Benefits from woodland derived by communities from case study areas and the main trade-offs

RESAS 1.4.3c D2: Report on benefits from woodland derived by communities from case study areas and the main trade-offs

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Suggested Citation: Brown K, Irvine J, Fischer A, Eastwood A and Herrett S (2016) Benefits from woodland derived by communities from case study areas and the main trade-offs, James Hutton Institute, 24pp.

Summary

It is widely acknowledged that Scottish woodlands provide people with many benefits. It is also recognised there can be competing benefits for the same area of woodland reflecting the variety of stakeholders and their interests. This report is based on a case study from the Cairngorms National Park - the community of Boat of Garten - to understand the main ways in which people obtain benefits from woodlands. These include material and non-material benefits (see full list in Table 1 below) such as employment from the production, processing and local use of timber; providing unique places for learning; inspiration and partaking in numerous recreational activities. In particular the extensive network of paths and accessibility surrounding Boat of Garten provides flexibility and a plethora of options to interact with the woodlands, including dog walking, mountain biking or walks to seek solitude and take in the Intricacy, intimacy and diversity of woodland features.

The report seeks to examine the impacts that competing demands on land use in the case study site has on local peoples use and experiences of the woodland places. The report summarises the main trade-offs between recreation, hunting, habitat condition and timber production.

Two vignettes have been provided from the case study showing lessons learnt and insights from particular trade-offs. One highlights how participants constituted and experienced a trade-off between 'Habitat creation and maintenance' for the highly threatened Capercaille & 'Physical and psychological experiences' of dog walkers. The key findings here show how:

- Virtually all participants experienced a loss of wellbeing when biodiversity enhancing management interventions were adhered to e.g. keeping dogs on leads during sensitive breeding times.
- How participants responded to management interventions depended on how they constituted the woodland character and purposes i.e. responses differed in respect of plantation and old growth pine forest.
- The provision of alternative paths to encourage users to stay away from sensitive breeding areas were claimed not to provide the same level of benefits, especially if these were straight, wide and 'industrial'.
- Awareness raising of biodiversity interventions was best received through indirect social and cultural channels rather than formal signage. Beyond displacement to other sensitive habitats, there was little behaviour change in the short term.

The second vignette provides early insight into the role of experiential learning in identifying and reworking the moral geographies of woodland expansion. The findings show how:

- The embodied experience and encounter from Biodiversity Action Plan (BAP) field visits, Norway study tours and woodland regeneration fieldtrips can be crucial in learning about – and reaching knowledge tipping points regarding – woodland management.
- There is a need to examine the cultural framing of moorland and woodland landscapes and make these visible in woodland management and governance processes. This includes considering what is at stake if particular habitats are replaced by others (e.g. moorland by woodland).

The report's findings are based on legacy work conducted under the Rural and Environmental Science and Analytical Services strategic research programme 2011 – 2016. The understanding into the main benefits and trade-offs from woodlands will inform ongoing RESAS research involving communities within the CNPA and Central Scotland Green Network. These initial insights will provide solid foundation in which we more deeply explore the motivations and barriers to woodland expansion throughout Scotland. This will provide valuable insights to inform decision making over woodland expansion and help inform the role Adaptive Management can have in these processes.

1. Introduction

A crucial foundation for understanding how woodland and its expansion can best be managed and governed for multiple objectives is to understand the range of benefits that different people seek from woodland and conversely, from the alternative land uses (moorland, farmland, housing), thus identifying areas where values and interests by different stakeholders are similar or may differ. Only by understanding the different motivations of the diverse stakeholders can we attempt to find acceptable and hence sustainable management solutions into the future. Here we focus on past and continuing research work in the Cairngorms to determine the main benefits provided by woodland to various communities (of place and interest), and explore the how different stakeholders may hold different values, stakes and perspectives on woodlands, and therefore key ways in which such benefits may (or may not) need to be traded-off in order to meet woodland expansion objectives[1]. This forms a basis for our upcoming empirical research seeking to deepen

understanding of how particular knowledge practices, and formal and informal governance mechanisms, affect the delivery of these benefits on the ground.

2. Background

Woodland in the Boat of Garten and wider Cairngorms case study area

The Cairngorms National Park contains the most extensive tracts of native forest in Britain, including pine, juniper and broadleaved species, and the scale and quality of this woodland is one of the Park's most distinctive dimensions. "The Park also contains the best examples in Scotland of bog woodland, montane willow scrub and stands of aspen. The native pine woodlands of predominantly self-sown Scots pine are the western-most link to the extensive boreal forest which formerly covered a much larger area of northern Europe" (CNPA Forest and Woodland Framework 2008). The Cairngorms Nature Action Plan focuses on 4 aims:

- Improve the quality and connectivity of woodlands and wetlands for biodiversity;
- Implement priority actions for other habitats;
- Conserve and enhance key species through focused conservation action;
- Encourage, support and provide opportunities for people to engage with nature.

The current forested area of the CNP is approx. 75,200 ha (Boyd-Wallis, 2016). The desired increase of 5-10% is equivalent to 3760-7520 ha.

Boat of Garten (hereafter Boat) is a village in the CNP with population of approx. 700. There is an identifiable parcel of woodland of approx. 4km^2 adjacent to the houses and accessible from many different points in the settlement, and is linked to other larger areas of woodland. Until 2012 there were no recreation management restrictions beyond the general condition of responsible access defined through legislation (LRSA 2003) and the supporting Scottish Outdoor Access Code. However, the process of meeting Natura obligations linked with a housing planning application in the village prompted the introduction of behavioural restrictions[2] for dogwalkers as a measure to minimise their disturbance of capercaillie (*Tetrao urogallus*), a IUCN red list species. Thus the governance of this development brought out the different values, perspectives and desires of different stakeholders

[2] The management request was that people keep their dogs on leads between April and August, to minimise disturbance during the breeding season. This restriction was communicated through signage and a part-time ranger presence. Although not an area with a large density of capercaillie, the Boat woodland was considered an important connecting route between the remaining areas of woodland with high capercaillie productivity. It is only recently that recreational disturbance of capercaillie has been discussed or acted upon in Scotland in any substantive way (see the Capercaillie Framework[2]). The other well-established factors are still thought to be the most important – climate change, fence collisions, predation – yet the population and the range of capercaillie is now considered so small that any possible marginal gains are worth pursuing.

surrounding biodiversity-recreation-housing trade-offs, highlighting how management of the area needs to adapt, incorporate and find solutions to contested stakes, spaces and values. This provided an opportunity to study how various mechanisms of formal and informal governance can shape the meeting of multiple objectives for forestry more broadly.

3. Approach

In this document we seek to draw out insights from the Boat case study that that can inform our work with woodland stakeholders in current and upcoming case studies. Work from the previous RESAS programme in Boat of Garten looked at aspects of community-woodland relations, involving in-depth qualitative and ethnographic work and building on this provides added value to the current research programme. .

Approach in Boat of Garten case study: Investigating responses to woodland management interventions

This case study investigated how different values and perspectives with regards to recreation, biodiversity conservation and housing can be assessed and conflicts arising might be ameliorated, in relation to accessible woodland. It looked at management interventions – and responses to them - which placed restrictions on outdoor access with dogs in the woods directly adjacent to Boat village. Hutton social scientists conducted in-depth qualitative research on the responses to these interventions between 2012-2016. Methods centred on mobile video ethnography in the woodland, supported by semi-structured interviews. This involved over 30 participants, including dogwalkers (and dog-runners and dog-cyclists), rangers, access managers, land managers, NGOs, and relevant public sector staff. The textual and visual data was subject to thematic, discourse and performative analysis.

3. Benefits provided by woodland to communities in the Cairngorms case study area

The main ways in which woodland benefits communities in the Cairngorms case study area is summarized in Table 1. This table is structured around the three main groups of Nature's Contributions to People (NCP) (**regulating, material and non-material**) and the 18 detailed, non-exclusive categories of NCP used in IPBES assessments. Please note that Cultural Ecosystem Services (CES) are no longer distinguished as a separate category since cultural dimensions shape people's perceptions and experiences of all NCP, and therefore influence all categories in the table.

Our findings speak primarily to the material and non-material categories. Notes are only made in the 'regulating' categories where notable to the trade-offs identified by stakeholders. This case study has focused on local-level dynamics, which is why it is not possible to comment extensively in some of the cells of the table. However, populating this framework flags up ways in which we can attend to issues of scale in the upcoming case studies.

Table 1

	Reporting categories of NCP (& brief explanation)	**Woodland in Cairngorms Case Study**
1	**Habitat creation and maintenance** The formation and continued production, by ecosystems or organisms within them, of ecological conditions necessary or favourable for organisms important to humans.	The CNP area has 25% of the Scottish native woodland resource and makes up the largest area of native woodland in Britain[3]. Woodland and woodland edge habitats here are important nesting, feeding, and breeding sites for a wide range of birds, mammals and other species, many of them of recognised as of international importance for biodiversity. 49% of the Park is part of the Natura 2000 network and 25% of the UK's threatened plant and animal species live there. The CNP is home to the six key woodland species have been identified for action under the Scottish Forestry Strategy as key species for woodland management including: Capercaillie, Black grouse, Red squirrel and Juniper. Woodlands are also important to many of the 26 CNPA Priority Species i.e. species that have been selected for focused action Cairngorms Nature Action Plan due to their urgent conservation and very specific management needs. These include: Wildcat, Red squirrel, Capercaillie, Twinflower, Pine hoverfly, Green shield moss, Kentish glory, and four species of Wood ants. CNP is now the only remaining area of the UK in which capercaillie are found, and has thus become the focus of concerted partnership action, indicated through the Capercaillie Framework[4]. According to Mikolas et al. (2015), the capercaillie is a prominent umbrella species, which means that the protection of their range and environmental requirements allow protection of a large number of other species. Commercial and actively managed

[3] Within the CNPA the stated the area of native woodland is 42,947 ha, (see page 3) which is 69% of the total woodland area within the park. So if the remaining 31% of non-native is 19,295 ha. Of the total woodland area in Scotland the NWSS report states 311,153 ha is native. So 42,947 ha is only approx. 14 %, not the 25% stated here. The 311,153 ha of native equates to 22.5% of the total woodland area in Scotland. The NWSS report states another 1% is 'nearly native'. So the remaining 76.5% equates to 1,057,920 ha of non-native woodland. So the 19,295 ha of non-native found in the CNP is approx. 2% of the total non-native in Scotland (Sources: https://www.forestry.gov.uk/PDF/FCMS126.pdf/$FILE/FCMS126.pdf, http://scotland.forestry.gov.uk/images/corporate/pdf/fcs-nwss-cairngorms.pdf.

[4] See: http://cairngorms.co.uk/wp-content/uploads/2015/07/CapercaillieFrameworkReport_V2.0.pdf

		woodland has been shown to be important to this species, which has thrown up interesting issues regarding whether native or commercial woodland benefits biodiversity the most.
2	**Pollination and dispersal of seeds and other propagules**	Pollination as an ecosystem service is limited in woodlands. Dispersal of tree seeds by birds and mammals to aid natural regeneration of woodlands
3	**Regulation of air quality**	Yes
4	**Regulation of climate**	Yes, carbon sequestration. According to a provisional report by the Forestry Commission (FC, 2015) the total carbon stored in all the principal tree species in the CNP is 4,318,000 tonnes.
5	**Regulation of ocean acidification**	Yes
6	**Regulation of freshwater quantity, flow and timing**	Yes, NB flooding is an issue for some parts of the case study area. If woodland expansion and management could aid flood management, this would likely act as a motivating factor for a variety of stakeholders (including businesses, residents and public agencies).
7	**Regulation of freshwater and coastal water quality**	Yes, NB water quality is very important to the local economy, which is very dependent on tourism e.g. through sport fishing and other forms of water-based recreation as well as the whisky industry.
8	**Formation, protection and decontamination of soils and sediments**	Yes
9	**Regulation of hazards and extreme events**	Yes
10	**Regulation of organisms detrimental to humans**	This is a complex and disputed issue. While woodlands in the CNP are home to predator species that are considered by some actors as vermin, for example, pine martens, black crows, foxes and common buzzards, the same species are seen as positive by other actors and are in some cases even the target of explicit conservation action (pine marten) and/or protected by law (all birds

		of prey). In addition, the role of predation in the success (or failure) of key species such as capercaillie is contested. The role of woodlands as habitat for such species (and the resulting contributions to people) is thus ambivalent.
11	**Energy**	Yes, CNP woodland is an important source of fuelwood and increasingly a source of biomass.
12	**Food and feed**	Yes, CNP woodland provides opportunities for: • Foraging (eg mushrooms, berries) for leisure and commerce • Meat from hunting deer (red and roe) & game birds Some livestock in CNP are also grazed in semi-woodland areas, providing them with additional shelter.
13	**Materials and assistance** Production of materials derived from organisms in crops or wild ecosystems, for construction, clothing, printing, ornamental purposes (e.g. wood, fibres, waxes, paper, resins, dyes, pearls, shells, coral branches). Direct use of living organisms for decoration (i.e. ornamental plants in parks and households, ornamental fish), company (i.e. pets), transport, and labour (including herding, searching, guidance, guarding)	The production, processing and local use of timber is important in this area. Forests in the CNP comprise £11m GVA (Source: The economic and Social Health of the CNP, 2010), not including construction or other downstream activities. Sawmills in area, providing employment. Woodland provides materials for sustainable design, construction, paper industries, woodfuel, biomass, river restoration measures, sculptures and art installations.
14	**Medicinal, biochemical and genetic resources**	[Not sure?]

15	**Learning and inspiration** Provision, by landscapes, seascapes, habitats or organisms, of opportunities for the development of the capabilities that allow humans to prosper through: - education, - acquisition of knowledge and development of skills for well-being, scientific information, and inspiration for art and technological design (e.g. biomimicry)	The Cairngorms area is long established as a space of learning and inspiration, both through formal education activities and informal learning and doing Formal education activities include: forest schools and camps (e.g. http://www.rootshighland.org/), nursery and primary school visits (most primary schools in CNP can access woodland in easy walking distance of small children), ranger events (Boat, Abernethy, Glenmore), DofE and other school groups, university field visits, academic and land manager study tours, courses provided by many outdoor activity organisations, treasure hunts. The Cairngorms is one of over 30 LTSER (Long-Term Social-Ecological Research) platforms across Europe, the purpose of which is to link ongoing ecological and socio-economic research data and infrastructure in a place-based approach to facilitate sustainable management of the area (and opportunities for meta-data analysis with other platforms). There is particular interest in emerging knowledge of altitudinal climate change effects on species composition, and of landscape-scale conservation and governance efforts more broadly. There are also many woodland-based visitor centres, feeding stations, camera traps, and citizen science activities, that help facilitate the flow of knowledge between scientists, land managers and the public. Informal learning and doing includes: children and adults going out with their friends and families, sometimes having gatherings (e.g. picnics) and informal activities like treasure hunts (e.g. one parent from Boat said they collected woodland 'treasure' (e.g. cones) every single day on the way back from school). NB a number of primary schools in CNP have woodland on the main off-road route to the school (e.g. Nethybridge, Boat of Garten, (some parts of) Aviemore) Both children and adults in the Boat of Garten case study demonstrated that they were developing skills for wellbeing insofar as learning that 'going to the woods' is a way of feeling better (most notably children learning about woods as a place to have fun and to 'hang your worries'). Bushcraft skills and sometimes artistic skills were an element of the above activities (e.g. children learning about art and the woods when an artist facilitated their making wooden capercaillie sculptures, one of which has remained permanently in the forest). Here an iconic woodland species was the inspiration for art. The contents of local galleries and displays also suggest that these woodlands act as a significant source of inspiration for artists doing painting, drawing and photography, with many local commercial artists and photographers resident.

16	**Physical and psychological experiences**
	
	Provision, by landscapes, seascapes, habitats or organisms, of opportunities for physically and psychologically beneficial activities, healing, relaxation, recreation, leisure, tourism and aesthetic enjoyment based on the close contact with nature. E.g. hiking, recreational hunting and fishing, birdwatching, snorkeling, gardening
		The recreational opportunities of the Cairngorms area have long been established as exceptional in range and quality. A significant and unique part of the attraction is the affordances provided by woodland on a large scale, and the relative abundance of old-growth forest, and the species living there. Woodland is thus a vital resource here for recreation, both guided and independent, visitor and resident, and involving active and passive forms of recreation. The activities pursued in relation to this woodland include:
		• Walking, dogwalking, running & orienteering
		• Cycling & mountain biking
		• Horse-riding
		• Wildlife watching & photography
		• Other adventure sport activities such as zip-wires & treetop trails
		• Camping
		• Hunting & shooting (including pheasant and roe deer)
		• Painting, drawing & landscape photography
		• Informal and improvised games and activities (e.g. hide and seek, 'tree golf')
		• Visual aesthetic appreciation without being in the woodland directly
		  o Driving & motorcycling
		  o Viewing the woods from buildings or settlements
		
		Woodland can be particularly special for orienteers and mountain bikers as the vast majority of their activity is done in forests (both in CNP and Scotland).
		
		The kinds of woodland experiences in the area reported as beneficial included:
		• Relaxation, calmness & tranquillity ("chance to switch off")
		• Connectedness (with human and nonhuman companions, and with nature more broadly)
		• Solitude
		• Contemplation, meditation and groundedness (feeling "place in the universe") (NB both active and passive activities were reported as meditative)
		• Reverie & spirituality
		• Thrill & challenge
		• Escape & freedom for emotional expression and healing (e.g. "to feel difficult emotions" such as grief)
		
		These experiences could be one-off or regular occurrences. Tourists mentioned the refreshment felt at being in woodland so different from anything else, whilst residents relied on the familiar (often daily)

		routine of going to the forest to give them "much needed de-fragging space", such as after work or respite from childcare duties.
		
		The affordances (Gibson, 1977) of this woodland upon which such experiences were contingent included some (and usually a combination of many) of the following:
		
		• **Sensory stimulation**
		  ○ **Ground-feel** – the kinaesthetic sensation coming from the shape and texture of a path or surface
		  ○ **Olfactory** sensation (e.g. how forest smells of pine needles after rain)
		  ○ **Sounds & soundscapes** – presences and absences (e.g. sounds of quiet, water, vegetation, wildlife and weather
		  ○ **Taste** or gustatory sensation (e.g. when eating blueberries picked from forest floor)
		  ○ **Visual** sensation – coming from seeing particular species, colours, textures and patterns of both vegetation and light and the way they intermingled with the above sensations to create "atmosphere" or a particular "vibe"
		• **Proximity** to settlement: Being able to exercise and experience nature straight from the door
		• The **scale, intricacy** and thus **challenge** of negotiating the woods enables tests of preparedness, navigation, strength, endurance, bravery and intellect
		• Associations of **wildness** (usually visual) with other significant wild places (e.g. one person said how much they liked driving through the area as it reminded them of North America and its big forests)
		• The **tall trees** and vegetation structure of the mature woodland was often mentioned as providing relative **shelter** for recreational activity in in particular weather conditions (i.e. participants would often choose the woodland over other options in wet or windy weather, some saying that they wouldn't go out, or for so long, if they didn't have a sheltered place to do it).
		• The extensive - and in some places dense - network of paths and **accessibility** of the woodlands gave **options & flexibility**: The diverse and relatively extensive nature of these woodlands provides options for people depending on the type, terrain and duration of experience desired, or the degree to which people want to have scope to improvise and amend a route as they go.
		  ○ E.g. participants often wanted to choose a route to match

		their mood (e.g. a mountain biker who doesn't have the headspace for a technical route; or a walker who seeks solitude to work through some worries) o Going on route matched to time slot available (due to work or family commitments) J **Intricacy, intimacy and diversity of woodland landscape features**: many participants benefitted from being able to engage with the myriad features of interest of the forest (e.g. admiring the bark of a granny pine, picking up and collecting pine cones; some participants with children got least bored in woodland) Such benefits provided in terms of landscape, sport, recreation, and health in turn support business development in the tourist and retail sectors. Tourism is central to the Cairngorms National Park economy, with an estimated 1.68 million visitors annually, accounting for 30% of the GVA and 43% of employment. Businesses supported provide activities including outdoor guiding and instruction, wildlife guiding and photography, as well as various forms of retreat and therapeutic tourism, where the special forest surrounds are sold as part of commercially packaged experiences.
17	**Supporting identities** Landscapes, seascapes, habitats or organisms being the basis for religious, spiritual, and social-cohesion experiences Provisioning of opportunities by nature for people to develop a sense of place, purpose, belonging, rootedness or connectedness, associated with different entities of the living world (e. g. cultural and heritage landscapes, sounds, scents and sights associated with childhood experiences, iconic animals, trees or	There are a number of identities that are co-performed and co-constituted with the woodland in this area. It will be important to explore how woodlands allow specific forms of meaning-making to happen (human to human & human to nonhuman). These identities variously involve: J A sense of **belonging** amongst fellow 'tribe' members of various outdoor activities and can be linked to a sense of self as environmental person, sporty person, community person, conservationist, good citizen, etc J A sense of **meaning** from particular activities e.g. o noting, ticking (e.g. 'twitchers') o collecting o navigating o feeling/doing/seeing J A sense of **confidence and self-esteem** coming from multiple ways of human-nonhuman relating. Where people develop a sense of themselves, what they can do physiological and psychologically, and linked to that a sense of belonging with others who also draw meaning from moving their body with, and against, the woodland environment in particular ways These include: J **Community participation & development**: there are a variety

	flowers) Basis for narratives and myths, rituals and celebrations provided by landscapes, seascapes, habitats, species or organisms (e.g. sacred groves, sacred trees, totem animals) Source of satisfaction derived from knowing that a particular landscapes, seascape, habitat or species exist in the present	of formal and informal local community groups that have organised around the woodlands and their wildlife, promoting a sense of belonging and in some case of a sense of ownership and responsibility for the woodland o e.g. Explore Abernethy, Cairngorm Mountain Bikers, Badenoch & Strathspey Conservation Group, Anagach Woods Trust). It was also found that communities of interest such as conservation volunteers **develop social links and cohesion** around helping to look after the forest species (e.g. RSPB). o Woodland can serve as a central pillar of **village identity** (e.g. the main sign coming into Nethybridge proudly welcomes visitors as "The Forest Village" o Conservationists can gain sense of purpose in protecting and restoring woodland habitats and species (see also professional identities)) **Familiarity & intimate knowledge leads to a sense of belonging**: residents and regular visitors said that gained much benefit from getting to know the forest intimately, sometimes even individual trees, roots and branches, which helped with feelings of groundedness and belonging. Some remarked that the Cairngorms is famed for its mountains, yet the forests are a key element in the experience of living and recreating there – most visitors do not go up the mountains.) **Making and remaking social bonds**: woodland provides a valuable space in which people can have meaningful interaction with dogs, horses, children, friends, partners and family (e.g. bonding over shared challenge or joy of aesthetic appreciation)) **Social inclusion** - Outdoor therapeutic interventions (e.g. groups from The Bridge vocational training facility for those who struggle with mainstream education); also evidence beginning to appear that women's participation can be aided by having the seclusion of woods in which to exercise, free from the fear of judgement from others.) **Memories and cultural heritage** tied up with woodland identities and forest cultural heritage very important in local history e.g. o the many loggers, 'floaters' and sawmill operators working in the forest in the past o the 'Heroes of Telemark' training for a crucial WW2 intervention in the heart of the Cairngorms forest o installations at Landmark and the Highland Folk Museum). o There are also powerful narratives relating to the Great

		Wood of Caledon (see e.g. Smout 2004; Crumley, 2011) which feeds into and underscores the role of woodland in Scotland's sense of itself, its history and future e.g. sense of past loss and mismanagement, and sense of duty to restore for future generations. • **Professional identities** can involve particular meanings attached to the woodland which shape someone's sense of themselves and their role in society: e.g. forestry and estate workers, property owners, artists, scientists, agency/NP staff, NGO staff and outdoor guides and instructors. • **Memory bank**: for many the woodland prompts memories of other people, places, times and creatures (e.g. some cited woodland as a cherished space in which their "children grew up" and often have strong memories of their own childhood experiences, such as climbing trees and building dens. • Place to make **human-nonhuman connections**, spirituality and sense of place in the universe (e.g. some like that big trees make them "feel small" or like "knowing that there are bigger things out there than me"). Some people seem to connect spiritually with Nature-as-'other' (e.g. awe, in the traditional sense of the sublime) whilst others welcomed feelings of being part of Nature. • **Iconic species**: key woodland species have important meanings and identities attached to them (e.g. red squirrel and wildcat thought very emblematic of Scotland). However, some species are more differentially embedded as culturally meaningful than others. Capercaillie is an interesting example in that some hold it as charismatic and iconic to the identity of Scotland and the CNP, but many others feel rather more ambivalent. Species meanings are deeply socially differentiated. A current key issue is how much the iconic value of protected species can be realised without the actual presence of, or close proximity to, the animals themselves, with implications for supporting and enhancing biodiversity. • **Existence**: those who support woodland restoration who have little chance of visiting "makes me happy just to know it's there" or some have been to the woodland before but can no longer go (due to age or infirmity).
18	**Maintenance of options** Capacity of ecosystems,	Yes. There will be a changing set of options presented through future scenarios of landscape change, climate change, habitat change (e.g. vegetation zones being 'pushed up the hill'; changing proportions and qualities of moorland and woodland) and through

	habitats, species or genotypes to **keep human options open** in order to support a later good quality of life.	possible changes in economy (e.g. away from tourism towards more renewable energy and wood fuel, should global geopolitics and resource flows dictate). The construction of new homes will also constrain particular options for the future, being irreversible in the short to medium term.

Managing woodland for these benefits inevitably involves key areas of trade-offs, some of which may have scope for becoming more synergistic in the future.

4. Key trade-offs of woodland expansion in multi-objective forestry in the Cairngorms case study area

As we have seen there are many ways in which woodlands contribute positively to people's lives and communities in the Cairngorms National Park. However, within the CNP there are many competing demands on land-use (housing, biodiversity conservation, recreation, field sports, grazing etc.) and different perspectives on how private and public land should be managed to deliver the range of potential benefits, for individual owners and the wider community. The majority of the land in the CNP, approximately 75% is privately owned by individuals and trusts. According to a recent survey the dominant form of land use in the park are managed moorland (189,552ha), followed by rough grazing (66,678ha), conservation (35,165ha), commercial forestry (28,390ha) and native woodlands (19,384ha) (Morran et al. 2014).

There is, therefore, a societal challenge on how to reconcile the private interests of land-owners and trusts, who may or may not to expand their woodlands, with the interests of communities and the public in general. Within the current Scottish Rural Development Programme (2014-2020) there are a number of incentive packages to encourage woodland expansion (native and non-native) and improvement for biodiversity (the Scottish Government has a target to increase woodland cover by 10,000 ha per year up to 2020). However, there is an additional locational premium for woodland planting that would benefit Capercaillie. Despite these incentive mechanisms the uptake in the Cairngorms is somewhat limited. It therefore may be helpful to identify how the different aspects of woodland expansion and associated biodiversity improvements may be in conflict with alternative objectives land use objectives, favoured and supported by different stakeholders. Issues and conflicts surrounding woodland change relate to its scale, quality, spatiality (notably location, connectivity and proportion), character, and affordances.

In the Cairngorms study area there will be a range of woodland management interventions relating to planting, fencing, changing browsing pressure (reducing

and/or changing spatio-temporal distribution), vegetation or habitat restructuring, changing predator control, anthropogenic disturbance, and access restrictions. These in turn may change the contributions woodland nature makes to people. See Table 2 for a summary of the main types of trade-offs between (and indeed amongst) the most relevant contribution categories. It should be noted that we are mobilising this framework based on an understanding of Nature's Contributions to People (NCPs) be co-produced rather than as a fixed or given outcome of 'natural' processes.

Table 2. Key trade-offs between main Nature Contributions to People (NCP) for the Cairngorms case study regarding woodland expansion

	Habitat creation and maintenance	**Food and feed**	**Materials and assistance**	**Learning and inspiration & Physical and psychological experiences**	**Supporting Identities**
Habitat creation and maintenance	Woodland biodiversity v moorland biodiversity (which habitats in which proportions and where? Through which techniques should afforestation happen?)	Woodland expansion trading off with moorland habitats and associated sporting 'monocultures' (grouse & deer)	Which tree species for timber? Which techniques of afforestation? Which micro-macro management measures (e.g. to change structure of woodland)? Plantation forestry can provide favoured habitats for protected species but very much depends on the precise management techniques used. History of antagonism between timber and habitat objectives.	Recreation can reduce habitat quality by (a) disturbing particular species (b) damaging vegetation. Likewise habitat quality improvement measures can reduce human well-being from recreation experiences (changes sensory and mobility affordances of landscape coming from access or behavioural restrictions). Woodland expansion would require increased deer culling unless fencing was used which affects public access.	Some stakeholders have identities tied up in their ecological roles and values (managers, agency staff, rangers, volunteers, enthusiasts (e.g. twitchers) and public citizens), shaping how they present themselves to others and how they are perceived by others. These identities do different kinds of work in woodland management governance, depending on a range of contingencies (e.g. how intersecting with urban identities).

Food and feed		Different ways of doing hunting - some have greater cultural and commercial value in Scotland than others	Timber versus game	Hunting-(other) recreation trade-offs. Recreation can disturb hunting directly (but doesn't have to if protocols observed). Scope for increased difficulty in accommodating both uses if area of moorland much smaller.	Powerful markers of identity in owning and working on a shooting estate (and to what degree hunting objectives are taken seriously). Links to identities through mobilisations of land-based livelihoods and rural/country people more generally.
Materials and assistance			[timber for biomass v other downstream products?]	Timber-recreation trade-offs. Access restrictions for forestry operations. Sensory experience of plantation v non-plantation woodland (users favouring kinaesthetic affordances can be more accepting of plantation woodland than those favouring visual affordances).	Strong identities of forest workers, managers and associated consultants, including those favouring a productivist view of woodland. Links to identities through mobilisations of land-based livelihoods and rural/country people more generally.
Learning and inspiration & Physical and psychological experiences				Recreation activities can preclude or encroach upon others. Trade-offs experienced in terms of amenity (including location, duration and sociality of opportunity), sensory and emotional experience. Evidence that woodlands can accommodate more and more diverse users than	Identities performed through different outdoor activities shown to be crucial to participating in - and managing - outdoor recreation. Visual landscapes also closely connected with particular constructions of Scottish and Highland Identity. Can cause conflicts over whose identities most 'belong' in

				other landscapes, depending on trail characteristics.	particular spaces, places and landscapes.
Supporting Identities					There is a history of contestation between identities practiced through conservation, hunting, productivist forestry and recreation (even though some people perform more than one of these identities). E.g. Longstanding struggle over who is the best, rightful, proper, more real or authentic steward of the land and who 'belongs' in different landscapes.
Maintenance of options					

However, to further explore the social and cultural co-constitution of woodland nature's contributions to people and thus how trade-offs between them can be managed, it is necessary to go beyond these NCP categories and make links with others. This reflects the revalorisation of cultural dimensions with the recognition in the NCP framework that "the cultural context influences the perception and experiences by people of all NCP". Key concepts emerging as important from the data include:

- **Hybridity (e.g. Whatmore, 2002)**: concerns how cultural (and sometimes physical) boundaries are often drawn between elements of a place or landscape so those categories can be purged of unwanted associations and held apart from other categories (e.g. urban and rural, grouse and trees, deer

and trees). There is a need to pay attention to the work various stakeholders do to make and remake such boundaries in relation to woodland expansion, especially where they invoke notions of whether and which trees belong (or not) alongside other species, landscapes and people. This involves examining important ways in which people's conceptualisations of species and landscapes become fixed or remain open to change, how they are linked to other concepts (e.g. interpretation of policy), and how they are mobilised in particular land use and decision-making (and justifying) practices.

- **Embodiment and encounter**: includes sensory and affective relations between humans and between humans and non-humans, including the more-than-representational (NB. Adaptive Management and Ecosystem Services frameworks seem to be particularly weak on role of embodiment, especially how particular knowledges and norms are embodied, and how this is spatially and temporally situated).
- **Moral geographies**: Moralities and normativities because taken-for-granted assumptions, boundaries and expectations infuse notions of what land is, what land does, for whom and to what end. Geographies because how space, place and landscape are co-constituted with the above matters to the work such constitutions doing in management and governance processes. Early data shows that some powerful (and often purified) stakeholder notions of how and where woodland belongs have been troubled by exposure to hybrid associations (e.g. grouse AND trees in Norway). It has been suggested that there are some unhelpful myths surrounding woodland expansion and that demystifying them will mean overcoming some of the barriers.

The main trade-offs can be summarised as recreation-hunting-habitat-timber trade-offs and we need to look more closely at the different kinds of socialities, identities, ecologies and economies afforded by (and not) related practices. This involves looking at how trade-offs are perceived and constituted by different stakeholders, as well as their key contingencies.

The data suggests factors upon which the form and effectiveness of managing trade-offs are contingent. In the context of woodland management, how much particular land uses constitute a trade-off and how acceptable that trade off is depends upon factors such as:

- Regulatory mechanisms
- Funding mechanisms
- Learning practices, processes and structures (see Vignette 1)
- Decision-making practices, processes and structures (including community engagement, see Vignette 2, and perceptions of justice and equity)

- Perceptions of (or lack of clarity on) which land uses (especially commercial forestry, wildlife tourism, stalking) provide (or could provide) which economic benefits and to whom. It has been expressed that there are many narratives and few facts circulating on this topic.

Vignette 1: What we have learned so far about the role of experiential learning in identifying and reworking the moral geographies of woodland expansion

Early insights include:

- Identifying the importance of embodied experience and encounter: lessons from land management collectives (regular BAP field visits, Norway study tours, CNP woodland regeneration fieldtrips) show that the material and social spaces of *in situ* encounter can be crucial in learning – and reaching crux realisation and turning points - about woodland management.
- The need to examine the cultural framing of moorland and woodland landscapes, uses and management, and the prospect of more hybrid (less cognitively 'siloed') relations. Key boundaries (associations and disassociations) embedded in 'taken-for-granted' moral landscapes are emerging. Some of them are referred to as myths to be busted. It is important to make these visible and explore how they work, not least to understand how power works in management and governance processes. Upon which processes are the hybrid relations necessary for woodland expansion contingent?
- Cultural values of treeline landscapes: these are uncommon in Scotland so difficult to ascertain or encourage cultural value. Is it a case of 'we can't be what we can't see'?

Vignette 2: Lessons learnt from an in-depth case study of one kind of woodland trade-off (between 'Habitat creation and maintenance' & 'Physical and psychological experiences' at Boat of Garten)

These NCPs were crux trade-offs in our Boat of Garten case study as efforts were made to manage the simultaneous delivery of recreation and biodiversity benefits relating foremost to capercaillie. Here we briefly consider the lessons learned about how participants constituted and experienced such trade-offs.

A. virtually all participants (other than people who kept their dog on a lead all the time anyway) experienced these NCPs as a trade-off in that wellbeing was lost when biodiversity-enhancing management interventions were adhered to. It is already well-established that recreation can cause ecological disturbance, but little acknowledged that avoiding disturbance can erode the quality of the recreational experience, and in turn wellbeing contributions of nature. Furthermore, we cannot assume that such qualities are static. It is possible that they change when conditions change (e.g. maybe I have to keep my dog on a lead but my experience is enhanced in other ways, such as because I see capercaillie).

B. Perverse outcome of net decrease in NCPs / 'worst of all worlds': quality of the experience was compromised (e.g. dogwalking under pressure for normative change was reported as 'not relaxing', 'makes you feel guilty, 'worry about others [peers, rangers, tourists] judging me', yet the actual recreational behaviour in the most capercaillie sensitive zones was predominantly unchanged (or more broadly was decreased as people went to even more capercaillie sensitive areas instead, as no restrictions were in force yet). So 'Physical and psychological experiences' NCP was diminished whilst the 'Habitat creation and maintenance' remained largely unimproved. The question prompted is whether the small number of people who did change their behaviour justified the trade-off. But the ecological evidence is not sufficiently detailed to indicate whether the passage of, say, 40 people instead of 60 people walking a path each week is a significant difference. This might be a point AM might tackle.

C. Moral landscapes of woodlands: participants' responses to management interventions depended on how they constituted the woodland, its character and purpose (e.g. for some the woodland was plantation, managed and industrial and therefore not pristine, special or wild –especially in comparison to classical old-growth pinewoods in the Park – which helped to justify their

position that people had the right to be there, whereas for others the woodland was very special, wild and natural).

D. Effective management of the recreation-related trade-offs demands a thorough grasp of the experiences regular and tourist users are seeking or expect to find (for themselves and their companions, human and nonhuman), and thus the nature and degree of benefit requiring to be sacrificed in a wellbeing-biodiversity enhancement trade-off. At Boat an alternative path was provided as a substitute to restricted access in the woods, however many claimed that the new option did not meet the same needs due to differences in:

- Multi-sensory affordances (e.g. some still wanted a narrow or rooty or sheltered or secluded path, when the alternative was open, straight, wide and 'industrial')
- Spatio-temporal affordances. Outing durations that particular 'loops' offer (some people have very precise windows of opportunity due to work and childcare commitments and if they have a 40-minute slot they might not find an alternative to fill that same slot e.g. "new path is more committing")

Many transgressions of the new rules seemed to happen in very non-cognitive moments (e.g. when the participant was distracted, lost in thought or movement) and these moments may not respond to cognitively-based interventions. The weaker elements of the measures were where abstract map knowledge had made do over embodied or experiential knowledge.

E. Recreationists particularly valued local non-woodland areas during the sensitive season as they were looking for alternative routes. This suggests that any expansion of woodland (or at least woodland likely to have sensitive wildlife seasonal restrictions) into these zones would be met with resistance (or lower compliance with the woodland habitat improvement measures still further).

F. However, if through woodland expansion there were greater expanses of quality caper habitat, then the need to micro-manage recreation might be diminished.

G. It should be noted that general preferences for recreating in non-plantation forestry can create less disturbed refuge areas in well-managed plantation forestry (which in itself challenges established notions of which woodland is the wildest or most natural).

H. Awareness-raising of the biodiversity issue at stake was best received through indirect social and cultural channels (notably though school children

and through the wooden caper sculpture) rather than through the formal interventions (notably signage). This was important because levels of knowledge about and care for capercaillie were surprisingly low.

Therefore, in our upcoming work we shall pay attention to how woodland NCPs - and how they are experienced and responded to by users – are conceptualised by managers when discussing and implementing management measures. This will involve examining influential moral geographies and how they shift (and not), and how key constitutions of landscape, place and space in various practices and identities matter for woodland expansion and related adaptive management.

The above insights into the main benefits and trade-offs from woodland derived by communities in the Cairngorms will inform the ongoing work there and in the Central Scotland Green Network (Cumbernauld Living Landscape), involving stakeholder meetings, events, correspondence and interviews. It sets a solid foundation from which we can explore in more depth the motivations and barriers to woodland expansion in these case studies, and how it shapes adaptive management practices, and also highlights the tensions arising between particular benefits that require further analysis.

Insights from this study, into the way nature contributes to people, provide valuable guidance on approaches to engaging different stakeholders in decisions over woodland expansion. Stakeholder engagement is a fundamental stage and principle for Adaptive Management but there are few examples where AM has been implemented. Bringing an understanding of the motivations and values held by stakeholders into the engagement process may help overcome barriers to implementing more effective AM initiatives.

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