Royal Botanic Gardens

Kew

Nature Unlocked: The Landscape Ecology Programme

Impact Report 2022–2023

Contents

Left: Close-up sample from Wakehurst being analysed by our mycology team.

Researching UK Nature-based solutions for climate change

Nature-based solutions (NbS) use nature to address societal and environmental challenges, such as climate change. Interventions include restoring natural ecosystems, sustainable and regenerative land management, and creating new ecosystems with multiple benefits for people and the environment.

Effective NbS enhance biodiversity and engage local communities. This duality is vital in achieving effective and long-term NbS interventions on the ground, providing co-benefits for nature, people and climate.

The UK government has ambitious plans to implement NbS *and* nature recovery across UK landscapes, through the 25 Year Environment Plan and subsequent Environment Act. This will protect 30% of UK land and sea by 2030 and create new farming schemes that aim to contribute 80–100% of the target to restore or create more than 500,000ha of wildlife-rich habitat outside of protected areas by 2042.

Halting biodiversity loss is critical

The UK is one of the most nature-depleted countries in the world, with almost a fifth of UK plants threatened with extinction, including 97% of species-rich grasslands and 70% of ancient woodlands. One of the key drivers has been land use change. Numerous studies state that a more connected landscape is vital for nature and ecological recovery. Connected landscapes protect biodiversity and ecological complexity, allowing the flows of species and genes and the provision of ecosystem services such as carbon sequestration, pollinator services, flood and drought resilience, and human wellbeing.

How can this vision for NbS be achieved in the complex UK environment, dominated by competing land use needs, competing interests and fragmented land ownership? In 2022, the House of Lords Science and Technology Committee highlighted obstacles to implement effective NbS: more scientific research on carbon sequestration in UK habitats; more training in skills to deliver NbS; more clarity and regulation for public-private finance routes for NbS; and more government forward planning on the competing demands – housing, nature, net zero, food production etc. – on limited UK land stocks.

The Royal Society (2023) report on multifunctional landscapes states: "*Land is a finite resource and we need to research new ways to use it more efficiently, as well as to apply existing knowledge more effectively.*" Key recommendations are that land use decision making must adopt a multifunctional approach, considering market products (e.g. food and timber) alongside non-market outputs such as biodiversity, carbon sequestration and recreation value.

Balanced outcomes between market and non-market products and outputs can be achieved, but research is needed to reduce negative trade-offs and increase benefits across multiple stakeholder groups. A data-driven and spatially explicit scientific approach is central to achieving this balance, developing "*consistent and scientifically robust baselines, metrics and systematic monitoring programmes … to better understand the state of landscapes and what they are being used for, and to track progress towards meeting policy objectives*".

RGB Kew's Nature Unlocked: The landscape ecology programme at Wakehurst

As a direct response to the need for more high-resolution science on natural capital across multifunctional landscapes, Nature Unlocked aims to research, engage with and share the value of UK biodiversity.

Launched in 2021, Nature Unlocked measures and models the multiple, 'stacked' benefits of biodiverse landscapes, focusing on the ecosystem services of carbon, hydrology, pollination and wellbeing. We use the Wakehurst landscape to test and develop novel methods, protocols and models, and scale to wider UK landscapes to evaluate trade-offs and reach balanced outcomes for climate, biodiversity and people.
The programme collaborates with the government, conservation groups, corporates, land managers, farmers, the public and scientists.

Our programme is a direct response to a changing policy climate and the opportunities it's generating for land managers, researchers, corporations, policy makers and the public.

Biodiversity

The variety and variability of life on Earth, including plants, animals, fungi and microorganisms.

Natural capital

The stock of renewable and non-renewable resources in nature that combine to provide a flow of benefits to people.

Ecosystem services

The benefits to humans provided by the natural environment and from healthy ecosystems.

Our vision when we launched Nature Unlocked was to unlock the potential of Wakehurst's biodiverse landscape and transform it into a living laboratory. Two years on, it's incredibly rewarding to see Wakehurst full of activity – a hub of innovative research, where science is in action across the gardens – from soil sampling in our woodlands, to drones measuring high-resolution data over the 535 acres. And with early findings from our research streams unlocking new perspectives and approaches to land management, it's exciting to see our ambitions and efforts advancing towards impactful change.

Ed Ikin, Director of Wakehurst

Programme deliverables

Nature Unlocked has five core deliverables, linked to RBG Kew's corporate manifesto (Our manifesto for change 2021–2030):

RBG Kew Corporate Priority		Nature Unlocked deliverable
Deliver science-based knowledge and solutions to protect biodiversity and use natural resources sustainably	⟷	Deliver high-quality, innovative science to measure, define and monitor natural capital across Wakehurst and varied UK landscapes
Inspire people to protect the natural world	⟷	Inspire engagement, participation and learning through citizen science and public programmes, enhancing an understanding of and connection to nature
Train the next generation of experts	⟷	Train the next generation through interdisciplinary higher education programmes and internships focused on valuing and protecting UK biodiversity
Extend our reach	⟷	Share replicable protocols and best practice in land management for UK nature-based solutions and biodiversity across varied land uses and stakeholders
Influence national and international opinion and policy	⟷	Evidence policy and practice on nature-based solutions across UK and beyond

Nature Unlocked is part of *Kew Science's Ecosystem Stewardship* priority and aligns to *Digital Revolution and Trait, Diversity and Function* by assessing UK biodiversity, genomics, traits and generation of natural capital data. Nature Unlocked supports RBG Kew's Climate Positive strategy, providing baselines of carbon storage and sequestration across Kew Gardens and Wakehurst and evidencing best practice for climate-positive, low-input horticulture and landscape management.

Left: MSc student Tom France researching the role of invertebrates in providing natural pest management.

What does impact look like for Nature Unlocked?

Our primary impacts are to influence policy and change behaviour through four outcomes:

High impact, innovative science

Connection to nature

Best practice shared

Evidencing policy

Successful impact realises Wakehurst's potential as 'Kew's living laboratory': researching and testing best practice for UK nature-based solutions. It includes the public visiting Wakehurst to engage with nature, horticulture and science, and members renewing through their connection to Kew's cause.

The programme will be an exemplar of collaborative working towards achieving nature-based solutions across diverse land uses, and evidence UK policy and practice, incorporating the true value of biodiversity into decision making on the environment. We will attract investment to scale up methods and protocols developed at Wakehurst to wider UK landscapes.

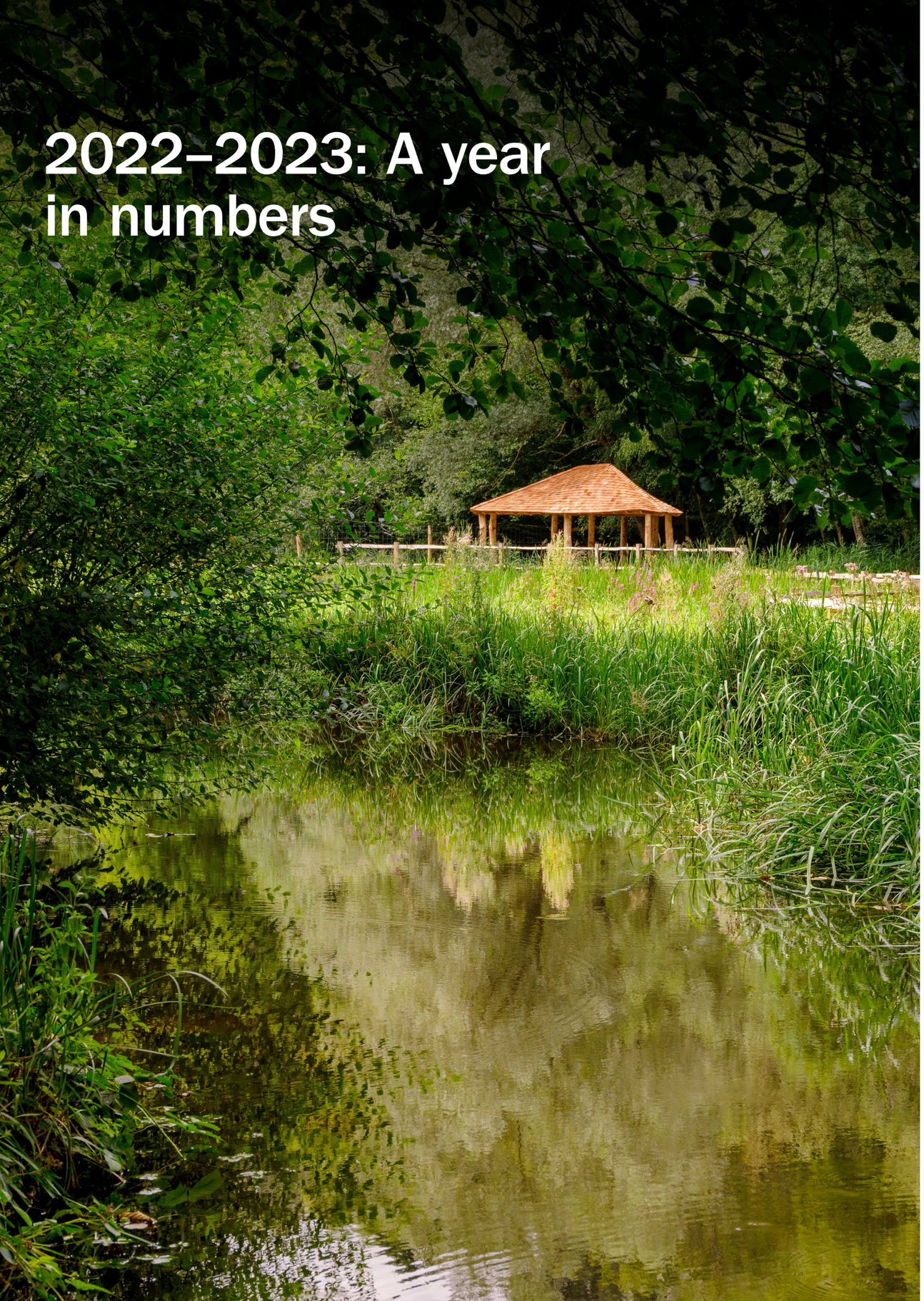
This year's impact report is structured around these outcomes, reflecting current achievements and future growth targets.

Left: Gas flux technology used to continuously monitor GHG respiration out of the soil and absorption into the soil. This tells us how carbon moves within different habitats under different conditions.

A year in review 2022–2023

Quarter	Activities
Q1 (April–June)	• 1st year anniversary of Nature Unlocked (May 2022) • Start of nature connectedness pilot project with children and adults at Wakehurst, in collaboration with Royal Holloway University London (May–November 2022) • Start of pollination summer research studentships at Wakehurst (June 2022) • Start of MSc projects on the American Prairie grassland, investigating species invasiveness risk and pollinator ecosystem services in comparison to Wakehurst's native Coronation Meadow. • Start of a full year's sampling of carbon and biodiversity across woodlands and grasslands at Wakehurst, funded by HM Treasury's Shared Outcomes Fund
Q2 (July–September)	• Launch of Channel 5 'Kew Gardens: A Year in Bloom' (July 2022) • Launch of a new Participation team to develop a Nature Unlocked citizen science programme (September 2022) • Completion of an above-ground carbon sequestration baseline for Wakehurst • Development of a landscape modelling tool to evaluate nature-based solutions, led by the University of Sussex • Launch of joint Royal Holloway University London/RBG Kew MSc linked to Nature Unlocked (September 2022)
Q3 (October–December)	• Start of PhD studentship exploring greenhouse gas flux across wet water bodies, including Wakehurst's wet woodlands, led by Royal Holloway University London (September 2022) • Publication of report on nature connectedness pilot project (November 2022) • Workshops with the Upper Ouse Farm Cluster Group to build local farming relationships and explore scaling carbon and biodiversity research onto farmland • Start of PhD secondment in science communications on Nature Unlocked (November 2022–February 2023) • Appointment of Creative Agency, Johnson Banks, to create a new brand identity for Shared Outcomes Fund, which Kew's carbon research is part of
Q4 (January–March)	• Completion of first full year of carbon and biodiversity research at Wakehurst, including spatial, greenhouse gas flux, soils and fungal data • Launch of six further UK pilot sites to research carbon storage and sequestration (Natural England), and blended finance and governance models (Environment Agency) for nature-based solutions, as part of Shared Outcomes Fund • Start of socio-cultural and economic research in the area local to Wakehurst, led by the University of Sussex • Recruitment of a post-doctoral researcher to deliver pollination research across Wakehurst and in urban areas

2022–2023: A year in numbers



High impact, innovative science

25 science projects have been undertaken with

10 active science projects

9 completed science projects

6 science projects in the pipeline

using Wakehurst as a 'living laboratory' to research

5 habitats

along with

7 university partnerships

Influencing policy

Nature Unlocked now has

6 government partners

leading to

1 national policy inclusion

Connection to nature

2 Nature Unlocked TV features on Channel 5's 'Kew Gardens: A year in bloom' reaching

6 million viewers

We've engaged

1,100 members of the public

with research, through

6 public engagement days

30+ social media posts

20 online press articles

14 blogs and articles

&

1 new animation: 'What is a living laboratory?'

Best practice shared

This year, 'Kew's

10 Guiding Principles for investing in Nature' was published on Kew.org

We have been busy securing and maintaining

4 corporate partnerships

&

3 land management relationships

Resource

£1.14m Total funding in FY 2022–2023

High impact, innovative science

As a botanic garden and home to the Millennium Seed Bank, Wakehurst offers an experimental platform to explore questions around the future of UK land use, landscape design and species selection.

How do different habitats and management methods sequester carbon? How can we maximise our landscape for invertebrate ecosystem services (e.g. pollination)? How can the multiple benefits of biodiversity be evidenced to ensure balanced land use policy decisions, not dominated by tree-planting or short-term carbon uptake?

Our research is creating a natural capital baseline of Wakehurst. This will evidence value of biodiversity across Wakehurst, including how biodiverse habitats can 'stack' ecosystem services such as carbon sequestration and wellbeing benefits, and the trade-offs and risks linked to these services.

Over the last year, we have connected Wakehurst to national and international research networks, such as the Wet Woodland Research Group, the Natural Capital Ecosystem Assessment (NCEA) and the Global Ecosystem Monitoring network. These networks give Wakehurst an external currency as a 'Kew's living laboratory', connecting and comparing our high-resolution science with other sites and data across the UK and globally.

Carbon

Aim: The carbon research strand will produce high-resolution, novel research on carbon sequestration, gas flux and biodiversity across Wakehurst's landscape. The methods and results will influence land management at Wakehurst, and data will feed into a landscape modelling tool to 'game' UK landscape change over time and evaluate nature-based solutions. The research will also inform government policy and business practice on nature-based solutions and investing in nature for net zero.

Throughout 2022–2023, Kew scientists and research partners developed methods and researched carbon and biodiversity across Wakehurst's woodland and grassland habitats. The research is funded by HM Treasury's Shared Outcomes Fund and it evaluates nature-based solutions to climate change, with government partners including Natural England, Environment Agency, Forestry Commission, Defra and the Department for Energy Security and Net Zero.

We now have a year's data on above-ground carbon, mainly from trees; greenhouse gas flux; and below-ground soil carbon and biodiversity. The below-ground mycology team have developed a protocol to analyse carbon from soils and fungi, and the spatial team have completed a full baseline of Wakehurst's carbon stocks in above-ground biomass using LiDAR and drone technology. The baseline used existing methods and national datasets for calculating UK carbon stocks, both above and below ground, and estimated a carbon stock between 10,419 and 28,292 tonnes across the Wakehurst site. Kew research will help to reduce the variance between these figures by improving the resolution of data and incorporating greenhouse gas flux, soil and mycorrhizal (fungal) data into calculations, giving a more accurate reflection of the carbon stored in woodland and grassland habitats.

Scaling our methods and data to wider UK landscapes is key for evidence building and creating additional reference sites to test and innovate carbon and biodiversity research. Thanks to the UK NCEA partnership, we are planning to scale our mycology protocols to agricultural and peatland habitats across the UK. In April, we were invited to join Defra Green Finance's new Nature Investment Standards programme, in partnership with the British Standards Institute.

Our carbon research is being integrated into University of Sussex's landscape mapping and modelling tool. It uses diverse data sources – including social, economic and ecological data – and novel techniques to characterise the changing function, value and usefulness of biodiverse landscapes to people. Currently, the focus is on the South-East of England, applying a 40km radius around Wakehurst – including urban, rural, agricultural and coastal environments – but we aim to increase the geographical scope in the future.

Left: Kew scientists Tim Wilkinson and Justin Moat using drone technology to gather high-resolution spatial analysis data to determine carbon storage of the Wakehurst landscape.

Training the next generation

Sky, a corporate partner of Kew's since 2021, supported a science intern to work on carbon and biodiversity research. Thomas, a second-year Geography student, spent a year at Kew in our spatial analysis team, participating in drone flying, soil sampling and LiDAR laser scanning. Thanks to Sky's support, Thomas was also able to attend COP26 as part of the Kew cohort. Some of his reflections are here: "*It's been amazing to be able to fly some of the drones that we have at Kew. … I was down in Wakehurst for a week working with the Spatial Analysis team surveying the entire site to collect high-resolution imagery. These images will be used to construct elevation models of the terrain and allow us to look at the health of Wakehurst's trees. I have even been lucky enough to go on a drone pilot training course, making me a fully qualified drone pilot. … What is exciting is that my internship supports Kew's wider work, including our sustainability strategy by modelling how much carbon is stored in our gardens and Kew science's work on ecosystem assessments and biodiversity metrics.*"

Pictured right: Sky-sponsored Nature Unlocked Science Intern, Thomas, and Spatial Analysis Research Assistant, Gui Castro, explaining the function of LiDAR technology to capture above-ground biomass for Channel 5's 'Kew Gardens: A year in bloom'.

Pollination

Aim: The pollination strand researches the impacts of Wakehurst's biodiverse landscape on pollinator diversity, health and contribution to ecosystem services, as one of several UK sites to inform national-scale natural capital assessment and land management for pollinator diversity. The public will be engaged through citizen science and interpretation in the Wakehurst landscape. In the long term, treatments and interventions at Wakehurst can be used to monitor invertebrate's function and role in ecosystem services and biodiversity. Research will become part of a fully integrated UK research group on pollinator diversity and inform national strategies.

With a 97% reduction in native wildflower meadows across the UK, and climate change, pests, disease and land use change threatening many of our native species, the last year of research has explored the importance of exotic landscapes and non-native plant species for pollinator diversity and abundance. Through a new post-doctoral researcher in February 2023, supported by Mount Anvil and Partners, we will develop research questions that bring future land use, climate change and biodiversity considerations into pollinator studies.

Understanding whether UK pollinators are attracted to, and supported by, non-native plants is important as we rely on pollinator services for benefits such as pest control and crop pollination. An MSc project used techniques such as flower-insect-time (FIT) counts and nectar sampling to assess pollinator diversity and abundance at the American Prairie grassland and the native Coronation Meadow at Wakehurst. Results showed that native flowering species were still preferable to UK pollinators, due to their higher nectar sugar content. Non-native species are also important for UK pollinators as they flower later than native meadows, extending the resources available to pollinators.

Throughout the season, volunteer groups participated in FIT counts, providing citizen science data alongside shifting public perception of Wakehurst as a site for conservation and scientific research. Away from the botanic garden setting, our science is influencing best practice in landscape management for boosting people's wellbeing and biodiversity in London property developments, thanks to our partnership with Mount Anvil & Partners.

Public outreach

Nature Unlocked offers the chance to engage the public with science stories at RBG Kew. Interpretation – for example, signage and audio in the landscape – plays an important role in providing context and information to the public, aiming to enhance understanding and foster a greater connection to place.

PhD student Deon Lum, while on placement with the interpretation team at Wakehurst, developed an interpretive piece that summarised our pollination research on the American Prairie and Coronation Meadow. To inspire action, the audience was addressed directly by asking- 'What can you do to help pollinators?' Using interpretation techniques, such as an active voice alongside providing practical solutions, we can aim to encourage our audience to act. This can help extend the reach of a project by empowering visitors to make beneficial changes to their daily lives. This piece of interpretation will be presented in the Visitor Centre where it will be seen by the public as they enter and exit the site.

Pictured below: Interpretative exhibit featured in Wakehurst's Visitor Centre, displaying Nature Unlocked pollination research and encouraging viewers to get involved in solutions.

Hydrology

Aim: The hydrology research strand will question how different landscapes mitigate against flooding, using Wakehurst's biodiverse and multi-habitat landscape to investigate and model water flow across landscapes and the role of biodiversity in reducing flood risk and providing landscape resilience. The public will help collect datasets through citizen science, for example pond dipping and investigating water quality. The hydrological research at Wakehurst is connected particularly with carbon research, understanding how gas flux and carbon sequestration is influenced by soil moisture. This holistic landscape-level science will inform UK greenhouse gas emission inventories and land management for nature-based solutions.

Wakehurst's diverse waterscape is a valuable research asset, featuring wet woodlands, a lake, a reservoir, brooks and wetlands. Water flows across multiple habitats to the Ardingly reservoir, which feeds the river Ouse, allowing researchers to explore how biodiversity influences hydrological flows and landscape function, including flood and drought scenarios.

Throughout 2022–2023, we have continued to build relationships with institutions such as Royal Holloway University London, Imperial College London and the UK Centre for Ecology and Hydrology (CEH). This collaborative approach is mutually beneficial, providing expertise on how best to establish hydrology research at Wakehurst and providing partners with access to Wakehurst's habitats, scientists and the public.

A PhD student from Royal Holloway University London is using Wakehurst as a field site within a research project on greenhouse gas fluxes (including methane and CO2) across varied UK landscapes and shallow water bodies, investigating the impact of seasonal temperature and rainfall changes on these soil gas fluxes. This is important as it takes the full ecosystem into account: by looking at water bodies and flows and how these influence carbon stocks in an ecosystem we can better understand the impacts of droughts and floods and provide better solutions for land management.

Above: Mark Lee, a scientist from Royal Holloway collecting real-time hydrological soil data in our Wakehurst habitats.

Wellbeing

Aim: The nature connectedness strand will deliver social research on the relationship between people and landscape, using Wakehurst's biodiverse habitats, a long-standing public programmes team and visitors to design projects on mental and physical wellbeing, access and the diversity of values of UK biodiversity. The research will build a body of evidence for the design of landscapes that improve nature connectedness of communities with their local landscapes across the UK, and continue to design, build, research and refine our horticultural landscapes at Wakehurst to enhance access and wellbeing.

Research shows the wellbeing and mental health benefits of engaging with nature include attention restoration, stress reduction and biophilia (love of plants). Children growing up in urban environments are less likely to enjoy natural environments and have less contact with green spaces and wildlife. With over 90% of the UK population living in urban environments, it's important to understand how to improve nature connection both among adults and children.

In 2022, Kew and Royal Holloway University London delivered a pilot study questioning how different biodiverse habitats at Wakehurst impact mental health and wellbeing. Over six months, more than 300 adults and 1300 school children participated in the study. Alongside pre- and post-activity surveys, the adults went on wellbeing walks, with prescribed 10-minute 'rest breaks', and had their heart rates monitored. The school children also filled out surveys, went on wellbeing walks in wetland, woodland or grassland habitats and participated in drawing sessions and activities to engage their senses at each habitat.

In 2023, research with Royal Holloway University London will continue, exploring the link between nature connection and mental health and wellbeing, including eco-anxiety, landscape design and the role of technology in increasing nature connection. The results will inform landscape design and Wakehurst programmes, aiming to attract a greater diversity of audiences to visit Wakehurst. We are building relationships with government stakeholders linked to the Levelling Up agenda, showing the importance of biodiversity in enhancing social and cultural benefits to people.

How do different biodiverse habitats impact nature connection and wellbeing?

Results of the Wakehurst pilot study found that children had the highest connection to nature in the meadow habitat, and those with higher wellbeing scores pre-visit were more likely to have a more positive change in their connection to nature. There is also a link between mental health, wellbeing and nature connection: children who had lower pre-visit mental health scores (e.g. anxiety and depression) before the walk were more likely to have greater positive changes in wellbeing post-walk.

For adults, men tended to get greater benefits for mood following the walk (e.g. a less negative mood and more positive mood), and a greater connection to nature pre-walk predicted more positive changes to mood following the walk for both genders. Younger adults reported feeling more restored after walks, and those with a lower heart rate at the resting points were more likely to report feelings of restoration post-walk.

Connection to nature

Nature Unlocked engages and shares the value of UK biodiversity with people. In the last year, we have engaged members of the public, volunteers and staff through citizen science activities, from soil sampling to pollinator transects. A new Participation Team is developing a citizen science plan, engaging new audiences to gather natural capital data across the Wakehurst site and in their own communities.

How do different habitats and management methods sequester carbon? How can we maximise our landscape for invertebrate ecosystem services (e.g. pollination)? How can the multiple benefits of biodiversity be evidenced to ensure balanced land use policy decisions, not dominated by tree-planting or short-term carbon uptake?

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Creating accessible science by naming 'Nature Unlocked'

Though great steps were made following the launch of the Landscape Ecology Programme (LEP) to engage public audiences with the science taking place in the landscape, this title formed a barrier, separating those with a non-scientific background from our research. Increasingly, media were omitting the programme name in their coverage, and though there was interest in the stories, its full potential to reach and inspire wider audiences was not realised. To address this, we workshopped a series of new names with our scientists and working groups, ultimately landing on 'Nature Unlocked'. Nature Unlocked forms a simple, memorable title; it inspires curiosity around what we're uncovering, and hints to how nature may hold unknown 'secrets' that will benefit us all. With a refreshed identity, we created a suite of assets to amplify the Nature Unlocked profile – from branded leaflets and posters, to a new webpage and animation. Since then, we've seen a direct positive impact on our search engine optimisation (SEO), increased interest from media, and have inspired our government partners to consider the branding of their own science-based projects.

Channel 5's 'Kew Gardens: A year in bloom' showcased our carbon and wellbeing research in action to viewers nationwide, reaching 6 million. In summer 2022, we launched a press campaign focusing on the role of Wakehurst's American Prairie in drought resilience, including interviews with Nature Unlocked scientists and MSc students. This secured a print and broadcast reach of 104K and 131 million unique views per month on online articles, with features in The Guardian, The Telegraph and inews. We integrated Nature Unlocked into our interpretation and programming with our carbon and pollination strands explained in accessible new signage and audio-visuals. Our science has inspired bespoke art installations and family events as part of the 2023 visitor programmes *Rooted* and *Nature Heroes*.

We regularly feature Nature Unlocked on our digital channels to reach a wider audience. We have sent six Nature Unlocked-focused newsletters to members, engaging readers with our innovative research. To mark the first anniversary of Nature Unlocked we commissioned an animation to illustrate Wakehurst's living laboratory in action, and regularly engage with national awareness days on social media such as World Biodiversity Day, World Bee Day and World Plant Health Week. Features for the Kew website explore each research stream in more detail, incorporating interviews with Kew scientists and up-to-date photography.

Best practice shared

Our relationships have helped to inform best practice across key UK priorities, including agriculture and food production, achieving net zero and nature recovery targets.

The National Farmers Union see Nature Unlocked's research supporting a 'new economic model for the countryside' and the Defra Land Use Committee are keen to incorporate our methodologies and data. Through our local Upper Ouse Farm Cluster Group, we have a stronger awareness of local agriculture issues and the trade-offs between biodiversity and productivity.

As part of Sky and Kew's ongoing corporate partnership, Kew scientists reviewed existing literature and provided expertise on the role of nature in net zero investments for business. The result was 10 guiding principles for investing in nature and biodiversity for net zero. These principles were launched in April 2023, and we hope will guide best practice when investing in nature projects for net zero.

Nature investment standards

Two projects investigated the risks to ecosystem services and biodiversity in the Wakehurst landscape. One focused on the impact of climate change on UK wild native plant species; and another researched species invasiveness risk on the American Prairie.

The species invasiveness study created low-cost methodologies for horticulturists to evaluate planting schemes. We evidenced the benefits of non-native grasslands, providing food for UK pollinators and carbon sequestration while managing the risk of species invasiveness. An MSc project is developing scientific baselines and methodologies to test whether systems-based horticulture improves carbon and biodiversity outcomes compared to traditional methods. This will inform the creation of the Silk Road Steppe, a new, climate-positive landscape at Wakehurst.

Ten Guiding Principles for Investing in Nature

1. Take a holistic approach – consider the whole ecosystem for nature and people
2. Creative multiple positive impacts – avoid negative impacts
3. Plan for the long term
4. Build in climate resilience and adaptation, from day one
5. Conserve and restore, before creating from scratch
6. Design and manage it, with Indigenous Peoples and local communities, in co-ownership
7. Create measurement baselines and invest in technologies for monitoring and reporting on nature
8. Tailor situations to each unique location
9. Secure funding and long-term monitoring, up-front
10. Support collaborative, science and rights-based partnerships through sustainable finance towards nature positive investments

Read more here:
kew.org/read-and-watch/10-guiding-principles

Left: Arial photo of Kyrgyzstan trial beds for the Silk Road Steppe project. **Above:** Wakehurst's Coronation Meadow

Evidencing policy

As an arms-length body in Defra, RBG Kew is a trusted source of evidence on biodiversity to guide government policy. The past year has strengthened relationships with local and national government bodies to scale our research to strategically important policy areas, such as the Defra Land Use Framework the Nature Investment Standards.

Two years into Nature Unlocked, we are achieving notable impact. Politicians (most notably the Committee on Land Use) and officials are seeking evidence on natural capital within the current UK landscape and make expert land use decisions. Kew's trusted status and combined expertise in natural capital science and land management gives us a clear role as an evidence provider.

For example, the protocols and methods developed within our carbon and biodiversity research, specifically those on mycology, have been integrated into the UK's Natural Capital Ecosystem Assessment (NCEA) framework. This is the first time that the role of mycology in carbon sequestration across habitats has been fully recognised in the policy, making it an important milestone in better measurements of carbon in UK landscapes and biodiversity's role in achieving climate change mitigation efforts.

The impact of Nature Unlocked continues to grow through collaboration, providing innovative scientific research to our partners. In March 2023, Defra Green Finance announced a partnership with British Standards Institution (BSI) to deliver a "UK-wide standards' framework that sets out clear principles and robust requirements to drive efficiency, greater clarity and rigour." This project will be backed by scientific research completed in the Nature Unlocked programme.

Through the Shared Outcomes Fund, we work with Natural England to combine the carbon and biodiversity evidence and methods from Wakehurst with data collected by Natural England across six English pilot sites. This can be used in existing frameworks such as the Woodland Carbon Code and evidence best practice in land management for nature-based solutions.

Left: Collecting soil samples as part of high resolution below-ground carbon and fungal research.

The year ahead 2023–2024

May 2023 marks two years since the launch of Nature Unlocked. The next year will build on our current impact, reflecting the challenges required to grow further. We need our research to be applied beyond Wakehurst's boundaries, integrated into Wakehurst's public programmes; aligned purposefully to relevant government policy; with more corporate partners and funded long-term for interdisciplinary research on the value of UK biodiversity.

Quarter	Activities
Q1 (April–June)	• Publication of Kew's 10 Guiding Principles for Investing in Nature, to inform best business practice (April 2023) • Start of Year 4 of the Sky/Kew partnership, supporting mycology and carbon research and trialling digital approaches to nature connectedness • Philosophy research assistant starts at Wakehurst, investigating people's approach to environmental stewardship and nature connection (April–July 2023) • Recruitment of a Nature Unlocked Research Leader as a joint post with the University of Cambridge • Start of MSc project collecting carbon and pollination baselines of the Asian Heath Garden at Wakehurst, exploring how horticultural approaches influence ecosystem services (February–June 2023) • Publication of peer-reviewed paper on UK native seed germination thresholds to climate change • Nature Unlocked: The Landscape Ecology Programme is formally incorporated into Kew Science as a Priority 1 Initiative • The House of Commons Environmental Audit and Science, Innovation & Technology Select Committees visit Wakehurst for a Nature Unlocked showcase
Q2 (July–September)	• Installation of greenhouse gas flux sensors in wet woodland at Wakehurst • Natural England finishes first season's carbon data on the six wider pilot sites as part of Shared Outcomes Fund • Integration of carbon and biodiversity data alongside socio-economic and cultural data into the University of Sussex's landscape modelling tool • Start of summer pollinator research across Wakehurst's treescapes and in London property developments, in collaboration with Mount Anvil and Partners • Development of citizen science plans across workstreams
Q3 (October–December)	• Final analysis of carbon and biodiversity research at Wakehurst and exploring use of landscape modelling tool with local stakeholders/ land managers • Kew scientists attend COP28
Q4 (January–March)	• Completion of Shared Outcomes Fund carbon and biodiversity research programme (March 2024) Publication of reports and academic papers

Acknowledgements

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Tree roots coated by an ectomycorrhizal fungus in a symbiotic relationship.


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kew.org/natureunlocked