#) was co-designed with the practitioner network, the Trees and Design Action Group (TDAG). The guide was released online in December 2017, since when there have been more than **2,000 downloads**. *First Steps* summarises the science on air pollution and green/grey infrastructure so practitioners can make informed decisions to improve air quality for better health outcomes. It was presented to Michael Gove MP on his visit to the University of Birmingham in April 2018. The guide has informed local authority policy in Birmingham, national planning policy (England and Wales), featured at four continuing professional development events with the NHS, TDAG, and Royal Town Planning Institute (RTPI), and has been added to RTPI-accredited planning degrees at the University of Birmingham. Further details of the dissemination of the report can be found in Appendix 3).

Trees and Design Action Group (TDAG) Emma facilitates meetings of TDAG in Birmingham. TDAG meetings are attended predominately by those in professional practice and provides a forum for knowledge exchange between practitioner and academic communities.

External Stakeholder Engagement

A full list of stakeholder engagement can be found in Appendix 3. Appendix 2 details our presence at sectoral conferences and workshops.

Small Woods Association

In 2018, Small Woods had two University of Birmingham students with them working on different aspects of their archive. The students worked on the socio-cultural and craft aspects of the collection and the more scientific elements, in particular a collection that they have inherited from eminent forest ecologist Oliver Rackham.

Small Woods are partners in the *Forest Edge* PhD of Ben Howard, looking at coppice management to reduce nutrient loads in forest streams (image below).



BIFoR/TDAG/RTPI Workshop on Valuing Urban Trees

On 19th September, BIFoR, TDAG and Royal Town Planning Institute (RTPI) hosted a joint workshop on valuing trees and other green infrastructure in the urban environment. Our urban areas need green spaces for many reasons. They positively impact public health, make our cities more liveable and resilient to extreme weather, and provide green spaces for the animals and nature.

Unfortunately, green space is often considered to have no monetary value (only costs – e.g. to maintain parks and trees). This joint workshop provided an overview of the tools available for valuing urban trees.

The event was attended by 120 delegates, mainly non-academics (32% public sector, 31% private sector, 17% research, 10% NPOs). The workshop was organised by Emma Ferranti, and the presentations and accompanying audio are available [online](#).

Joint Land Environment Simulator (JULES) conference

Jointly with Harper Adams University, BIFoR hosted the 2018 JULES Annual Meeting in September. Forty five delegates met to discuss the most recent developments of the land surface model underpinning UK climate projections. Delegates toured BIFoR FACE; providing experimental data to inform & challenge models like JULES is one of the primary research outputs of the facility.

Urban Tree Manual

BIFoR supported the implementation of national environmental policy by contributing to this Defra guide. The Manual acts as entry point for those involved in the government's 'one million urban trees' initiative. The manual contains links to BIFoR publications including the *First Steps* guide (see 'Focus on green Infrastructure', page 16).

Internal Stakeholder Engagement

BIFoR exists to help University of Birmingham academics do the very best teaching and research related to all aspects of forested landscapes. Throughout 2018 we have continued to build BIFoR's network within the University of Birmingham, this has been helped tremendously by the Forest Edge Doctoral Scholarship Programme (page 14)

University of Birmingham Research Conference

Dr Emma Ferranti was shortlisted for the University of Birmingham Emerging Impact Award 2018 for her work translating research into societal impact. She was the only person selected to represent the College of Life and Environmental Sciences in this category. Emma was also highly commended in the NERC Impact Awards (2018). Her work will feature in an upcoming edition of the NERC *Planet Earth* Magazine.

Birmingham University Award for Tremendous Achievement (BUAFTAs)

The BIFoR FACE facility Team have been shortlisted for Team of the Year for the third time. The award recognises a team that is acknowledged as consistently high performing and that works exceptionally well as a team, using the skills of all members productively to execute business as usual activity to a high standard.



Research Poster Conference

Our doctoral researchers presented posters at the University of Birmingham Research Poster Conference, this is the flagship event for the University Graduate School. Postgraduate researchers from across the Colleges come together in the Great Hall of the Aston Webb Building to present their research to fellow researchers.



Outputs

2018 saw 3 journal articles published in the first-rank of general science journals (i.e., the *Nature* family, *Science*, PNAS), another 35 published in top disciplinary international peer-reviewed journals. A full list of papers can be found in Appendix 4.

Comer-Warner, S. A., Romeijn, P., Goody, D. C., Ullah, S., Kettridge, N., Marchant, B., Hannah, D. M., & Krause, S. (2018) Thermal sensitivity of CO₂ and CH₄ emissions varies with streambed sediment properties. *Nature Communications*, 9 (1) 2803
<https://doi.org/10.1038/s41467-018-04756-x>

Globally, rivers and streams are important sources of carbon dioxide and methane, with small rivers contributing disproportionately relative to their size. Previous research on greenhouse gas (GHG) emissions from surface water lacks mechanistic understanding of contributions from streambed sediments. We hypothesise that streambeds, as known biogeochemical hotspots, significantly contribute to the production of GHGs. With global climate change, there is a pressing need to understand how increasing streambed temperatures will affect current and future GHG production. Current global estimates assume linear relationships between temperature and GHG emissions from surface water. Our results confirm that streambeds, with their non-linear response to projected warming, are integral to estimating freshwater ecosystem contributions to current and future global GHG emissions.



Wood Brook stream runs alongside the FACE facility. Hydrologists enjoy completing their research near here as they know they'll be uninterrupted and that they have welfare facilities nearby



Johnston, I. G. (2018) Tension and Resolution: Dynamic, Evolving Populations of Organelle Genomes within Plant Cells. *Molecular Plant*

<https://doi.org/10.1016/j.molp.2018.11.0002>

The bioenergetic organelles that plants contain – mitochondria and chloroplasts – are the central players in the world's carbon budget. Through photosynthesis and respiration, these organelles fix and release dozens of petagrams (1 petagram = 10¹² kilograms) of carbon each year. Both mitochondria and chloroplasts were originally independent organisms, harnessed by ancestral cells billions of years ago. Because of this history, they retain small genomes, which encode genes of crucial importance in photosynthesis and respiration. Each plant cell contains hundreds of these organelle genomes, which are constantly evolving inside cells in response to the plant's energetic and nutritional needs. These populations move rapidly round the cell, replicate and degrade, and interbreed, and we don't yet understand the principles that govern this complicated behaviour. This paper reviews the vital and rich behaviour of plant organelle genomes, and proposes an evolutionary theory that these fascinating behaviours have evolved to increase plants' robustness to.

Funding

In addition to our £15 million visionary founding gift, from the JABBS Foundation, we have secured a further £2.4 million directly into BIFoR in 2018. Further detail of funding received in 2018 can be found in Appendix 5.

The Wolfson
Foundation



The Leverhulme Trust

In their biggest donation to the University of Birmingham in over 15 years, the Wolfson Foundation have generously pledged £1million towards the refurbishment of glasshouses on the University campus. This funding will enable us to pursue our research around tree disease and tree health. A gift of just under £200,000 by John Powell will allow us to convert the listed building beside the glasshouses into a bespoke education space.

Eager to use these facilities will be new BIFoR pathology experts Prof Nicola Spence, Prof Christine Foyer, Dr Estrella Luna-Diez, and Dr Graeme Kettles.



Going Forward

The capability and reputation of BIFoR is growing quickly, internally and externally, nationally and internationally. We have a dedicated and passionate team working directly for BIFoR, and are supported by many BIFoR Champions across the University.

Our key foci for 2019 will be;

- to report early scientific deliverables from BIFoR FACE and use these as proofs-of-concept for further grant applications
- to put in place robust systems for sample tracking, chain of custody, and data discoverability through improved curation
- to prioritise our relationships with external stakeholders focusing on joint funding and help in-kind to BIFoR FACE and *Forest Edge*
- to connect more deeply into the International Forest Research Community, including through the International Union of Forest Research Organisations (IUFRO) World Congress and specialist groups
- to demonstrate leadership in doctoral-level training in forest research



First acorn from BIFoR FACE grown in laboratory

Appendix 1: People

BIFoR Advisory Group Members

Chaired by Professor Laura Green, Head of College of Life and Environmental Sciences (LES)
Professor Bradwell, Honorary Professor of Immunology University of Birmingham
Professor Richard Bardgett, Manchester University, Professor of Ecology
Iguatemi Costa, Head of Natura Amazon Innovation Centre (NINA), Natura Plc
Dr Clive Elphick, independent Director with the National Grid Gas Plc and National Grid Electricity Transmission Plc, a Trustee of the National Museums Liverpool, and is on the Board of the Environment Agency.
Professor Peter Freer-Smith former chief scientific adviser for the Forestry Commission
Professor John Grace, University of Edinburgh, Professor and Senior Research Fellow
Professor David Johnson, University of Manchester, Chair in Microbial Ecology
Professor Rob MacKenzie, University of Birmingham, BIFoR Director
Professor Sir Ghilleen Prance, formerly Director of Royal Botanical Gardens KEW
Professor Nicola Spence, Defra and University of Birmingham, BIFoR Director
Mike Townsend, Principal Advisor for woodland conservation, Woodland Trust, UK
Professor Xin Zhou, China Agricultural University, Department of Entomology

BIFoR Directors

The Directors of BIFoR are [Professor Rob MacKenzie](#), Prof [Jeremy Pritchard](#). and [Professor Nicola Spence](#).

BIFoR Champions

We have BIFoR Champions throughout the University, most are members of the BIFoR Board and champion BIFoR within their colleges. Our College representatives are:

- Professor [William Bloss](#) (College of Life and Environmental Sciences)
- Professor [Tim Dafforn](#) (College of Life and Environmental Sciences)
- Professor [David Hannah](#) (College of Life and Environmental Sciences)
- Professor Jeff McDonnell (College of Life and Environmental Sciences)
- Prof [Jeremy Pritchard](#) (College of Life and Environmental Sciences)
- Professor [David Maddison](#) (College of Social Sciences)
- Dr [Andrew Quinn](#) (College of Engineering and Physical Sciences)
- Dr [Frank Uekötter](#) (College of Art and Law)

The number of academic members of staff affiliated to BIFoR has grown quickly. 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 Life and Environmental Sciences

School of Biosciences

Ben Brown	Juliet Coates	Liam Crowley	Anna Gardner
Scott Hayward	Iain Johnston	Graeme Kettles	Estrella Luna-Diez
Lynne Macaskie	Robin May	Carolina Mayoral	Jeremy Pritchard
Michael Tausz	Sabine Tausz-Posch	Susannah Thorpe	Clare Ziegler

School of Geography, Earth and Environmental Sciences

Nezha Acil	Aileen Baird	Rebecca Bartlett	Edward Bannister	Lesley Batty
James Bendle	William Bloss	Alfred Bockarie	Chris Bradley	Deanne Brettle
Xiaoming Cai	Lee Chapman	Julian Clark	Guilio Curioni	Simon Dixon
Steve Dugdale	Edward Eaton	Yvette Eley	Steven Emery	Ian Fairchild
Emma Ferranti	Ruben Forquet	Sophie Hadfield-Hill	Nicholas Harper	Kris Hart
Tony Hyacinth	Jason Hilton	Peter Hopcroft	Ben Howard	Alex Hurley
Polly Jarman	Nicholas Kettridge	Jennifer Knight	Stefan Krause	Joshua Larsen
Peter Lee	James Levine	Daijun Liu	Xiaolong Liu	Angeliki Kourmouli
Peter Kraftl	Gregor Leckebush	Rob MacKenzie	Thomas Matthews	Jeff McDonnell
Peter Miles	Christian Pfrang	Francis Pope	Tom Pugh	Sue Quick
Jim Reynolds	Jon Sadler	Greg Sambrook-Smith	Zongbo Shi	Roberto Sommariva
Rick Thomas	Sami Ullah	Anne Van Loon	Bridget Warren	Sebastian Watt

School of Psychology

Jane Raymond

Ali Mazaheri

Eszter Toth

College of Engineering and Physical Sciences

Rosemary Dyson

Bruno Fraga

James Hale

Mike Jesson

Joanne Leach

Chris Mayhew

Andrew Quinn

David Soper

Joe Wood

College of Arts and Law

Louise Hardwick

Corey Ross

Frank Uekötter

College of Social Sciences

David Maddison

Vilane Goncalves-Sales

Fiona Nunan



BIFoR volunteers.- undergraduates and doctoral students gave 1,300 hours of their time in 2018

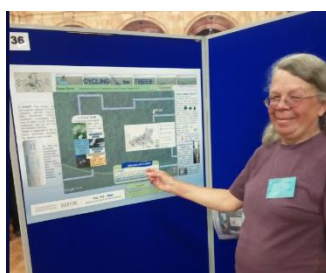
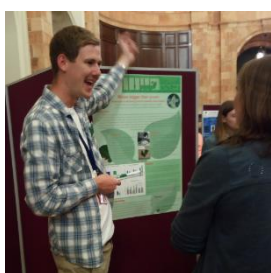
Appendix 2: BIFoR Presence at Sectoral Conferences and Workshops

Conference

16.02.2018	'Bugs, bees, Carbon and trees: One year of data from BIFoR FACE' at Royal Entomological Society post graduate forum. Liam Crowley
07.03.2018	Invited speakers, EcoBuild "First Steps for Urban Air Quality", London. Rob Mackenzie and Emma Ferranti
08.04.2018 – 13.04.2018	European Geosciences Union General Assembly (EGU) 2018 Pico session BIFoR FACE by Rob MacKenzie Abstract: Assessing the ecohydrological role of cryptic, forestland wetlands in the boreal plain (Canada): Local-scale effects with a potential regional impact. Alex Hurley, Nick Kettridge, K Devito and Stefan Krause Abstract: Extreme wildfire exposes remnant peat carbon stocks to increased post-fire drying. Nick Kettridge Abstract: Estimating sub-canopy evapotranspiration and resistances from small-scale, forested wetlands in the sub-humid Boreal Plain, Alex Hurley, Nick Kettridge and Stefan Krause Abstract: Dugdale, SJ, Hannah, DM & Malcolm, IA. 2018. Integrating structure-from-motion photogrammetry and process-based river temperature modelling for improved characterisation of riparian shading. Poster: Global Earth observation and in-situ data for improved understanding of terrestrial ecosystem dynamics (co-organized) Tom Pugh
09.04.2018	Inaugural talk at the British Science Association Festival by Prof Jeremy Pritchard
30.08.2018	Invited talk: 'Investigating short-term effects of elevated Carbon Dioxide on forest insects: One year of data from BIFoR FACE' at Royal Entomological Society annual meeting. (first prize) Liam Crowley
10.09.2018 – 14.09.2018	Invited talk: 'Identification of a bet-hedging network motif generating noise in hormone concentrations and germination propensity in Arabidopsis' 1st international Plant Systems Biology meeting Iain Johnston
03.10.2018	Oral presentation at ForestSat18 conference in Washington DC Tom Pugh
5/8.11.2018	Presentation, Joint Conference on Forests and Water 2018 Valdivia, Chile, Sue Quick
14.12.2018	Invited talk, 'Responses of leaf-mining larvae to elevated Carbon Dioxide' at Royal Entomological Society climate change special interest group meeting. Liam Crowley and Rob MacKenzie gave an introductory talk about the BIFoR FACE facility
16.12.2018 – 19.12.2018	Oral Presentation, Tom Pugh 'The contribution of forest disturbances to global forest dynamics and carbon cycling' British Ecological Society Oral Presentation, Daijun Liu High-habitat dependency for the sensitivity of plant communities to climate change globally Poster presentations, Aileen Baird, Susan Quick and Liam Crowley

Other workshops/meetings/events

26.01.2018	Key note speaker at Geography Teacher Educator's Conference, Prof Jeremy Pritchard
06.02.2018	Invited speaker: 'Changing patterns of animal diversity' guest lecture at the University of Worcester'. Liam Crowley
20.02.2018	Invited speaker, National Environment Research Council (NERC) Head Office, Swindon. Michael Tausz, Rob MacKenzie and Rick Thomas
03.2018	Invited speaker, TDAG meeting "Natural based solutions for flood risk management". Simon Dixon
13.03.2018 and 15.03.2018	Invited speakers, Trees Design and Action Group (TDAG) event, "First Steps for Urban Air Quality", London 13.03.018 and Birmingham 15.03.2018. Rob MacKenzie and Emma Ferranti
15.03.2018	Invited speaker, Royal Town Planning Institute (RTPI) Meeting, "Green Infrastructure and Urban Air Quality, Rob Mackenzie
16.05.2018	Invited speaker, Pint of Science event, BIFoR and value of Green Infrastructure, Rob MacKenzie
13.06.2018	Poster presentations, University of Birmingham Research Poster Conference 2018, Liam Crowley and Sue Quick
02.07.2018	Invited speaker, University of Hull, 'Forests, river channel morphology and flood hydrology at the opening meeting of the Flood Risk, Resilience and Adaptation Network' Simon Dixon
13/14.09.2018	<i>State of the World's Fungi</i> Kew- Poster & Flash presentation, Aileen Baird
20.09.2018	Invited seminar: 'Will Forests help us reach climate goals? Lund University, Tom Pugh
09.10.2018	Invited speaker, Royal Meteorological Society, Rob MacKenzie
08.10.2018 – 10.10.2018	Attended and presented at workshop on CO ₂ Effects on Crops: Current Understanding, Modelling Needs, and Challenges, Tom Pugh
18.10.2018	Invited talk, West Midlands Public Health Consultants as part of the CPD training session on Improving air quality through changing people and places, Emma Ferranti
12.11.2018	Invited speaker, "First Steps ins Urban Air Quality", US EPA-EA Air Quality Workshop. Emma Ferranti
20.11.2018	Invited speaker, "First Steps ins Urban Air Quality", Myerscough College Research Conference, Emma Ferranti
21.11.2018	Poster: Royal Society of Chemistry held their 3rd Early Career Researcher Meeting in London, Angeliki Kourmouli
29.11.2018	Invited speaker to Ulster Museum to welcome the Dippy tour to the museum, Jeremy Pritchard



Liam Crowley (left) and Sue Quick (right) poster presentations

Appendix 3: BIFoR stakeholder engagement

The following programme of engagement gives a flavour of our stakeholder engagement in 2018. Without stakeholders, our research will lie unused.

External Stakeholder Engagement - Academic			
Date	What	BIFoR contact	Location
30.01.2018	Round table discussion with visitors from India	Rob MacKenzie	Campus
23.02.2018	New University of Birmingham Geography Earth and Environmental Sciences staff away day	Kris Hart	BIFoR FACE
22.03.2018	World Water Day Conference	Stefan Krause, Rob MacKenzie, Nicolai Brekenfeld, Sue Quick	Edgbaston Campus
03.04.2018	Royal Meteorological Society: Atmospheric Science Conference	Susan Quick	Other
27.04.2018	British Ecological Society teaching and Research event	Susan Quick	UoB campus
10.05.2018	Visiting academics from University of Illinois Urbana Campaign	Rob MacKenzie	BIFoR FACE
16.05.2018	Host for an international workshop on quantifying rates at drivers of tree mortality. This included a visit to BIFoR FACE facility	Tom Pugh	Edgbaston Campus / BIFoR FACE
21.05.2018	Richard Norby – Oak Ridge National Laboratory, USA	Rob MacKenzie	BIFoR FACE
20.08.2018	University of Lancaster	Kris Hart	BIFoR FACE
04.09.2018 - 06.09.2018	Field visit and 1 day of European Wood Pastures	Sue Quick	Other
09.09.2018	Researcher Links Workshop in Brazil, Workshop organised by RCUK	Estrella Luna-Diez	Other
17.10.2018	Plant Health Conference	Graeme Kettles Estrella Luna-Diez	Other
02.11.2018	Matthias Forkel (Technische Universität Wien, prospective Collaborator)	Tom Pugh	BIFoR FACE
06.11.2018	National Tree Officers Conference, Telford	Kris Hart	Other
09.11.2018	Head of College, Prof Laura Green visit	Internal	BIFoR FACE
15.11.2018	Catherine Souch from RGS visit	Stefan Krause	Edgbaston Campus
16.11.2018	University of Edinburgh, Prof John Grace	Rob MacKenzie	BIFoR FACE
19.11.2018	Visitors from Tianjin University	Zongbo Shi Rob MacKenzie	Edgbaston Campus
23.11.2018	Visit to Lady Park Wood with key stakeholder from Small Woods	Rob MacKenzie	Other
27.11.2018	Henan Province Forestry Department visit to campus	Rob MacKenzie and others	Edgbaston Campus
04.12.2018	Landscape Leadership workshop in Bonn, Germany	Ruben Foquet	Other
10.12.2018 - 11.12.2018	British Society of Plant Pathology Conference	Estrella Luna-Diez Graeme Kettles	Other
13.12.2018	Prof Shahbaz Khan – UNESCO	Rob MacKenzie	Edgbaston Campus
14.12.2018	Royal Entomological Society Climate Change meeting on campus	Scott Hayward	Edgbaston Campus
12.12.2018	Visitors from Nankai University	Rob MacKenzie and Zongbo Shi	Edgbaston Campus

External Stakeholder Engagement - Education

Date	What	BIFoR contact	Location
22.01.2018	UAV training course	Rick Thomas	BIFoR FACE
26.01.2018	Carbon Management Away Day – UoB masters students tour	Francis Pope/Kris Hart	BIFoR FACE
02.02.2018	UoB Bioinformatics Group Tour, students tour	Kris Hart	BIFoR FACE
01.03.2018	UoB 21 st Century Ecosystems Module, undergraduate student tour	Michael Tausz & Tom Pugh	BIFoR FACE
05.03.2018	Queensbridge High School, site tour	Rob Mackenzie, Aileen Baird	BIFoR FACE
08.03.2018	UoB 21 st Century Ecosystems Module, student away day	Michael Tausz & Tom Pugh	BIFoR FACE
14.03.2018	Skype a scientist – Yr 2 Coventry Primary	Aileen Baird	Other
16.03.2018	UoB Occupational Health and Safety Students, site tour	Kris Hart /Surindar Dhesi	BIFoR FACE
19.03.2018	Imperial College London, Hydrology Students, site tour	Kris Hart/Nicolai Brekenfeld	BIFoR FACE
20.03.2018	University of Gloucester (Environmental Science, Ecology and Biology) student visit	Liz Hamilton/Kris Hart	BIFoR FACE
27.03.2018	UoB Environmental Science course (1 st year) students tour	Kris Hart	BIFoR FACE
27.03.2018	Visit to University of Birmingham School – for live switch on of CO ₂ at BIFoR FACE	Jerry Pritchard Rick Thomas	Other
17.04.2018	University of Gloucester students	Angeliki Kourmouli Liz Hamilton	BIFoR FACE
15.05.2018	National Arboretum & Harper Adams	Kris Hart	BIFoR FACE
23.06.2018	Undergraduate Open day	Rob MacKenzie	UoB Campus
26.06.2018	University of Birmingham School visit	Michael Tausz and PhD students	BIFoR FACE
29.06.2018	CENTA Doctoral Training Partnership - Training Day	Rob MacKenzie, Michael Tausz, Liam Crowley	BIFoR FACE
03.07.2018	Great Wyrley High School visit	Kris Hart Carolina Mayoral	BIFoR FACE
20.07.2018	Birmingham International Summer School (BISS) delegates	Rob MacKenzie Liam Crowley	BIFoR FACE
29.08.2018	Summer school visit (water sciences)	Michael Tausz	BIFoR FACE
15.09.2018	Undergraduate Open Day	Rebecca Bartlett	Edgbaston Campus
22.09.2018	University of Birmingham. Student Welcome Week	Deanne Brettle	Edgbaston Campus
27.09.2018	University of Birmingham Student Guild Volunteers Fayre	Deanne Brettle	Edgbaston Campus
17.10.2018	University of Birmingham, Volunteers Welcome Week	Michael Tausz and PhD Students	Edgbaston Campus
20.10.2018	Undergraduate Open Day	Francis Pope	Edgbaston Campus
08.11.2018	Rivers and their Management group, University of Birmingham, GEES tour	Chris Bradley	BIFoR FACE
16.11.2018	Geography teachers from Bromsgrove High School	Kris Hart	BIFoR FACE
23.11.2018	Yr 12 sample lecture to Wrekin College	Jerry Pritchard	Edgbaston Campus
04.12.2018	First Cohort of Forest Edge students visit BIFoR FACE	Rob MacKenzie	BIFoR FACE
07.12.2018	St Peters school A level students visit BIFoR FACE	Jerry Pritchard	BIFoR FACE

External Stakeholder Engagement Public Engagement with Research

Date	What	BIFoR contact	Location
02.02.2018	Birmingham Museums Trust Tour	Kris Hart	BIFoR FACE
27.02.2018	Norbury Park, Farmers Discussion Group	Kris Hart	BIFoR FACE
05.03.2018	I'm a Scientist get me out of Here!	Aileen Baird	Other
14.03.2018	Skype at scientist – Yr 2 Coventry Primary	Aileen Baird	Other
09.06.201	Severn Trees Trusts (Saturday)	Peter Miles	BIFoR FACE
12.06.2018	DSG Farming Agriculture Training	Kris Hart	BIFoR FACE
01.05.2018	Chamberlain Circle event – alumni event	Rob MacKenzie	UoB campus
2.05.2018	University of Birmingham Student Recruitment and Marketing Team	Kris Hart	BIFoR FACE
2.05.2018	UoB external relations away day	Kris Hart	BIFoR FACE
05-07. 05.2018	Norbury Canal Festival	Deanne Brettle Anna Gardner	Other
14.05.2018	Pint of Scientist event “Planet Earth” theme	Aileen Baird	Other
26.05.2018	Alumni event on campus – Gratitude 2018: Drinks with a Dinosaur	Rob MacKenzie	UoB campus
5.06.2018	Public tour of BIFoR FACE	Kris Hart	BIFoR FACE
11.06.2018	Pheonix Group - local community group	Kris Hart	BIFoR FACE
13.06.2018	South Staffordshire Women's Institute tour	Kris Hart	BIFoR FACE
25.06.2018	Opening Up science for all event	Sue Quick	Other
10.07.2018	Alumnus visitor Matt Rawlinson	Rob MacKenzie	BIFoR FACE
12.07.2018	Public tour of BIFoR FACE with local people	Kris Hart	BIFoR FACE
13.07.2018	Film crew from French television programme makers	Rob MacKenzie	BIFoR FACE
16.07.2018	Trees Design and Action Group TDAG meeting	Emma Ferranti	BIFoR FACE
24.07.2018	Royal Visit	Everyone	BIFoR FACE
16.08.2018	Public tour of BIFoR FACE	Kris Hart	BIFoR FACE
04.09.2018	Joint UK Land Environment Simulator (JULES) conference delegates – BIFoR were conference hosts and also arranged a visit to BIFoR FACE	Rob MacKenzie	BIFoR FACE
18.09.2018	TDAG/RTPI workshop: How do we value trees & other green infrastructure in the urban environment? (page 18)	Emma Ferranti	Edgbaston Campus
24.09.2018	Terry Mabbett – writing article for Forestry Journal	Rob MacKenzie	BIFoR FACE
03.10.2018	ENCOMPASS partners visit (Highbury Park Friends Group, Birmingham Ranger and Wildlife Trust)	Sue Quick Aileen Baird	BIFoR FACE
09.10.2018	Malvern Festival	Liam Crowley, Aileen Baird, Clare Ziegler Angeliki Kourmouli	Other
13.11.2018	Technical Academy – stand	Nick Harper and Peter Miles	Edgbaston Campus
12.11.2018 – 13.11.2018	UK-US Air Quality Workshop (international collaboration meeting & tour of BIFoR FACE)	Kris Hart and Rob MacKenzie	BIFoR FACE
22.11.2018	Earthwatch Institute research visit	Kris Hart	BIFoR FACE
22.11.2018	Wyre Forest 'Opinion Leaders Workshop'	Tom Pugh Jenny Knight	Other

External Stakeholder Engagement - Private			
Date	What	BIFoR Contact	Where
05.03.2018	Project AGM with Stakeholders Syncrude and Canadian Natural on project 'Applying Natural Analogues to Constructing and Assessing Long-Term Hydrologic Response of Oil Sands Reclaimed Landscapes'; HEAD3	Nick Kettridge	Other
05.03.2018	Final reporting of project 'Ecohydrogeologic Investigation of Opportunistic and Constructed Wetlands on Syncrude's Mildred Lake Lease' and dissemination of findings to Canada's Oil sand Innovation Alliance	Nick Kettridge	Other
18.05.2018	Shaylor Group and HMRC rep	Rob MacKenzie	BIFoR FACE
16.10.2018	Sinar Mas Group (Indonesia)	Rob MacKenzie, Craig Edwards	BIFoR FACE
30.10.2018	Treemanía (Dutch Business)	Kris Hart	BIFoR FACE

External Stakeholder Engagement - Public			
Date	What	BIFoR Contact	Where
11.04.2018	Michael Gove visit to campus	Various	UoB Campus
20.04.2018	Staffs lieutenancy	Rob MacKenzie	BIFoR FACE
17.05.2018	Environment Agency Tour and Away Day	Rob MacKenzie	BIFoR FACE
22.05.2018	Wykeham Forest visit with Continuous Cover Forest Group	Sue Quick	Other
31.05.2018	Environment Agency Directors	Stefan Krause Rob MacKenzie Michael Tausz	BIFoR FACE
13.06.2018	Green Infrastructure for Road Air Quality Workshop	Rob MacKenzie	UoB campus
14.06.2018	Staffordshire Lord Lieutenant	Kris Hart and Rob MacKenzie	BIFoR FACE
20.06.2018	Action Oak Partners Meeting	Michael Tausz and Rob MacKenzie	Other
4.07.2018	Municipal Trees Officers Association	Rob MacKenzie and Emma Ferranti	BIFoR FACE
5.07.2018	Forestry Commission Foresters	Kris Hart	BIFoR FACE
11.07.2018	The National Forest Company	Kris Hart Rob MacKenzie	BIFoR FACE
17.07.2018	Forestry Commission – Forest Service Board	Rob MacKenzie	BIFoR FACE
18.07.2018	Forestry Commission	Rob MacKenzie, Frank Uekotter Sami Ullah	BIFoR FACE
25.07.2018	Forestry Commission Policy and Advice Team	Rob MacKenzie	BIFoR FACE

External stakeholder engagement - Third Sector			
Date	What	BIFoR Contact	Where
14.02.2018	Tree Planting with Birmingham Trees for Life	Deanne Brettle	Other
18.04.2018	Earthwatch: Future Woodlands meeting	Rob MacKenzie, Kris Hart, Alan Jones	BIFoR FACE
19.04.2018	CEO of Wolfson Trust	Various	BIFoR FACE
15.05.2018	Manchester City of Trees Team visit	Rob MacKenzie	Other
22.06.2018	Woodland Heritage	Kris Hart Rob MacKenzie	BIFoR FACE
6.07.2018	CPRE visit from local group	Kris Hart	BIFoR FACE
25.09.2018	Woodland Trust senior executives and trustees	Rob MacKenzie & Charlotte Allen	BIFoR FACE
27.09.2018	FERN	Rob MacKenzie	BIFoR FACE
29.10.2018	Royal Forestry Meeting (RFS) meeting	Kris Hart	BIFoR FACE

Appendix 4: BIFoR Papers 2018

Those directly discussing the BIFoR FACE Facility are marked with an asterisk. Papers from previous years can be found online at <https://www.birmingham.ac.uk/Documents/college-les/gees/bifor/BIFoR-related-papers.pdf>

Alexander, P., Rabin, S., Anthoni, P., Henry, R., **Pugh, T. A. M.**, Rounsevell, M. D. A., & Arneth, A. (2018) Adaptation of global land use and management intensity to changes in climate and atmospheric carbon dioxide. *Global Change Biology*, 24 (7) 2791-2809 <https://doi.org/10.1111/gcb.14110>

Blaen, P. J., Kurz, M. J., Drummond, J. D., Knapp, J. L. A., Mendoza-Lera, C., Schmadel, N. M., Klaar, M. J., Jäger, A., **Folegot, S.**, Lee-Cullin, J., Ward, A. S., Zarnetske, J. P., Datry, T., **Milner, A. M.**, Lewandowski, J., **Hannah, D. M.**, & **Krause, S.** (2018) Woody debris is related to reach-scale hotspots of lowland stream ecosystem respiration under baseflow conditions. *Ecohydrology*, 11 (5) <https://doi.org/10.1002/eco.1952>

Boeiro M., **Matthews T.J.**, et al. (2018) A comparative analysis of terrestrial arthropod assemblages from a relic forest unveils historical extinctions and colonization differences between two oceanic islands. *PLOS ONE*, 13(4) <https://doi.org/10.1371/journal.pone.0195492>

Borges, P.A.V., **Matthews, T.J.**, et al. (2018) A Global Island Monitoring Scheme (GIMS) for the long-term coordinated survey and monitoring of forest biota across islands. *Biodiversity and Conservation*, 27(10) 2567-2586 <https://doi.org/10.1007/s10531-018-1553-7>

Bourgault, M., Löw, M., **Tausz-Posch, S.**, Nuttall, J. G., Delahunty, A. J., Brand, J., Panozzo, J. F., McDonald, L., O'Leary, G. J., Armstrong, R. D., Fitzgerald, G. J. & **Tausz, M.** (2018) Effect of a Heat Wave on Lentil Grown under Free-air CO₂ enrichment (FACE) in a semi-arid environment. *Crop Science*, 58 (2) 803-812 <https://doi.org/10.2135/cropsci2017.09.0565>

Choosang, J., Numnuam, A., Thavarungkul, P., Kanatharana, P., Radu, T., **Ullah, S.**, & Radu, A. (2018) Simultaneous Detection of Ammonium and Nitrate in Environmental Samples Using an Ion-Selective Electrode and Comparison with Portable Colorimetric Assays. *Sensors*, 18 (10) 3555 <https://doi.org/10.3390/s18103555>

Christy, B., **Tausz-Posch, S.**, **Tausz, M.**, Richards, R., Rebetzke, G., Condon, A., McLean, T., Fitzgerald, G., Bourgault, M. & O'Leary, G. (2018) Benefits of increasing transpiration efficiency in wheat under elevated CO₂ for rainfed regions. *Global Change Biology*, 24 (5) 1965-1977 <https://doi.org/10.1111/gcb.14052>

Comer-Warner, S. A., Romeijn, P., Goody, D. C., **Ullah, S.**, **Kettridge, N.**, Marchant, B., **Hannah, D. M.**, & **Krause, S.** (2018) Thermal sensitivity of CO₂ and CH₄ emissions varies with streambed sediment properties. *Nature Communications*, 9 (1) 2803 <https://doi.org/10.1038/s41467-018-04756-x>

Depante M. Petrone R.M. Devito K.J. **Kettridge N.** Macrae M.L. Mendoza C. Waddington J.M. (2018) Potential influence of nutrient availability along a hillslope - peatland gradient on aspen recovery following fire. *Ecohydrology*, 11 (5) <https://doi.org/10.1002/eco.1955>

Dixon S., Sear D., and Nislow K., (2018) A conceptual model of riparian forest restoration for natural flood management. *Water and Environment Journal*, <https://doi.org/10.1111/wej.12425>

Dugdale, S. J., Malcolm, I. A., **Kantola, K.**, & **Hannah, D. M.** (2018) Stream temperature under contrasting riparian forest cover: Understanding thermal dynamics and heat exchange processes. *Science of the Total Environment*, 610-611, 1375-1389. <https://doi.org/10.1016/j.scitotenv.2017.08.198>

Hokanson, K.J., Moore, P.A., Lukenbach, M.C., Devito, K.J., **Kettridge, N.**, Petrone, R.M., Mendoza, C.A., Waddington, J.M. (2018) Hydrogeological landscape framework to identify peatland wildfire smouldering hotspots. *Ecohydrology*, 11 (4) <https://doi.org/10.1002/eco.1942>

Houshmandfar, A., Fitzgerald, G. J., O'Leary, G., **Tausz-Posch, S.**, Fletcher, A. and **Tausz, M.** (2017) The relationship between transpiration and nutrient uptake in wheat changes under elevated atmospheric CO₂. *Physiologia Plantarum*, 163 (4) 516-529 <https://doi.org/10.1111/ppl.12676>

Johnston, I. G. (2018) Tension and Resolution: Dynamic, Evolving Populations of Organelle Genomes within Plant Cells. *Molecular Plant* [doi:https://doi.org/10.1016/j.molp.2018.11.0002](https://doi.org/10.1016/j.molp.2018.11.0002)

Kautz, M., Anthoni, P., Meddens, A.J.H., **Pugh, T.A.M.**, Arneth, A (2018) Simulating the recent impacts of multiple biotic disturbances on forest carbon cycling across the United States. *Global Change Biology*, 24 (5) 2079-2092, <https://doi.org/10.1111/gcb.13974>

Kirby, J., **Chapman, L.** & **Chapman** (2018) Assessing the Raspberry Pi as a low-cost alternative for acquisition of near infrared hemispherical digital imagery. *Agricultural and Forest Meteorology*, 259, 232-239 <https://doi.org/10.1016/j.agrformet.2018.05.004>

Kondo, M., Ichii, K., Patra, P.K., ... **Pugh, T.A.M.** et al (2018) Land use change and El Niño-Southern Oscillation drive decadal carbon balance shifts in Southeast Asia. *Nature Communications*, 9 1154 <https://doi.org/10.1038/s41467-018-03374-x>

Kondo M., Ichii K., Patra K., **Pugh T.**, (2018) Plant Regrowth as a Driver of Recent Enhancement of Terrestrial CO₂ Uptake. *Geophysical Research Letters*, 45 (5) 4820-4830 <https://doi.org/10.1029/2018GL077633>

Krause, A., **Pugh, T.A.M.**, Bayer, A.D. et al. (2018) Large uncertainty in carbon uptake potential of land-based climate-change mitigation efforts. *Global Change Biology*, 24 (7) 3025-3038 <https://doi.org/10.1111/gcb.14144>

Krause, A., **Pugh, T. A. M.**, Bayer, A. D., Li, W., Leung, F., Bondeau, A., Doelman, J. C., Humpeöder, F., Anthoni, P., Bodirsky, B. L., Ciais, P., Müller, C., Murray-Tortarolo, G., Olin, S., Popp, A., Sitch, S., Stehfest, E., & Arneth, A. (2018) Large uncertainty in carbon uptake potential of land-based climate-change mitigation efforts. *Global Change Biology*, 24 (7) 3025-3038 <https://doi.org/10.1111/gcb.14144>

Leonard, R.M., **Kettridge, N.**, Devito, K.J., Petrone, R.M., Mendoza, C.A., Waddington, J.M. and **Krause, S.**, (2018). Disturbance Impacts on Thermal Hot Spots and Hot Moments at the Peatland-Atmosphere Interface. *Geophysical Research Letters*, 45 (1) 185-193 <https://doi.org/10.1002/2017GL075974>

Macabuhay A., Houshmandfar A., Nuttall J., Fitzgerald G. J., **Tausz M.**, **Tausz-Posch S.** (2018) Can elevated CO₂ buffer the effects of heat waves on wheat in a dryland cropping system? *Environmental and Experimental Botany* 155, 578-588 <https://doi.org/10.1016/j.envexpbot.2018.07.029>

Matthews, T. J., Borregaard, M. K., Gillespie, C. S., Rigal, F., Ugland, K. I., Krüger, R. F., Marques, R., **Sadler, J. P.**, Borges, P. A. V., Kubota, Y., & Whittaker, R. J. (2018) Extension of the gambin model to multimodal species abundance distributions. *Methods in Ecology and Evolution*, <https://doi.org/10.1111/2041-210X.13122>

Matthews T., **Sadler J.** Curvalho R., Nunes R, Borges P., (2018) Differential temporal beta-diversity patterns of native and non-native arthropod species in a fragmented native forest landscape. *Ecography*, 42 (1) 45-54 <https://doi.org/10.1111/ecog.03812>

Matthews T., **Sadler J.**, Kubota Y., Woodall W., **Pugh T.A.M** (2018) Systematic variation in North American tree species abundance distributions along macroecological climatic gradients. *Global Ecology and Biogeography*, accepted/in press

Parazoo, N. C., Arneeth, A., **Pugh, T. A. M.**, Smith, B., Steiner, N., Luus, K., . . . Miller, C., (2018) Spring photosynthetic onset and net CO₂ uptake in Alaska triggered by landscape thawing. *Global Change Biology*, 24 (8) <https://doi.org/10.1111/gcb.14283>

Pärn, J., Verhoeven, J. T. A., Butterbach-Bahl, K., Dise, N. B., **Ullah, S.**, Aasa, A., . . . Mander, Ü. (2018). Nitrogen-rich organic soils under warm well-drained conditions are global nitrous oxide emission hotspots. *Nature Communications*, 9 (1) 1135 <https://doi.org/10.1038/s41467-018-03540-1>

Parvin S., Uddin S., Bourgault M., Roessner U., **Tausz-Posch S.**, Armstrong R., O'Leary G., Fitzgerald G., **Tausz M.** (2018) Water availability moderates N₂-fixation benefit from elevated [CO₂]: A 2-year FACE study on lentil (*Lens culinaris* MEDIK.) in a water limited agro-ecosystem. *Plant, Cell and Environment*, 41 (10) 2418-2434, <https://doi.org/10.1111/pce.13360>

Pugh, T. A. M., Jones, C. D., Huntingford, C., Burton, C., Arneeth, A., Brovkin, V., et al. (2018) A Large Committed Long-Term Sink of Carbon due to Vegetation Dynamics. *Earth's Future*, 6 (10) 1413 – 1432 <https://doi.org/10.1029/2018EF000935>

Robinson, D. T., Di Vittorio, A., Alexander, P., Arneeth, A., Barton, C. M., Brown, D. G., Kettner, A., Lemmen, C., O'Neill, B. C., Janssen, M., **Pugh, T. A. M.**, Rabin, S. S., Rounsevell, M., Syvitski, J. P.,

Ullah, I., & Verburg, P. H. (2018) Modelling feedbacks between human and natural processes in the land system. *Earth System Dynamics*, 9 (2) 895-914 <https://doi.org/10.5194/esd-9-895-2018>

Schleussner C., Deryng D., Muller C., Elliott J., Saeed F., Folberth C., Liu Wenfeng., Wang X., **Pugh, T.A.M.**, Thiery W., Seneviratne S., Rofelj J., (2018) Crop productivity changes in 1.5 °C and 2 °C worlds under climate sensitivity uncertainty. *Environmental Research Letters*, Volume 13 (6) <http://stacks.iop.org/1748-9326/13/i=6/a=064007>

Schurgers, G., Ahlström, A., Arneth, A., **Pugh, T.A.M.**, Smith, B. (2018) Climate sensitivity controls uncertainty in future terrestrial carbon sink. *Geophysical Research Letters*, 45 (9) 4329-4336 <https://doi.org/10.1029/2018GL077528>

Shimono H., Farquhar G., Brookhouse M., Busch F. A., O'Grady A., **Tausz M.**, Pinkard E.A. (2018) Pre-screening from large populations as a tool for identifying elevated CO₂-responsive genotypes in plants. *Functional Plant Biology*, 46 (1) 1-14 <https://doi.org/10.1071/FP18087>

Uddin S., Löw M., Parvin S., Fitzgerald G., **Tausz-Posch S.**, Armstrong R., O'Leary G., **Tausz M.** (2018) Elevated [CO₂] mitigates the effect of surface drought by stimulating root growth to access sub-soil water. *PLOS ONE*, 13 (6) <https://doi.org/10.1371/journal.pone.0198928>

Uddin S., Löw M., Parvin S., Fitzgerald G., Bahrami H., **Tausz-Posch S.**, Armstrong R., O'Leary G., **Tausz M.** (2018) Water use and growth responses of dryland wheat grown under elevated [CO₂] are associated with greater root length at depth. *Field Crops Research*, 224, 170-181 <https://doi.org/10.1016/j.fcr.2018.05.014>

Uddin S., Löw M., Parvin S., Fitzgerald G., **Tausz-Posch S.**, Armstrong R., O'Leary G., **Tausz M.** (2018) Yield of canola (*Brassica napus* L.) benefits more from elevated CO₂ when access to deeper soil water is improved. *Environmental and Experimental Botany*, 155 518-528 <https://doi.org/10.1016/j.envexpbot.2018.07.017>

Uddin S., Parvin S., Löw M., Fitzgerald G. J., **Tausz-Posch S.**, Armstrong R., **Tausz M.** (2018) The water use dynamics of canola cultivars grown under elevated CO₂ are linked to their leaf area development. *Journal of Plant Physiology*, 229, 164-169 <https://doi.org/10.1016/j.jplph.2018.08.001>

Ulrich, W., Nakadai, R., **Matthews, T. J.**, & Kubota, Y. (2018) The two-parameter Weibull distribution as a universal tool to model the variation in species relative abundances. *Ecological Complexity*, 36 p110-116 <https://doi.org/10.1016/j.ecocom.2018.07.002>

Wartenger, R., Seneviratne S., Jinfeng H., ... **Pugh, T.A.M.**, (2018) Evapotranspiration simulations in ISIMIP2a—Evaluation of spatio-temporal characteristics with a comprehensive ensemble of independent datasets. *Environmental Research Letters*, 13 (7) <http://iopscience.iop.org/article/10.1088/1748-9326/aac4bb>

Other literature

- Online article in the Ecologist - A 'forest time machine' <https://theecologist.org/2018/oct/08/earthwatches-forest-time-machine>
- Birmingham Brief, Autumn Train Timetables a Leafy Subject <https://www.birmingham.ac.uk/research/impact/thebirminghambrief/items/2018/11/autumn-train-timetables-a-leafy-subject.aspx>
- Article in Royal Society of Biology magazine, the Biologist, by Anna Gardner, <https://thebiologist.rsb.org.uk/biologist/158-biologist/features/2070-the-forest-in-the-future>
- Frank Uekotter wrote op-ed article for Focus.de September 2018 https://www.focus.de/politik/experten/gastbeitrag-frank-uekoetter-im-hambacher-forst-steckt-eine-chance-fuer-die-demokratie_id_9593769.html#commentFormbegin
- Article in June edition of 'Microbiologist' by Aileen Baird, PhD student https://issuu.com/societyforappliedmicrobiology/docs/microbiologist_june18
- BBC2 Fighting for Air featuring Rob MacKenzie talking about green infrastructure. <https://www.bbc.co.uk/programmes/b09m2djj>
- On 6 February 2018, BIFoR was covered on the BBC One Show, a link to the recording then featured on the BBC One Show home page <http://www.bbc.co.uk/programmes/p05x8p74rifch>
- Article in Botany One, by Clare Ziegler <https://www.botany.one/2018/06/elevated-carbon-dioxide-getting-to-the-root-of-the-problem/>
- Article by FERN featuring comment from Michael Tausz <http://www.climatechangenews.com/2018/09/28/poland-pushing-forest-agenda-climate-host-leak-shows/> article
- Podcast www.entocast.com by Liam Crowley. May 2018 Bugs, Bees, Carbon and Trees

Appendix 5: Funding 2018

Title	Principal Investigator	Funder	Call	Awarded
Support for doctoral researcher (majority-funded)		John Horseman		Jan 2018
Embedding Volunteering in BIFoR	Deanne Brettle	Alumni Impact Fund		Feb 2018
Green Infrastructure for Roadside Air Quality - pathfinder	James Levine	NERC	Innovation	May 2018
Capital bid for BIFoR related rebuild of glasshouses and engagement space on campus.	Michael Tausz	Wolfson Trust		Pledged July 2018
Support for a Research Technician		John Horsman		Pledged Autumn 2018
Disentangling mechanisms of co-adaptation between trees and soil food webs in response to environmental perturbations	David Johnson (Manchester)	NERC	Standard Grant	September 2018
Green Infrastructure for Roadside Air Quality - placement	James Levine	NERC	Innovation	September 2018
Examining Oak Tree Defences	Graeme Kettles and Estrella Luna-Diez	JABBS Foundation		Pledged 2018
West Midlands Air – Green Infrastructure work strand	William Bloss	NERC	Regional Impact from Science of the Environment (RISE)	2018
Elm's Cottage refurbishment	Jeremy Pritchard	John Powell		Dec 2018

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