

Does woodland expansion offer nature-based solutions for Scotland?

Woodland expansion offers a wide range of nature-based solutions for Scotland, but in most cases these benefits will depend on the characteristics of new woodland and the specific landscape scale implementation of planting schemes. We still need an improved understanding of how woodland expansion can ensure the greatest environmental and public benefit.

Woodland expansion

The Scottish Forestry Strategy has a target to increase woodland cover from 18% to 25% by 2050 (1), which has been altered to an aspiration to achieve 100,000 hectares by 2022 (2). However, there are many factors which may stand in the way of achieving this aspiration. Scotland is unique in that it has one of the most concentrated patterns of land ownership in the world (3), with rural Scotland being strongly defined by sporting estates which have contributed to creating aspects of the cultural landscape for which Scotland is so famous. Remaining sensitivities concerning the 17th Century Clearances are combined with the fact that a large proportion of Scotland is classified as 'Less Favoured Area', an agricultural designation which highlights the sensitivity of upland and marginal farming. At the same time, although little, if any, of the Scottish landscape remains unmodified by humans, contemporary discourses of a 'wild landscape' have considerable popular and political resonance in Scotland (4), and as a result the landscape is the focus of conservation efforts to maintain this. This apparent conflict between rural livelihoods and a desire to conserve the wild Highland landscape has been described as a 'dichotomy between threatened nature and threatened communities' (5). Looking into the future, farmland abandonment is projected across Europe as a whole (6), and thus there is uncertainty surrounding the long term sustainability of upland farming in Scotland. This complex Scottish picture presents both challenges and opportunities, and this is particularly obvious when examining the potential for woodland expansion.

The context for woodland expansion cannot be considered in isolation from its history. There has been much debate over woodland history in Scotland, as it is thought by some that a better understanding of what 'natural' woodland cover should look like will provide an appropriate 'baseline' for current aims. The concept of a great 'Caledonian Forest' covering a large proportion of Scotland up until the last 1000 years has been advocated by several authors (7,8). However palaeoenvironmental evidence suggests that there has been a dynamic balance of agriculture and woodland throughout the Holocene, with woodland loss occurring gradually since prehistoric times (9–12). The current consensus is that cover was at a maximum of 50 – 80% in the Neolithic (13), and that it declined to around 4% at the beginning of the 20th century due to a complex combination of human impact and climate change (14). Multiple causes of forest loss are cited, including climatic decline, use of foliage for overwintering fodder, cyclical 'wandering settlements' in the Bronze Age and more rapid clearance for farming in the Iron Age (15). Overall the synchronicity of human and climatic causes makes it difficult to decide on the major causes of woodland decline, but there is no doubt that woodland retreat occurred at the same time as human settlement expanded (16). A minority view argues that the current landscape would prevail regardless of human impact (17), but most research

concludes that there is no reason that lowland and mid-elevation woodland should not have persisted to the present, had it not been cleared for farming and timber (16).

The last hundred years of woodland history are well documented, with a concerted effort to enhance the woodland resource post WW1 supported through the establishment of the Forestry Commission, with initial focus on conifer plantations. More recently a succession of Woodland Grant Schemes have supported planting of native woodlands, and forestry policy advocates conversion of Plantation on Ancient Woodland Sites (PAWS) and sensitively located and managed plantations. Despite this afforestation, at 18% woodland cover in Scotland remains low in both a historical and European context (14). The theory of 'forest transition' postulates that there is a change from net deforestation to net reforestation as economic development proceeds, agricultural efficiency improves and rural to urban migration takes place (18). Scotland is argued to be unique, as although all of the above has occurred, the land that in other countries in Europe was returned to woodland has been amalgamated into large estates managed as open habitats for deer stalking and grouse shooting (18). This links to the argument that Highland Scotland is an exception to the UK trend for a shift from production to consumption in the uplands due to the estates (19). In addition to the estate model, Scotland has also been highlighted as having a unique approach within its National Parks. Unlike elsewhere in the world, where the predominant aim of national parks is conservation, in Scotland aims have combined environmental management with local rural development (20). It could be argued that this has been a result of the social context outlined previously, with a desire to balance improving rural livelihoods with nature conservation.

It is clear that the aspiration for more woodland sits within a complex social and environmental context, and this is also true for the political setting. Since devolution, the Scottish Government has produced a range of progressive policies including the Biodiversity Strategy (21), the Climate Change Act (22), the Land Use Strategy (23) and more recently the Land Reform Bill (24) and the Community Empowerment Act (25). Together these policies advocate afforestation as a strategy to both mitigate and adapt to climate change, improve biodiversity levels and link people to the land. Multi-functionality is also consistently mentioned as a primary objective for Scottish land use. However there are also conflicting objectives between stakeholders and a lack of understanding of how exactly to achieve this multi-functionality (26), which indicates that there are challenges in achieving synergy between policies, and therefore achieving the aspiration for more woodland cover. In addition, there is ongoing debate surrounding the European Union Common Agricultural Policy (CAP), which is implemented in Scotland through the Scottish Rural Development Program (SRDP). This both subsidises agriculture through the Single Farm Payment and provides grants for woodland planting. Many are beginning to question its effectiveness, and argue for increased integration between these two seemingly conflicting aims (2). In particular, subsidies for upland farming are increasingly criticised, as they are seen to support increasingly unprofitable activities (27) and are projected to be unlikely to continue into the future (19).

Nature-based solutions

'Nature-based solutions' advocate working with nature as a cost-effective way to achieve multiple ecosystem services, climate change mitigation and adaptation, and general sustainability (28). A number of studies have highlighted the potential for woodland to provide a number of benefits (2,29–32). There is evidence that integrating more woodland into the landscape could improve soil productivity, reduce the risk of soil erosion and flooding, provide more shelter and forage for domestic stock and deer, as well as material for timber and fuel wood, enhance habitat for rare species, and, through increasing landscape diversity, bolster resilience to both climate change and pests and diseases (29,30). Woodland creation is also seen as a powerful and cost-effective method to store carbon for climate change mitigation (31,33). The current UK carbon stock in woodland is approximately 2,900 Mt and it is estimated that woodland creation would be a cost effective and achievable way of absorbing emissions at less than £100 per tonne of CO₂ absorbed (34). In addition, the creation of 'woodland islets' in the landscape could provide multiple benefits through

providing native seed banks for regeneration, habitat for dispersing animals and services to farmers such as shelter for stock and crops, water retention and opportunities for diversification (32).

Although extensively used in other parts of Europe, agroforestry systems are less familiar in Scotland (16), yet they have the potential to deliver greater yields and financial returns than either conventional agriculture or forestry in isolation (5). A 2008 Scottish study found that there were higher returns – up to 20% more than expected – from a combined system of new woodland and seasonal grazing compared to traditional grazing without woodland (35). Furthermore, the need to secure sources of renewable energy has led to the re-emergence of wood-fuel as a desirable energy source, which is argued to be yet another benefit available from integrating more woodland into the landscape (36). The Renewable Heat Incentive introduced by the Scottish Government is argued to be a potential ‘game changer’ in this regard, as it could provide a reliable demand for wood fuel that has the potential to contribute to diversified rural livelihoods (2). This collected evidence shows that there is an opportunity to fully examine the hypothesis that working with nature through integrating more woodland into the landscape could of greater benefit to both the environment and society.

Increasingly, ‘rewilding’ is promoted as an alternative strategy for areas where rural livelihoods that have been supported by agri-environmental subsidies which are becoming less economically viable (37). A recent study challenges three assumptions relating to traditional landscapes in Europe: 1. That traditional landscapes are environmentally friendly, 2. That traditional rural populations live well and 3. That traditional rural landscapes can be kept despite the context of recent rural exodus and future socio-economic trends (6). Instead it is argued that rural life in traditional systems has always been hard and is getting harder under current trends, which may be illustrated in rural Scotland by moves towards diversification (38). Rewilding is ‘a plastic term that has been applied to a range of visions’ (39) but can be defined as *the development of self-sustaining ecosystems, protecting native biodiversity and natural ecological processes* (6). It is argued that, following spatially-explicit, participative trade-off analysis, in certain areas rewilding can be promoted as a more beneficial strategy that could potentially provide more ecosystem services. So, in the right places, it is possible that rewilding, which would be expected to include more woodland cover, could offer a viable strategy to provide a number of nature-based solutions for Scotland.

Research challenges and collaboration

Despite the potential benefits from woodland expansion being made clear, research challenges remain. These include: understanding barriers to uptake, developing methodologies to quantify benefits, assessing synergies and trade-offs resulting from alternative expansion strategies, and developing guidance for best practice planting. Numerous research projects are focusing on these topics, and are regularly presented at ECom events.

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