

Institution: University of Cumbria (UoC)
Unit of Assessment: UOA14: Geography and Environmental Studies
<p><u>1. Unit context and structure, research and impact strategy</u></p> <p>A: Overview & Context; Building upon REF2014, the University of Cumbria (UoC) has enhanced its research capacity and profile in UoA14: Geography and Environmental Studies. This has been achieved through growth in research-active Category A academic staff (from 6.0 FTE in 2014 to 10.6 FTE in 2020) and a significant rise in research outputs (from 44 in 2008-2013 to 95 in 2014-2020), accompanied by a step-change in the range and value of awarded external research and enterprise funding. Within a rapidly maturing institution, there is an emergent, thriving culture of inter- and transdisciplinary research within the Unit, particularly utilising the unique location of the Ambleside campus in the heart of the English Lake District UNESCO World Heritage Site. The Unit specialises in environmental research grounded in the sciences and social sciences, applied through community level partnerships and real-world stakeholders to understanding key challenges at regional, national and global levels.</p> <p>Institutional reconfigurations in 2017 and 2019 have resulted in research being coordinated through four research centres cutting across the five academic institutes constituting UoC (REF5a, Fig.2.). All Category A staff returned within UoA14 are located within the <i>Institute of Science, Natural Resources and Outdoor Studies</i> (SNROS) and undertake their research through the <i>Centre for National Parks and Protected Areas</i> (CNPPA) launched in 2017 and expanded in scope in 2018-19. Development of the CNPPA has reflected the <i>University of Cumbria Strategic Plan 2017-20</i>, the <i>University of Cumbria Research, Innovation and Enterprise Strategy 2018-2021</i>, the <i>DEFRA 25 Year Environment Plan</i> and the <i>UNESCO World Heritage Site Inscription for the Lake District</i> (2018).</p> <p>Researchers named in bold are Category A staff with ‘significant responsibility for research’ (SRR, see UoC REF2021 Code of Practice, 2.10) and those in bold and <i>italics</i> are individuals who left UoC during the REF assessment period. Individuals in plain are non-submitted UoC staff – including staff with ‘emerging responsibility for research’ (ERR, see UoC REF2021 Code of Practice, 2.12), Research Assistants (RA), Postgraduate Researchers (PGRs) and honorary/retired staff. Names followed by a number (e.g. Convery1) cross reference to REF2 outputs.</p> <p>B: Unit Structure & Development; Research within the Unit contributes to the <i>Centre for National Parks and Protected Areas</i>, a research centre for the transdisciplinary study of national park and protected area management. The CNPPA is led by a Director (Mansfield) and overseen by the Deputy Vice Chancellor and Director of Research through the <i>University Research and Knowledge Exchange Committee</i> (REF5a, Fig.2.). The CNPPA is supported by a 0.2 FTE administrator as well a centralised University bidding team. The CNPPA is managed through an <i>Advisory Board</i> (chaired by the CNPPA Director, and includes Research Theme Leads, Graduate School (PGR) representatives, external Professors of Practice) which has developed the <i>CNPPA Research Strategy</i> and the rolling <i>Annual Operational Plan</i>, reporting to the <i>University Research and Knowledge Exchange Committee</i> each June. Research Theme Leads hold monthly operational meetings with staff associated with each theme.</p> <p>Researchers within the CNPPA are returned in UoA14, UoA17 (Business & Management), UoA23 (Education) and UoA32 (Art & Design) through five research themes. Each theme is co-ordinated by a senior member of staff (<u>underlined</u>), and comprise early-, mid- and senior career staff and PGRs. These research themes are interconnected and function as overlapping constellations of research interest rather than rigid groupings, and many staff are aligned with multiple themes (Figure 1).</p>

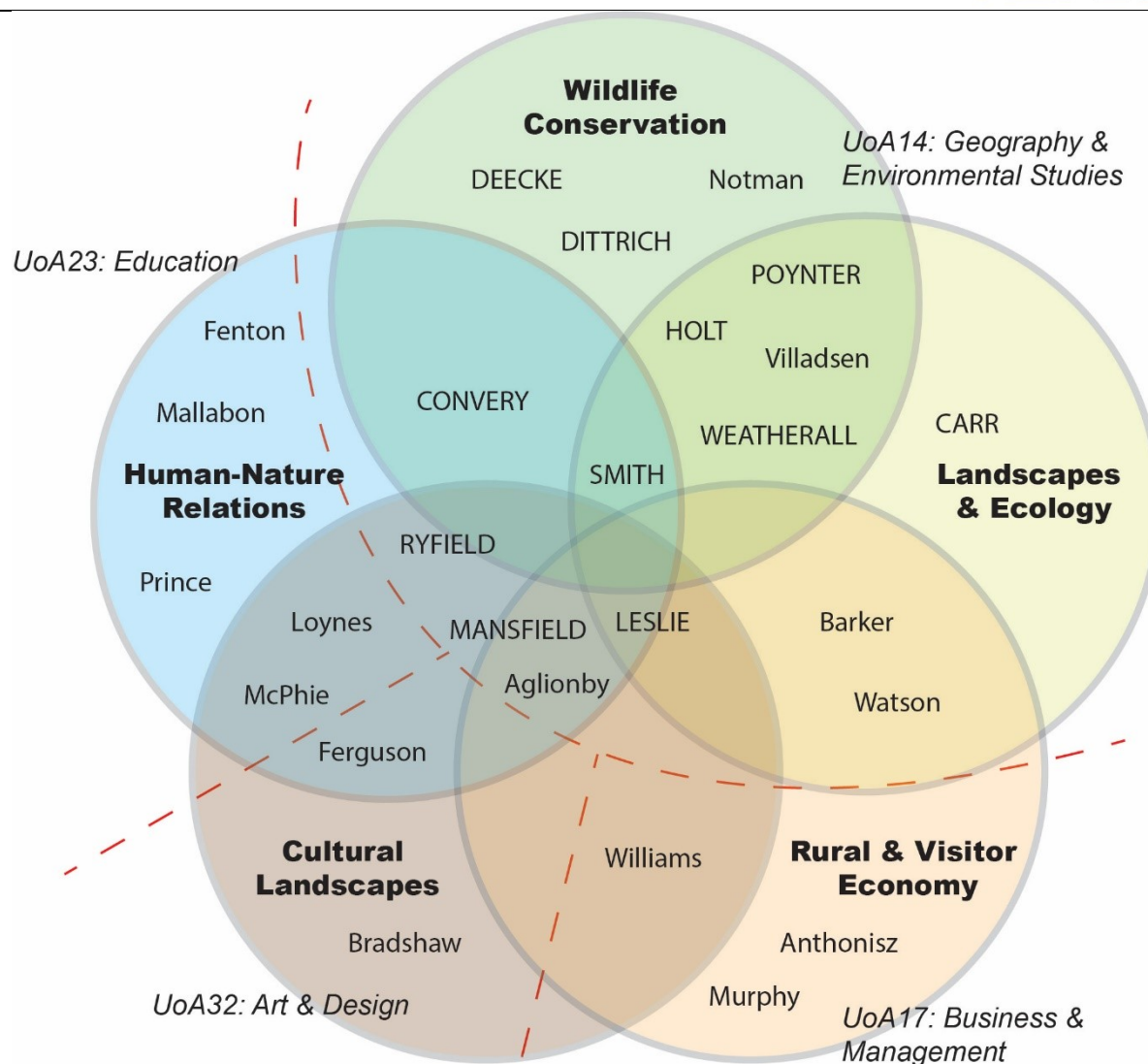


Figure 1: Structure of the CNPPA. Category A staff returned in UoA14 are noted in CAPITALS, those returned in other UoAs or not eligible for REF2021 but who are referred to in this return are recorded in lowercase text. Dashed red lines mark the boundaries between the four UoA's associated with the CNPPA.

- Landscapes & Ecology (UoA14)** – **Weatherall**, Barker, **Carr**, **Holt**, **Leslie**, **Poynter**, **Smith**, Villadsen, Watson. 3 current, 3 completed PhD students;
- Wildlife Conservation (UoA14)** – **Convery**, **Deecke**, **Dittrich**, **Holt**, Notman, **Poynter**, **Smith**, Villadsen, **Weatherall**, 2 PDRAs, 4 current, 3 completed PhD students;
- Human-Nature Relations (split between UoA14 & UoA23)** – **Loynes**, Aglionby, **Convery**, Fenton, **Leslie**, Mallabon, **Mansfield**, McPhie, **Ryfield**, **Smith**, 7 current, 2 completed PhD students (5 within UoA 14)
- Rural & Visitor Economy (UoA17)** – **Anthonisz**, Aglionby, Barker, **Leslie**, **Mansfield**, Murphy, Watson, Williams.
- Cultural Landscapes (UoA32)** – **Bradshaw**, Aglionby, Ferguson, Loynes, **Mansfield**, McPhie, **Ryfield**. 1 current, 1 completed PhD student.

An emphasis on *interdisciplinary* research within the CNPPA means that research returned within this Unit encompasses diverse fields drawn from *both* the Geography and Environmental Studies strands for UoA14. However, the *transdisciplinary* nature of research within the CNPPA bridging to other UoAs is also demonstrated, mixing different epistemologies and ontologies. This enables an inclusive, vibrant, but coherent research culture that sustains what could otherwise become isolated pockets of research expertise within UoC.

C: Research Strategy;

The *Strategic Aim* of the Unit in REF2014 was to *produce research that contributes to solving the problems faced by society globally*. The REF2014 *Strategic Objectives* were to:

- i. Grow research activity within existing research themes;
- ii. Embed stakeholder relationships and research collaborations;
- iii. Strategically target West Cumbria as an area for research development;
- iv. Increase numbers of PhDs, including those funded by external partners;
- v. Deepen internal research connections within the University of Cumbria; and
- vi. Increase the amount of external research funding.

During the period since REF2014, the Unit has been able to meet each of these objectives. Key *Strategic Achievements* in each of these areas include:

- i. Increasing Category A research staff capacity (10.6 FTE) and doubling research outputs (~100 academic texts, monographs and peer-reviewed research papers) demonstrating a significant uplift in research activity at national and international levels; Section 2.A;
- ii. Appointment of two Professors of Practice (Aglionby, Barker) has facilitated and supported the translation of research expertise into stakeholder and end-user impact (Sections 1.D and 4.A/B/D). The (0.4 FTE) secondment of **Mansfield** to lead development of the LDNPA Research Framework, and the appointment of **Convery** to co-chair the IUCN Commission for Ecosystem Management Rewilding Thematic Group demonstrate a long-term commitment to embedding stakeholder relationships and collaborations within research in the CNPPA; Sections 4.A/B;
- iii. The appointment of **Ryfield**, and the *Back On Our Map* project (BooM, section 1.D) demonstrate commitment to expanding existing research engagement with the West Cumbrian coast by the Unit (see **Convery1**; **Ryfield2**); Two PhDs undertaken during 2014-20 were grounded in West Cumbria, and supported by funding from the *Energy Coast Campus* project;
- iv. Approval of Research Degree Awarding Powers (RDAP) in 2019, and growth in number of PhDs awarded (from 4 in REF2014 to 9 for REF2021) and external funding for PhDs (from 3 in REF2014 to 9 for REF2021);
- v. The development of the CNPPA provides a coherent structure and vehicle enabling researchers across UoC to collaborate and develop transdisciplinary research; This has significantly enhanced the organisation and environment for research activity, introducing new, exciting areas of research for this and other UoAs. Sections 1.B/C/D;
- vi. **£1.76M** external income awarded, up from £0.49M reported in REF2014; including 25 research project grants awarded (£0.33M); full- or part-funding for 9 PhD projects (£0.23M); and 7 programmes funded through competitive enterprise awards (£1.2M returned to HESA as HE-BCIs Enterprise or Regeneration Income; Section 3.A).

The outcome is that the Unit's REF2021 return represents considerable development from that described in REF2014 and reflects a vibrant, dynamic research environment and culture. As shown in Figure 1, research returned in UoA14 focuses around three of the research themes of the CNPPA, each representing the strategic evolution and expansion of research groups and research areas returned in REF2014:

- a) **Landscapes & Ecology** explores the interplay between physical and biological systems within the context of environmental and climate change. This theme has evolved from the *National School of Forestry* group returned in REF2014, with significant input of new staff appointments. Processes that form, shape and modify landscapes (Barker, **Carr**, **Smith**) and ecosystems (**Holt**, **Poynter**, **Smith**, Villadsen, Watson, **Weatherall**) are studied to provide the scientific basis for real-world decision making at multiple scales and timelines. Agenda-setting method development and application in 3D imaging (**Carr3,4,5**), environmental modelling (**Smith**) and development of low-cost environmental sensors (**Poynter2**) demonstrate the importance of innovative data-gathering and management within environmental contexts. Understanding the structure and function of landscape systems (**Carr1, 2**) and the fundamental connections between biological and physical processes

(**Weatherall2,3**) inform debates about critical international issues, such as defining how climate-smart forestry can prioritise sustainable forest management that enables trees, woods and forests to adapt to and mitigate climate change (**Weatherall4**). Research funding includes NERC, EU Cooperation in Science and Technology (CoST), Royal Forestry Society, DEFRA, European Regional Development Fund (Section 3.A). Future research will focus on the importance of biophysical processes and feedbacks in conditioning environmental resilience in multiple landscapes and ecosystems; and exploring landscape function through ecological, societal and economic perspectives, including those associated with ecological restoration or rewilding within an Anthropocenic framework.

- b) **Wildlife Conservation** researchers adopt a transdisciplinary action-orientated approach, drawing upon the natural and social sciences to conduct research with the aim of protecting species (**Convery, Deecke, Dittrich, Holt, Notman**), their habitats and ecosystems (**Convery, Holt, Smith, Weatherall**) from biodiversity loss. The Wildlife Conservation theme represents the continued development of the *Centre for Wildlife Conservation* returned in REF2014. Alongside climate change, the loss of biodiversity represents one of the greatest challenges facing humanity in the 21st century. Exploring the characteristics and biogeography of native and invasive woodland animal species including squirrels (**Holt1,2**) and bats (**Weatherall1**) within the UK, other globally threatened species such as geckos (**Dittrich1, Smith2**) and snow-leopards (**Convery, Deecke, Holt3**), researchers within this theme explore how species respond to changes to their environment. Investigating the physical and behavioural characteristics of marine (**Deecke1,2,3**) and freshwater (**Poynter1, Notman**) species and their vulnerability to environmental toxicity or changes in population dynamics informs ongoing debates about species protection and conservation. Within a broader societal context, researchers are involved in projects ranging from engagement with nature and natural capital (**Convery1, Smith1**) to species reintroductions and rewilding (**Smith, Convery2,3**). Research support includes the Heritage Lottery Fund, EU European Regional Development Fund, British Council (Section 3.A). Future research will focus upon habitat restoration and species reintroductions associated with the BooM project centred on south and west Cumbria (Sections 1.D, 4.B), and to include increased engagement with partners through development of the Natural Capital Laboratory.
- c) **Human - Nature Relations** examines the nexus relationships between people/wildlife (**Convery, Mansfield**; see *Wildlife Conservation* theme); communities/habitats (Aglionby, **Convery, Fenton, Mansfield, Smith**); and institutions-societies/land-seascapes (**Leslie, Loynes, Mallabon, McPhie, Ryfield**), within the frame of emerging concepts of post-humanist relationships, climate change and biodiversity loss. Aspects of this theme have emerged from both the *National School of Forestry* and *Centre for Wildlife Conservation* groups returned in REF2014, reflecting growing expertise within the Unit and CNPPA. The research approach is transdisciplinary, and fields of application include business, recreation, education, civil society, conservation, activism, politics and planning. Studies of the engagement between people and wildlife and the places they co-habit includes reintroductions (**Convery2, Mansfield**), place-based approaches to human and habitat wellbeing (McPhie, Fenton, Loynes, Mallabon), the role of trees and woodland in cultural landscapes and as providers of economic and cultural ecosystem services (**Leslie1, Ryfield2**). Research is also examining the characteristics and ecologies of emerging rural land-based economies (Aglionby, **Mansfield1, Ryfield1**), including the role of protected areas in supporting resilient and sustainable economies and ecosystems. Further work concerns the equitable participation of all voices, human and non-human in socio-political decision-making concerning landscapes and communities (**Mansfield1, Smith1, Convery1**) and the practices of radical place-based pedagogies (Fenton, Loynes). Research is supported by the ESRC, European Climate Change Programme, Forestry Commission Scotland, Royal Society of Arts (Section 3.A). Future research will focus upon nature-based economies; the restoration of nature and communities; and studies of human engagement with and construction of places in education, civil society, economy and recreation with an emphasis on transformative and radical interventions.

Two additional research themes within the CNPPA represent coalescing areas of research that examine the economic (**Rural & Visitor Economy**) and cultural/literary (**Cultural Landscapes**) dimensions of use and interactions within protected areas. These themes cross-over with research undertaken within the Unit (Figure 1), but their disciplinary cores are currently beyond the scope of UoA14. However, both themes are a focus of future development of the CNPPA through the exploration of nature-culture entanglement faced by many protected areas, representations of landscape and environment, and the complexities of multifunctional land use, common property resource management and the resultant cognitive conflicts of multiple stakeholders.

The Unit's overarching *Strategic Aim* from 2019 within the broader framework of the CNPPA is to *develop and sustain world-class academic research with a global reach, the purpose of which is to inform and influence policy-making, develop best practice, governance and innovation of resource use*. Our vision is for the CNPPA to become a national and international centre of excellence for the transdisciplinary study of national park and protected area management – developing sustainable solutions to complex global problems. The environmental research undertaken by the Unit sits at the core of this future vision.

The current *Strategic Objectives* are to:

- SOi. Enable staff development through clear governance and support to provide the opportunity for research engagement for emerging and early career researchers;
- SOii. increase numbers of research-active staff recognised through authorship of peer-reviewed research outputs and contribution to research impact, enhanced through the establishment of outstanding, innovative and successful collaborative partnerships;
- SOiii. Develop recruitment at graduate (MRes and PGR) level through enhanced reputation and academic standing, partnerships with employers and external stakeholders;
- SOiv. Continue to grow income through externally-funded research and enterprise projects;

These objectives are embedded within the rolling *CNPPA Annual Operating Plan*.

D: Impact Strategy;

Context: Impact is both integral and core to research activity within UoA14; ensuring that our research has significance beyond academia, with a reach extending from local to international scales. This reflects the University of Cumbria *Strategic Plan (2017-20)*, which focuses on *people, place and partnerships*, encapsulating the role of the University as a catalyst for regional development (REF5a, 2.4). The location of the CNPPA in Ambleside offers a unique opportunity to contextualise the rationale for protected landscape designations, and to examine their intended outcomes, governance and conflict, benefits and environmental accounting. This enables us to work in partnership with the DEFRA family, the Lake District National Park Authority and other national parks, AONBs, landowners, businesses, schools and communities.

Approach: Research impact is the primary focus of the UoC *Research, Innovation and Enterprise Strategy 2018-21*. This represents an emphasis on policy- and practice-based research activity grounded in the real world, with particular themes of *rural and visitor economy, culture and environment* relevant to the work of UoA14. Throughout the Unit, high levels of user engagement (Section 4.B) in our research practice has generated impact extending beyond the academy in three ways:

- a) *Collaborative frameworks for research* provide opportunities to identify and work with research users to shape and embed research with the communities, organisations and environments that ground our inquiry. We regard our research partners as the experts in their fields, and collaborative research is designed to enhance their capacity to use our research effectively. Research funding has been secured from public, private and voluntary sector organisations whose operational needs and interests coincide with those of the Unit (Section 3.A). Within this research cycle, we have worked with *international bodies* including the International Union for Conservation of Nature and the Canadian Government (Impact1402, Impact 1401) whilst within the UK, our research users and partners have comprised *national governmental bodies* including the Environment Agency, DEFRA, National Trust, Natural England, *regional and*

local organisations, including Carlisle City Council, the Lake District National Park Authority and nature conservation bodies including the Freshwater Biological Association. Other collaborators in our research comprise *voluntary and community organisations* including Cumbria Wildlife Trust, Friends of the Lake District, and *private companies and industry associations* including AECOM, the Cumbria Local Enterprise Partnership, Maelor Forest Nurseries. This includes effective use of KTP-agreements and partnerships through schemes such as the ERDF, supported by a central bidding and partnerships team to facilitate clear agreement of expectations and anticipated outcomes to the benefit of both the researcher and the end-user.

- b) *Applying research in practice* enables members of the Unit to contribute their research expertise to membership of advisory committees, working groups and other public bodies (Section 4.C). Given the location of the Unit, there is considerable engagement through the Lake District National Park Authority (LDNPA), and as a partner within the UNESCO World Heritage Site designation. **Mansfield** was a member of the Technical Advisory Group of the English Lake District World Heritage Site nomination. **Carr, Mansfield, Smith, Weatherall** participated in working groups preparing the LDNPA State of the Park Report 2018, working alongside other members of the National Parks Partnership to report the condition of the National Park to DEFRA, and to inform the 5-year review of the LDNPA Management Plan. **Mansfield** has subsequently led the research framework development for the LDNPA, utilising her long-term expertise in upland resource management, demonstrated by **Mansfield1**. Other contributions include **Carr's** membership of the Fforest Fawr Geopark Management Group (2006-2015) and Strategic Steering Group (2011-2015), and **Convery's** role as trustee of the Lifescapes Project Charity (2019-) and co-chair of the IUCN Rewilding Task Force (2017-).
- c) *Reaching and engaging with diverse communities and publics* is fundamental to the Unit's research, with many of our projects closely-tied to authentic engagement, outreach and end-users. Examples of our engagement beyond the academy are given in Section 4.D. Our approach of embedding engagement through our research to generate impact is exemplified by **Convery's** BooM project (Impact1401), which applies world-leading conservation research to a community-based species reintroduction and habitat restoration project in South and West Cumbria, generating *impact on the environment*, but also working with Morecambe Bay Partnership, local landowners, community growers, local Young Farmers and prisoners from HMP Haverigg to generate wider *impacts on social welfare, culture, and ethical practice*.

Two examples of research *impact on the environment* at both national and international levels comprise the submitted impact case studies (REF3) and represent the impact of research in influencing *policy-making and implementation*. **Convery's** work (Impact1401) explores the community contexts for rewilding and species reintroductions in the UK. The research identifies a lack of sufficient public engagement in the planning process for rewilding and has informed UK Government decision-making and international policy development of standards in rewilding programmes; and has developed best-practice frameworks for the implementation of rewilding schemes for both wildlife and communities. **Deecke's** (Impact1402) research identifies the impacts of underwater noise from shipping and anthropogenic sources on communication, cognition and feeding behaviour of marine mammals, and the resulting impact on their population dynamics. These findings have directly influenced policy interventions on commercial shipping management in Canada and the USA, has informed the designation of marine protected areas and killer whale management and conservation in Iceland and the UK, and increased public awareness of Killer Whales and their habitats.

The *Strategic Impact Aim* of the CNPPA for the next research cycle is on *world-class academic excellence with a global reach, the purpose of which is to inform and influence policy-making, develop best practice, governance and innovation of resource use and to promote knowledge transfer within national parks and protected areas through high quality translational skills*. Although this mission has only been recently formalised, it draws upon a long history within the University and UoA14 of pursuing research closely linked to the needs of end-users and stakeholders, as identified in REF2014.

The *CNPPA Research Strategy* and rolling *Annual Operating Plan* defines four *Research Impact Objectives* for the coming research cycle:

- IOi. Undertake applied research to inform and enable better management of National Parks and Protected Areas;
- IOii. Establish the Centre as a hub for national and international debate to raise the profile of Cumbria, to inform and develop strategy and attract funding relevant to the region;
- IOiii. Produce high quality graduates with the skills required to progress into local and regional employment;
- IOiv. Upskill the current workforce in Cumbria, supporting diversification, innovation and continuation of businesses enabling a sustainable future for the region.

We are currently developing space within the nexus of the five CNPPA research themes through the launch of the *PLACE Collective* in 2021, utilising artistic and creative approaches to research and relationship-building within a shared landscape to add a new dimension to our impact strategy.

E: Open Access and Ethical, Legal and Professional Frameworks;

With our emphasis on collaborative and applied research with partners within and beyond UKHE, the University and the Unit is committed to supporting an open and inclusive research environment. An institutional *Open Access Policy for Research and Scholarly Outputs* was approved and implemented in 2015, requiring that all academic staff deposit their work using the *Insight* repository (<http://insight.cumbria.ac.uk>) to enable a 'green' open access approach (see REF5a 4.3). 65% of the REF2 outputs submitted by UoA14 are 'gold' open access. Beyond meeting REF open access policy requirements, members of the Unit extensively use *Insight* to share data, technical reports and other research materials. All members of UoA14 have an ORCID ID and maintain active profiles through ResearchGate and LinkedIn to highlight research activities and maintain professional networks in a highly-visible public domain.

2. People

A: Staffing Strategy and Staff Development;

Whilst *Research Strategy* and *Research Objectives* are led by and monitored through the CNPPA (Section 1.B), contractual responsibility for *Staffing, Staffing Strategy* and *Staff Development* within UoA14 rests within the *Institute of Science, Natural Resources and Outdoor Studies (SNROS)*. Category A researchers within SNROS constitute ~28% of total staff FTE returned in the UoC submission for REF2021 (also returned in UoA3, UoA23), demonstrating a critical mass of researchers not immediately evident from the numbers of returned staff just within UoA14 (Figure 1). Between REF2014 and REF2021 the Unit has maintained continuity of core staffing, complemented by new and replacement academic appointments in-line with the strategy outlined in REF2014, and development of early-career and previously non-active researchers. During the period 2014-2020, there has been a *net* increase in Category A permanent staff for the Unit of 2.0 FTE, and replacement of departing staff (Kouloumpsis to Manchester, Sinclair to Islay Community Trust, van der Velden to Permaculture Association) and retirees (Armstrong).

In line with *Strategic Objective* (i) in REF2014, the Unit has grown in both research capacity and research activity. The appointment of five academic posts since REF2014 has strengthened each of the three research themes across UoA14, but also enables tangible connections to be drawn between themes: **Carr** (QMUL) SL: *Landscapes & Ecology*; **Dittrich** (Anglia Ruskin) SL: *Wildlife Conservation*; **Poynter** (Natural England) L: *Landscapes & Ecology and Wildlife Conservation*; **Ryfield** (PDRA, University College Dublin), L: *Human – Nature Relationships, Cultural Landscapes*; **Smith** (PhD, Cumbria), L: *cross-theme* appointment. The appointment of **Smith** exemplifies a wider long-term staff development strategy within UoC, including the permanent appointment of **Holt** (*née Stevenson* returned as an ECR in REF2014), and **Leslie** and **Mansfield** achieving research-active Category A status for REF2021. This growth in research capacity is projected to continue through the development of Notman, Villadsen and Watson towards REF submission eligibility. The confirmation of Research Degree Awarding Powers (RDAP) in 2019 further enables the Unit to develop and train new researchers.

Research activity is supported by 5.8 FTE technicians and 1.78 FTE outdoor demonstrators. The appointment of 0.2 and 0.1 FTE Professors of Practice (Aglionby, Barker) in 2019 has enhanced the capacity to translate research findings into policy and professional practice. Visiting and Honorary staff (Bell, Entwistle, Nevin, van Maanen) also support Unit research culture, offering distinctive areas of research expertise, engagement and practice to complement core staff.

All staff undertake annual *Performance and Professional Development Review* (PPDR) and *Research and Scholarly Activity* (RASA) planning to monitor and set research objectives with their individual line managers and the Institute Director. A transparent approach to booking RASA enables staff to book protected research time in a similar way to that for annual leave. Teaching, research and administrative workloads are agreed annually through the PPDR and RASA process between the Institute Director, line managers and individual staff. Funded *Sabbatical Leave* periods of 6-10 weeks are available to all academic staff with more than 3 years employment. The Research Office administers an *Internal Research Fund* (23 awards, totalling £22.5k to the Unit) for researchers, primarily as seed-funding and for research dissemination, a one-off *Global Challenges Fund* (1 award, £30k to the Unit), and a separate *Early Career Researcher Fund* (3 awards, totalling £15k to the Unit) to support ECRs. All staff are given the opportunity to join the *University Research Mentor Scheme*, with experienced, research-active staff providing guidance and support for the development of emerging researchers.

UoC operates a biannual promotion application round (see REF5a, 3.1) to encourage academic career progression. Staff development during the assessment period is evidenced by the promotion of staff since REF2014 in recognition of their changing status as researchers (**Convery** Reader to Prof.; **Deecke** Senior Lecturer to Assoc. Prof.; **Mansfield** Principal Lecturer to Prof.).

The vision for future researcher development within SNROS delivered through the CNPPA is centred around developing an escalator from UG to PGT and PGR, and particularly to grow the proportion of eligible Category A staff with significant research responsibility (SOi). An initial **consolidation phase** (2020-2023) aims to develop current staff (Notman, Villadsen, Watson) towards *Significant Responsibility for Research* (SOii), whilst enhancing infrastructural support to enable increased research grant bidding activity within the CNPPA. This represents an opportunity to further expand research capacity and vitality without impacting financial sustainability of the Unit. This will be followed by an **expansion phase** (~2024 onwards) during which the CNPPA will look to attract additional research-active staff to extend research expertise and capacity (SOi).

B: Research Students;

Since REF2014, the Unit has expanded the PGR cohort within wider development of the CNPPA. 9 PhD students have completed since 2014, with a further 12 PhD students ongoing (6 FT, 6 PT), and 1 new funded PhD studentship in Autumn 2020. This represents a near-doubling of the PGR cohort compared with REF2014 (REF4a). Funding sources for current and completed PhD students include NERC (UKERC awards), Cumbria Wildlife Trust, Forestry Commission/Forest Research, EU (European Regional Development Fund), Brazilian Science Without Frontiers Programme, Sellafield Bursary scheme, and UoC-funded Graduate School studentships. The granting of *Research Degree Awarding Powers* in 2019 mark a step-change in the capacity and capability of the Unit to attract and develop talented research students. Recent validation of a *Masters by Research* programme (REF5a, 2.2) with an emphasis on projects working with external stakeholders will facilitate growth in research capacity within the Unit, and offer a research training and development escalator stretching from undergraduate through to PhD level.

The recruitment, induction and training needs of PGRs are centrally coordinated through the *Graduate School Office* (REF5a, 3.2). In-house theme-specific research training is provided to extend institutional training programmes, particularly for laboratory and field techniques, and will become more formally embedded in researcher development through the new MRes programme. PGRs supported by UoC-funded studentships receive a *research training and support* grant (£500 pa.) for costs associated with their research. All PGRs have dedicated desk/computing space in recently refurbished offices (Section 3.A) and have full access to CNPPA research facilities.

The PGR community is fundamental to the evolution of the CNPPA and the Unit's research culture (SOi; IOiii), as evidenced by the ongoing development of **Holt** (néé Stevenson; PhD 2012) and **Smith** (PhD 2015) from being UoC PGRs to Category A researchers. PGRs are integrated into all research themes of the CNPPA and are represented on the *CNPPA Advisory Board*, the *University Research and Knowledge Exchange Committee* and the *University REF Steering Group*. The excellence of research undertaken by PGRs within the Unit is evident in the publication of 5 external professional and technical reports, authorship of 15 peer-reviewed research papers (including 1st author publications in *PLoS ONE*, *Hydrobiologia*, *Molecular Ecology*, *Conservation Genetics Research*, *Sustainability*) and 2 book chapters. Our PGR graduates since REF2014 have moved on to academic posts (UoC, University of Calgary) or industry/research posts (Duke University, Forestry England, Wordsworth Trust, Freshwater Biological Association).

C: Equality, Diversity & Inclusion (EDI);

UoC has a centralised *EDI Policy* and *EDI Steering Group* that actively works to ensure that the institutional culture is inclusive, prioritises staff and student wellbeing, and invests in people (see REF5a, 3.3). EDI policies are followed in all appointment and promotion processes within the Institution, and Unit staff are supported by centralised policies regarding research and scholarly leave, requests to work flexibly, reduce working hours, or adjust hours to suit changing personal circumstances.

Within the CNPPA, there is an approximately 50:50 gender balance of researchers (12 male, 13 female, including Professors of Practice and staff returned to other UoAs noted in Figure 1). However, within UoA14 gender balance is skewed towards more male Category A staff (Table 1), although both Professors of Practice (Aglionby, Barker) are female. The proportion of submitted outputs in REF2 closely mirrors both the gender and age structure within UoA14. In the coming research cycle, a strategic focus to support two female staff (Notman, Villadsen) towards eligibility for REF2028/29 (Section 2.A) will increase unit representation of women. The Unit demonstrates a broad age demographic, with a balance between Category A staff aged below and above a post-doctoral mid-career threshold of 50 years respectively, and all are employed on permanent academic contracts, offering long-term stability for individuals and the Unit.

Table 1: Age and gender balance of Category A staff, REF2 outputs, PGRs within UoA14.

	% male	% female	Age <50	Age >50
Category A Staff (n = 10.6)	78%	22%	49%	51%
REF 2 outputs (n = 27)	77%	23%	48%	52%
Current UoA PGRs (n = 12)	42%	58%	75%	25%
UoA PGRs (2014-20 n = 18)	39%	61%	78%	22%

There has been progression towards greater gender equality since REF2014, with an increase in female researchers, including those at senior levels within the Unit. With regard to other protected characteristics (Table 2), the Unit is broadly in-line with the University, but the size of the Unit means that individual categories are easily skewed above or below sector norms. In terms of ethnic diversity, BAME individuals in Cumbria comprise ~1.5% of the population and our Unit reflects this low ethnic diversity. All staff have undertaken face-to-face training on EDI issues, including unconscious bias, and the introduction of positive action statements to encourage the recruitment of researchers identifying with protected status characteristics marks a commitment to promote greater inclusivity with future recruitment of PGRs and academic staff (SOi).

Within our PGR community, there is a majority of female researchers since REF2014, with a closer gender balance of currently registered PGRs. The average age of the current PGR cohort is 40, and the average age of PhD graduates 2014-2020 is 37, representing a diversity of PGRs, including those starting research degrees immediately after graduation to those returning to research after working other employment. This diversity enriches the culture of the Unit and indicates that the Unit is open and inclusive to all those seeking to conduct research.

Table 2: EDI protected characteristics within UoA14

	BAME	Part-Time/Flexible working	Identify as LGBTQ	Declared disability	REF2 Outputs from Cat A staff with EDI protected status
Category A Staff (<i>n</i> = 10.6)	0%	9%	9%	0%	22%
UoA PGRs (2014-20 <i>n</i> = 18)	8%	50%	25%	8%	-

Commitment to achieving *Athena Swan Bronze* is an institutional priority (REF5a, 3.3) and Lemmey is Athena Swan Lead for SNROS. All Unit staff utilise PPDRs to request staff development or to discuss wellbeing issues. Flexible working arrangements are available for all staff and PGRs, and parental leave has been taken up by **Holt**, **Poynter** and **Ryfield** during this research cycle. PGRs are encouraged to seek work-life balance, with a number switching between full-time and part-time status to accommodate changing circumstances.

3. Income, infrastructure and facilities

A: Research Income & Expenditure;

The Unit has received **£0.56M** direct external research income and funding for PhD projects since 2014 (REF4b). Although the amount of HESA-returned research income is modest, this represents growth since 2014, and funding success across diverse funding organisations, including UKRI, international and UK statutory bodies and research funders, charitable and private sector support (Table 3). The final category includes successful development of knowledge transfer partnerships in each theme (KTP = £164k) to increase collaborative research activities identified in REF2014 as a strategic growth area.

Table 3: Distribution of direct research income across the research themes submitted to UoA14

	Landscapes & Ecology	Wildlife Conservation	Human-Nature Relations
UKRI	NERC (3 awards)	-	ESRC (1 award)
International & UK Statutory Bodies	EU-COST Action, ERDF, Forestry Commission (KTP), DEFRA	IUCN, ERDF, Forestry Commission.	DEFRA, ERDF, ECCP
Charitable & Private Sector	Lake District National Park Authority (KTP), Royal Forestry Society	SMRU Ltd., HLF, Snow Leopard Network, Tarmac, Derbyshire Environment. Fisheries & Oceans Canada	Nurture Lakeland (KTP), Maelor, Royal Society of Arts, United Utilities, Friends of the Lake District, CONE
PhD Funding & Support	ECCP, Forestry Commission	British Council, Freshwater Biological Association (KTP), Knight Inlet Lodge, Science Without Borders	Energy Coast Campus Project.
TOTAL	£133k	£247k	£180k

Direct research income is distributed across all three Unit themes and has supported PGR and ECR activities, including **Holt** and **Smith**. Awards during this research cycle have contributed to 10 of the REF2 submitted outputs (**Carr5**; **Convery2,3**; **Deecke2,3**; **Holt1,2,3**; **Smith1**; **Weatherall2,3,4**) of which 5 also represent support for PGRs or ECRs. Further outputs are being generated from current research associated with these awards, and represents excellent value for money and a highly efficient return on direct research funding to the Unit. £68.2k of internal (QR) funding has provided seed-funding for proposal development and proof of concept research (Section 2.A).

The focus of UoC on research engagement with business, public and third-sector stakeholders and end-users regionally to nationally (REF5a, 1) means that the Unit has generated additional external funding (returned to HESA through HE-BCIs as Enterprise or Regeneration income), with a total value of **£1.2M** since 2014. This has enabled growth in the scope and significance of research impact (Section 1.D) representing significant engagement with research users and long-term commitment to supporting regional development through application of research expertise of the Unit (Section 4.B).

Growth in Category A staff (Section 2.A), and maturing structure and governance of research within the CNPPA (Section 1.A) means our ambition is to grow research income through the next REF cycle (SOiv, Section 1.C). Our continuing strategy will be to access a broad range of direct research funding, particularly through increased regional and national partnerships, combined with enterprise and regeneration funding to support regional development (IOi).

B: Infrastructure & Facilities;

Since 2014, UoC has invested ~£14M on facilities and infrastructure to support research within the Unit (REF5a, 4.3). Capital investment updating and expanding the Ambleside campus (~£10.5M since 2014) has included infrastructural investment in a suite of new laboratories, library facilities, dedicated PGR offices (£5.8M), as well as providing student working spaces and residential accommodation (£4.7M). The Ambleside laboratory suite offers comprehensive facilities for physical, chemical and biological analysis of environmental samples, and extensive optical microscopy capability, including the globally unique Centre for Micromorphology archive of sediment thin sections. Enhanced by a purpose-built STEM laboratory suite (Carlisle: £3.5M infrastructure, £200k equipment) opened in 2015, the laboratories provide specialist facilities in atomic absorption spectrophotometry, spectrometry and chromatography for gas and water analysis. These facilities support activity within both **Landscapes & Ecology** and **Wildlife Conservation** themes, and laboratory-based research activity is supported by 3.6 FTE of dedicated technical staff (Section 2.A). An archive suite opened in 2019 provides new space for our collection of historic mapping of the UK and documents supporting activities within the **Human-Nature Relations** theme.

The Unit draws upon a large field equipment pool within SNROS, supported by 2.2 FTE of field technical support (Section 2.A) and ~£0.24M investment in equipment since 2014. This enables environmental monitoring and sampling, with field analytical equipment for studying water, soils, sediment, vegetation and animals, but also comprises an extensive portfolio of expedition, climbing, caving and water-based equipment and boats, kayaks and canoes for working in freshwater, coastal and marine environments. Support is provided by 1.78 FTE of specialist outdoor demonstrators. The Unit is a research partner in the *Natural Capital Laboratory*, led by AECOM (Section 4.A), providing access to a ~100ha field laboratory to identify, quantify and value the impacts of rewilding and ecological restoration. This field laboratory will provide future infrastructural support for research and collaborations between the **Landscape & Ecology** and **Wildlife Conservation** themes in the coming research cycle (SOii, SOiii).

4. Collaboration and contribution to the research base, economy and society

The vision of the University is to *be recognised as a catalyst for individual and regional prosperity and pride with national and international relevance, reach and impact* (see REF5a, 1). Within this context, the *Impact Objectives* for the CNPPA (Section 1.D) are central to growing our engagement, collaborations and partnerships within and beyond the academy.

A: Research Collaborations, Networks and Partnerships;

We view research collaboration as the engine room for developing new, exciting and impactful knowledge: as a small Unit within a teaching-focused university, collaborations enable members of our three themes to engage across the sector in a manner that maximises our impact and celebrates our research vitality, whilst maintaining a sustainable research culture. Our collaborations operate at four levels:

- a) *Collaborative research amongst colleagues* within the Unit is evident in REF2, where ~20% of submitted outputs (**Convery1,2, Holt3, Mansfield1, Smith1**) have been facilitated either by joint investigator collaboration and/or joint PGR supervision through the evolving research theme structure of the CNPPA. This also reflects support and mentoring in the development of ECRs and the transition from PGR to Category A researchers (**Holt, Smith**). Appointment of new Category A staff since REF2014 has opened up further internal collaborative research opportunities which will mature through the next research cycle (SOiii, Section 1.C), along with opportunity to facilitate career development of less-experienced colleagues (SOi; SOii; Section 2.A).
- b) *Transdisciplinary collaborative research* within UoC is fundamental to the CNPPA and has enabled the expansion of research capacity, drawing together pockets of research excellence submitted in other Units (UoA17, UoA23, UoA32) into a coherent research framework (SOi; IOi; IOii; Section 1.B; REF5a, 1). This has led to growth of PGRs co-supervised through the **Human-Nature Relations** theme by staff returned in UoA14 (**Convery, Ryfield, Smith**) with colleagues within other UoAs (UoA17: Murphy; UoA23: Loynes, Prince).
- c) *UK cross-institutional research partnerships and projects* enable our researchers to add value to larger collaborative research teams and have increased since REF2014. *Regional partnerships* have been established through the ERDF between the University and Lancaster University (CUSP), and with Lancaster University and UCLan (Eco-I Cumbria). UKRI Grant awards with a total value of £1.15M include members of the unit as Co-Investigators in *national projects*, including **Carr** (NERC Flocs £558k with QMUL, HR Wallingford; NERC Resist UK £582k with Cambridge, QMUL, BGS, Trinity Dublin), **Convery** (ESRC Productivity, People & Place £7k with Lancaster). Developing this approach to involve more members of the Unit through the next research cycle is key towards meeting SOi and SOiv. In addition, members of the Unit collaborate as external PGR or PDRA supervisors including **Carr** (QMUL, 1 PGR; 2 PDRA), **Deecke** (Iceland, 1 PGR), **Mansfield** (Bangor, 1 PGR), **Weatherall** (Bristol, 1 PGR; Edinburgh, 1 PGR).
- d) *International and interdisciplinary networks and collaborations* have grown since REF2014, demonstrating growth in scope and reach of research within the Unit in response to feedback received in REF2014. **Carr**: Co-I, *Combining worms and vegetation to enhance tailings dewatering* (C\$240k/£145k, Institute of Oil Sands Innovation, with QMUL, Deltares, Netherlands, Northern Alberta Institute for Technology); **Convery, Deecke, Holt**: PI/Co-Is, *Fuzzy Logic modelling of Snow Leopard populations in response to threats from climate change* (£45k, Snow Leopard Network, with Central Queensland University, Kazakh National University, Almaty State Nature Reserve); **Deecke**: *Research on Killer Whales* (£7k, SMRU Ltd., with Fisheries & Oceans Canada, University of British Columbia, Icelandic Institute of Marine & Freshwater Research, University of Iceland, NOAA, Scripps Institute of Oceanography); **Weatherall**, Working Group Leader, *EU COST Action CA15226 Climate Smart Forestry in Mountain Regions* with partners from 28 participating countries.

B: Relationships with Research Users, Beneficiaries & Audiences;

Our research aims to inform policy-making, best practice, governance and innovation of resource use in protected areas. Consequently, research opportunities and funding emerge from developing relationships with stakeholders and end-users outside academia across our three research themes.

Within **Landscapes & Ecology**, access to ERDF funding (£730k to UoA14) has enabled **Carr, Leslie** and **Smith** to work directly with 15 Cumbrian SMEs to quantify and reduce the carbon footprints of commercial and industrial activities. Through **Wildlife Conservation**, National Lottery Heritage Funding (£0.4M, with a further £0.88M from 2021), has supported BooM led by **Convery** and **Deecke** to work with the *Morecambe Bay Partnership* (Impact1401; Section 1.D). **Dittrich**'s expertise in terrestrial invertebrate ecology has informed *Carlisle City Council*'s regeneration plan for a former golf course as new urban greenspace. **Weatherall1** has been highlighted in both EU policy (*Science for Environment Policy News Alert 548, September 2020*) and UK practitioner outlets (*Bat Conservation Trust Magazine, August 2020*) as valuable research extending beyond the academy. Finally, **Mansfield** exemplifies our depth of user engagement within **Human-Nature Relations**, with academic research (**Mansfield1**) underpinning community and business-focused projects. These include involvement in the *Windermere Reflections Landscape Partnership* project (£53k), slope stabilisation using novel methods with *Friends of the Lake District* and *United Utilities* through to supporting the *Cumbria Fells & Dales Local Area Group* in a LEADER knowledge exchange project on land management.

Since 2014, Unit staff have written 25 open-access (via *Insight*) technical and advisory reports for end-users, 19 contributions to books guiding professional practice, and authorship or editorship of 6 books.

C: Wider Contributions to Economy and Society;

Unit research impact extends beyond influencing policy-making and planning, into implementation and professional practice, particularly demonstrating *impacts upon commerce and the economy*. For example, **Leslie**'s research into the viability of *Eucalyptus* as a production crop in the UK engaging with *Maelor Forest Nurseries, Tilhill, Forestry England* and *Forestry Scotland* has resulted in commercial forest managers trialling species of *Eucalyptus* as fuel for biomass energy production. A Royal Society of Arts, Manufactures and Commerce-funded gap analysis within their *2018-19 Food, Farming and Countryside Commission* by **Mansfield** explores Brexit implications on the sustainability and resilience of upland agriculture, the recommendations of which have been adopted by the *Cumbria Local Enterprise Partnership*. Community-level *impacts on social welfare* are demonstrated through the application of innovative cognitive mapping developed by **Smith** enabling *Staveley & Ings Parish Council* to incorporate valuing of natural and community assets in the development of their 2020-25 Parish Plan.

D: Engagement with Communities and Publics;

Beyond working directly with research users, Unit staff reach out to wider publics to offer impacts on understanding, learning and perception. Research without engagement loses relevance outside the academy, and across the spectrum of our research projects (e.g. BooM (**Convery, Deecke**); NERC Resist (**Carr**)) there is a deep commitment to public engagement. The first NERC Resist film won best video category in the 2019 *Earth Photo* competition (<https://www.earthphoto.world/2019prizewinners>), praised for its communication of complex scientific processes that contextualise and humanise geography, and **Ryfield**'s research on heritage and environmental debates featured in ITV's *Best Walks With A View* (2015). Communicating aspects of our research through documentary films such as Terry Abraham's *Helvellyn: Life of a Mountain* (**Carr, Mansfield**), also broadcast by the BBC in early 2021, and frequent engagement through local to national press, radio and TV news outlets, and through online popular science podcasts (e.g. **Weatherall: The Naked Scientists**) showcases our research to the widest of audiences.

Within the CNPPA, the Unit engages directly with rural communities in protected areas through hosting events and conferences drawing together researchers, policy-makers, land-owners and community representatives, including those from excluded communities, for example through the *Landscapes for Everyone* virtual conference (2020) led by Aglionby, **Mansfield** to explore the implementation and impact of the 25-year DEFRA *Landscapes Review*.

More immediate engagement of our research with communities and publics includes the participation of **Convery** and **Weatherall** in the annual *TimberFest* held annually in the National Forest, where the often-contested nature of the Unit's research on rewilding and climate smart forests are debated on a public platform. **Convery** is a regular contributor to *The Ecologist* which ran a special issue *The Timber Takeover*, edited by **Weatherall** after the 2020 festival was cancelled due to Covid-19. The *TimberFest* director notes "*this is a relationship that has explored how arts and culture can be used as a vehicle to help translate research in environmental science to the general public, creating new passions and enthusiasms*". This statement encapsulates precisely why we undertake our research.

E: Wider Influence and Contributions to the Research Base;

Within what is a small research unit, Unit staff play a dynamic role in supporting the vitality of research within the discipline. Every member of UoA14 has contributed to sustaining Geography and Environmental Studies both in the UK and internationally. Protected time in individual staff annual workload models is negotiated within the PPDR and RASA processes to enable staff to contribute to external boards, committees and review panels:

- a) *Journal editorships/board membership*: **Carr** (Editorial Board: *Geography, the Journal of the Geographical Association*, 2019-); **Deecke** (Editor: *Animal Behaviour*, 2016-2019); **Weatherall** (Guest Editor: *Canadian Journal of Forest Research*, 2020; *The Ecologist*, 2020).
- b) *Academic leadership on boards and committees*: **Carr** (Trustee, Council Member, RGS-IBG, 2015-2018; Secretary, Expedition & Fieldwork Committee, RGS-IBG, 2015-2018; Member, Expedition & Fieldwork Committee, RGS-IBG, 2012-2015; Member, RGS-IBG NW Regional Committee 2018-); **Convery** (Member, IUCN World Commission for Protected Areas, 2016-; Co-Chair, IUCN CEM Rewilding Task Force, 2017-); **Ryfield** (Secretary, Coastal and Marine Research Group, RGS-IBG, 2019-); **Weatherall** (Member, Working Group Leader, EU CoST Action CA15226 Climate Smart Forestry in Mountain Regions, 2016–2021; Member, British Ecological Society Forest Ecology Group, 2019-)
- c) *Peer Review College and Grant Assessment Panel Membership*: **Carr** (Grant Assessment Panel, RGS-IBG Geographical Fieldwork Grants, 2009-; Grant Reviewer Polish National Science Centre, 2017); **Convery** (Review Panel member, UN International Resource Panel Global Outlook Report, 2019; Panel Member, NERC CASE awards panel 2016).
- d) *Fellowships*: **Mansfield** (Churchill Fellow, 2019; Invited Fellow, Royal Society of Arts, 2019).
- e) *Keynote, Invited Lectures, Conference Convenorship*: **Carr** (Invited Speaker, European Geoscience Union, 2015); **Convery** (Conference Keynote Speaker, Qinba Mountain Forum, China, 2019; Invited Speaker RGS-IBG Northwest Region, 2019); **Deecke** (Conference Keynote Speaker, 16th Colombian Zoological Congress, 2014; Vienna Rotary Club Inner Wheel, 2016; Invited Speaker RGS-IBG Northwest Region, 2019); **Leslie** (Conference Keynote Speaker, Short Rotation Forestry Group Symposium, Dublin, 2017); **Mansfield** (Keynote Speaker, DEFRA Public Consultation on UK Government Farming Policy, 2018); **Ryfield** (Co-Convenor and Chair, Heritage and Changing Environments, AAAG Annual Meeting, 2015); **Weatherall** (Convenor, EU COST International Workshop, 2019).
- f) *Refereeing Academic Publications*: All members of the Unit have undertaken peer-review work for: *Area*, *Australian Journal of Forest Science*, *Basic and Applied Ecology*, *Biomass and Bioenergy*, *Boreas*, *Cultural Geographies*, *Forestry: An International Journal of Forest Research*, *Geography*, *Geografiska Annaler*, *Insect Science*, *International Forestry Review*, *International Journal of Forest Research*, *Irish Forestry*, *Journal of Arachnology*, *Journal of Comparative Psychology*, *Journal of Housing and the Built Environment*, *Journal of Quaternary Science*, *Journal of Rural Studies*, *Journal of Soils and Sediments*, *Journal of Veterinary Behaviour*, *Maritime Studies*, *Oecologia*, *Permafrost & Periglacial Processes*, *Polar Record*, *Proceedings of the Geologists' Association*, *Quaternary Geochronology*, *Quaternary*

Science Reviews, Restoration Ecology, Rural Landscapes: Society, Environment, History, Science, Scientific Reports, Sedimentary Geology.

SUMMARY: Since REF2014, the Unit has grown in research capacity and capability, generating high-quality, impactful research demonstrating sustained engagement with research beneficiaries and users. We have continued to increase the amount and diversity of funding to support research and knowledge exchange. The coherent structure and governance introduced by the CNPPA provides a platform and clear vision for future development of research activity for the Unit, and we confidently view 2021-2028 as an exciting period of research consolidation followed by expansion.