Should we bring Wolves back to Britain- what is the scientific case for rewilding?

Luke Nash, Gresham's School

Introduction

'Rewilding', the concept of returning landscapes to their natural state in order to encourage biodiversity, did not appear in print until 1990, which is a testament to just how modern and forward-thinking it is; even then rewilding was only firmly established as a valid conservational tool in 1998 in a paper by conservation biologists Michael Soule and Reed Noss. Within the UK, rewilding was brought to the forefront of the field of conservation when the Knepp Estate was reinvigorated when the land was deemed to be economically unsustainable (Tree, 2018), and now hosts a number of highly endangered UK species including European Turtle Dove, whose numbers have declined by up to 95% in the last 25 years (RSPB, 2019). One of the features of this process of rewilding has been the reintroduction of native species, most notably beavers in recent times, to areas where they were formerly naturalised. These reintroductions are now looking to be expanded, with plans to reintroduce Eurasian Lynx to the Kielder Forest now in the advanced stages (Natural England, 2019).

The Biocontrol of Red Deer Populations

With these reintroductions, the Eurasian Wolf has inevitably been considered. The reason that Wolves were initially suggested as reintroduction candidates aside from the species' former presence within the UK was due to the explosion of the Red Deer population (Wilson, 2004). It has long been established that deer populations are on the verge of reaching their food-limited carrying capacity (Clutton-Brock, Coulson, & Milner, 2004), which is in itself a problem, but also there is evidence that overgrazing by Red Deer reduces success rates of reforesting programmes (Putman & Moore, 2002) therefore having a knock-on effect on population densities within the ecosystem, including birds (Nilsen & Coulson, 2007). In Scotland, this is an even more grave issue, as one of the species concerned is the Western Capercaillie (*Tetrao urogallus*), itself a reintroduced species, which is critically endangered in the UK and afforded extremely strict protection, with an estate in Scotland being partially closed to the public this spring in order to protect a displaying male of this species (Glen Tanar Estate, 2019). Capercaillies require areas of coniferous plantations interspersed

with low juniper or brash cover, and this presents two issues: either, deer eliminate this cover through overgrazing, therefore removing the habitat; or, birds can collide with any fencing designed to keep deer away from this habitat, though marking can mitigate these effects (Poole, 2011). One interesting secondary effect is that smaller predators such as Red Fox predate Capercaillie eggs, and a larger carnivorous predator such as the Eurasian Wolf would help to mitigate this (Wegge & Kastdalen, 2007).

From this then it seems that Eurasian Wolf reintroduction in Scotland would have a significant impact on controlling Red Deer populations in the absence of any effective artificial control schemes in Scotland (Clutton-Brock, Coulson, & Milner, 2004) which would therefore have a knock-on effect for other components of the ecosystem- the Capercaillie is just an example, and other species that may benefit from a reduction in deer numbers include Pine Marten, Red Squirrel and a host of threatened conifer forest specialist plant species. These species would also benefit enormously from an extensive programme of reforestation, a practice which is threatened by Red Deer populations (Bunting, 2019).

However, it is not just in Scotland where various deer species (including the non-native Chinese Water Deer) have increasingly become an issue, with an estimated 8,000 hectares of SSSI (Site of Special Scientific Interest) woodland being deemed 'unfavourable' or 'recovering' directly as a result of deer-related environmental impacts according to the Parliamentary Office for Science and Technology (POST). The Government has created plans for a 50-million strong 'Northern Forest', which would encompass a vast stretch of land between Liverpool and Hull (Nolan, 2019).
This would massively increase biodiversity- declining woodland species such as Northern Goshawk (*Accipiter gentilis*), Bechstein's Bat (*Myotis bechsteinii*) and Cosnard's Net-winged Beetle (*Erotides cosnardi*), labelled as some of the most threatened woodland species in the UK (Woodland Trust, 2019) would benefit enormously by having such a large expansion in suitable habitat. A reforesting programme would be much more sustainable with regards to conservation than the dominant management strategy in the Northern Forest region, which is management for driven grouse shooting. This practice has increasingly been shown to be unsustainable, most notably with regards to an increasing correlation in raptor persecution (Melling, Thomas, Price, & Roos, 2018), especially the Hen Harrier (*Circus cyaneus*), which forms part of a moorland management strategy designed to reduce predator density (Bennett & Sutherland, 2016).

However, in addition to impacts on existing forest, it is important that, in the context of a British rewilding scheme, deer damage to reforested areas would be a natural result given the current population of deer species in the UK sits at roughly two million and has more than doubled since 1999 according to the Deer Initiative. In order to combat this, only two feasible suggestions have been proposed- a localised deer cull which would potentially require a change in legislation due to the outlaw of deer hunting (Wäber, Spencer, & Dolman, 2013) or the reintroduction of a large predator as a biocontrol method. The reforestation would provide ideal habitat for Wolves, especially if the reintroduced populations are taken from the populations within Eastern European forests such as Bialowieza Forest in Poland and surrounding areas, which has a similar climate to the north of the UK (Climate-Data.Org, 2019). The reforesting would also logically mitigate instances where Wolves would take livestock as the Wolves would be more confined to forest, where there would be an ample supply of deer (Clutton-Brock, Coulson, & Milner, 2004).

The sheer scale of the reforestation would also minimise human-wolf interactions which, though fatalities or injuries from wolf attacks are very rare indeed on a global scale, is a major yet valid concern amongst the public. This is because the scale of the Northern Forest would reduce habituation of Wolves to humans and therefore decrease the likelihood of an attack, as habituation has been shown to be a cause of attacks in certain cases in Icy Bay, Alaska (McNay & Mooney, 2005) and Points North Landing, Saskatchewan (McNay M. , 2007). In addition, risk of attacks can be further mitigated by ensuring the Wolves are healthy, as multiple sources state that no healthy wild Grey Wolf has ever killed or seriously injured a human in the entirety of North America (Parker, 1997). As a result, the attack risk is very unlikely to apply even in the North of England or Caledonia, where the population density is as high as 400 persons/sq. km (Compton, 2013) compared to Saskatchewan or Alaska, where it is estimated to be only 1.8 and 0.5 persons/ sq. km respectively.

One other counter-argument that has repeatedly been cited whenever the issue of wolf reintroduction is raised is that of livestock predation. Aside from the economic impact that belies this, it may also provide any Wolves with a much easier and more available food source than any deer that may roam their woodland habitat, which therefore defeats the aim of the reintroduction in the first place. A study in Arizona & New Mexico also showed that it was often difficult to gauge any compensation that ranchers in the area would be entitled to in the event of losing livestock (Anderson et

al., 2014). However, in spite of livestock predation by Wolves being inevitable, the sheer availability of the deer population could well sustain the wolf population to a degree where livestock predation is kept to an absolute minimum, as the population of deer seems to be at a level far higher than what could have occurred naturally, therefore providing ample food source for Wolves (Clutton-Brock, Coulson, & Milner, 2004). Though it is impossible to guarantee the safety of commercial livestock (especially sheep), the research seems to indicate that any impact can be minimised.

Previous Reintroduction Schemes

Despite having seen that the scientific evidence points in favour of a reintroduction, it is important to examine instances of wolf reintroduction and examine the extent to which they were successful in biocontrol. In most instances, in Europe, Wolves have returned to former haunts naturally without human assistance, including in Sweden and Northern Spain (Mech & Boitani, 2003) and so deliberate reintroductions in a European context are non-existent. However, several high-profile cases have occurred in North America, and one of these in particular still provides an invaluable opportunity to study directly how Wolves can act as a biocontrol mechanism.

The Yellowstone Reintroduction and its Effects on the Wider Ecosystem

Grey Wolves were reintroduced to Yellowstone National Park in 1995 after Elk (*Cervus elaphus*) had caused serious ecological damage within the park, including overgrazing and erosion, which created obvious concerns with regards to the populations of certain plant species. Wolves had been largely eradicated from the park and the extent to which the elk were preyed on by other predators, such as bears, cougars and coyotes, was limited (Thomas & Toweill, 2002). In a similar situation to Scotland, it was deemed that the elk populations had reached or nearly reached the food-carrying capacity; this led to overgrazing, with 100% of measured leaders within 97 aspen, willow and cottonwood stands in the park being browsed (Ripple & Beschta, 2012). This was caused because a lack of hunting pressure on the elk herds meant they excessively grazed certain strands. This led to a decrease in Beaver (*Caster canadensis*) populations due to the lack of availability of willow, a major food source for Beavers during winter (Müller-Schwarze & Sun, 2003). As Beavers are a keystone species able to increase biodiversity through pond and wetland creation (Wright,

Jones, & Flecker, 2002), their presence leads to an increase in biodiversity across a wide range of species groups, including insects, invertebrates, birds and fish (Rosell et al., 2005), this presented a problem and it hampered biodiversity within the park.

The decision was taken to reintroduce Wolves into Yellowstone Park, and what followed was a trophic cascade within the Yellowstone ecosystem far better than anyone had predicted- not only did Elk populations decrease, but Bison (*Bison bison*) numbers and, more importantly, Beaver numbers increased, most probably due to an increased availability in woody plants (which had grown taller and had seen a greater than 75% reduction in browsing) as a result of decreased competition from Elk. Wider effects were also observed across a greater variety of plants and animals within 15 years despite the recovery still being in its early stages. The reintroduction also led to an increase in canopy cover in certain areas of the park, which will allow certain threatened American Mid-West forest species to expand their ranges (Ripple & Beschta, 2012).

What are the implications for British rewilding?

Ripple & Beschta noted that wolf reintroduction could present an effective passive restoration approach in ecosystems where Wolves have been extirpated. The UK does fall under this category, with Wolves officially going extinct in England in 1680 after being hunted to extinction (Perry, 1978). We are also presented with a similar ecological situation to Yellowstone in what is currently happening in large parts of the UK: deer have reached unsustainable levels of population which is having a detrimental effect on woodland biodiversity, especially in Scotland (Nilsen & Coulson, 2007).

The British 'rewilding vision' is to return the British uplands to their state before the Industrial Revolution, of vast forests covering a lot of the countryside and any farmland to be more traditional and reduce insecticide and herbicide usage, with natural grazers such as Exmoor ponies (*Equus ferus caballus*) keeping the grassland in as natural state as possible. Knepp has provided an interesting case study to examine, especially given the speed with which fast-declining species such as European Turtle Dove and Common Nightingale (*Luscinia megarhynchos*) returned to the estate (Tree, 2018). Evidently the scale is much smaller than the Government's proposed Northern Forest, but it is still extremely interesting with regards to the rate

of which these species returned to the area after such drastic changes in the land's management strategy.

There is an active beaver reintroduction programme currently in place in several regions of the UK, including Devon, Western Scotland and most recently Essex, in an attempt to increase biodiversity and reduce flood risk and, given the effects that arose from the Yellowstone reintroduction with regards to beaver populations and the subsequent trophic cascade that resulted from their return, a similar event in the UK would have enormous benefits for biodiversity and would certainly be a huge advancement in any rewilding campaign. The Knepp project provided a snapshot of what the British countryside could look like- it's just a question of expanding it.

However, it is important to understand that the generalizability of the Yellowstone project with regards to the UK is limited- firstly the size of Yellowstone compared to some of the proposed areas in the UK (Yellowstone is roughly 9,000km^2 and the Northern Forest is initially only going to be 120 square miles) means that the extent to which you can apply some of the population changes that resulted from the reintroduction in Yellowstone is limited due to the innumerable differences between the two ecosystems. Furthermore these differences will give rise to a vast number of variables, a lot of which will lie outside of human control- these may include climate, trophic systems, plant composition and myriad others which will undoubtedly influence the extent to which Wolves and the ecosystem around them can survive.

However, an important thing to remember is that the Yellowstone techniques don't have to be copied verbatim- the wolf taxon that we reintroduce was a factor mentioned earlier, but it won't be the same as the Yellowstone subspecies (which originated from Northern Canada). Adapting the taxon in this way may well limit the impact of certain variables such as the climate and any issues related to adapting to prey types. In addition, Yellowstone National Park and the UK aren't total polar opposites- in both instances, the ecological imbalance is/was caused by an overpopulation of a large mammal species due to an absence of an effective predator within the ecosystem. The problem is fundamentally the same, which then means a similar solution could certainly be implemented and achieve some form of results. Other factors can be controlled for- the number of Wolves released can be lower to account for the smaller area, and strategies with regards to the actual procedure can be adapted to account for differences such as Yellowstone containing far less infrastructure than the areas of the UK where Wolves could be reintroduced. As a

result of all this, the issue lying in the generalizability of the Yellowstone case study can be controlled for to such an extent that it may well become totally negligible.

Conclusion

Ultimately the actual effects of any wolf reintroduction lie purely within the scope of conjecture as nothing like this has ever been attempted in an ecosystem which has been so continuously and extensively destroyed as the ecosystem in the UK: the UK's ecological history has seen extinctions of native species including Wolves, bears and countless invertebrates, and there is currently a looming ecological crisis with regards to mass insect extinction (Sanchez-Bayo & Wyckhuys, 2019) and countless other species on the way to extirpation. Wolves will not be the 'magic bullet' in the British rewilding project and will not provide a total solution, but in the context of the ambitious plans to rewild Britain, Wolves can act as a real driver of change, as evidenced in Yellowstone (Ripple & Beschta, 2012) and, given the disastrous effects on woodland ecosystems that are wrought by deer overpopulation, Wolves can also help to preserve the ecosystems that are already present in the UK as well as new ones. As a result, a wolf reintroduction program in the context of a wider British rewilding scheme would be of great benefit to UK biodiversity.

Bibliography

Anderson et al. (2014). *Economic Analysis of Indemnity Payments for Wolf Depredation on Cattle in a Wolf Reintroduction Area.* University of California.

Bennett, O., & Sutherland, N. (2016). *Driven Grouse Shooting: Pack Prepared for Government Driven Grouse Shooting Debate.* London: House of Commons Library.

Bunting, R. (2019, February 27). *Trees for Life*. Retrieved from New action for threatened Highland woodlands and species: https://treesforlife.org.uk/news/article/new-action-for-threatened-highland-woodlands-species/

Climate-Data.Org. (2019, March 7). *Climate-Data.Org*. Retrieved from Climate Bialowieza: https://en.climate-data.org/europe/poland/opole-voivodeship/bia%C5%82owieza-449804/

Clutton-Brock, T., Coulson, T., & Milner, J. (2004, May 20). Red deer stocks in the Highlands of Scotland. *Nature*, pp. 429:261-262.

Compton, G. (2013). *2011 Census: Population Estimates by five-year age bands, and Household Estimates, for Local Authorities in the United Kingdom.* Office for National Statistics.

Glen Tanar Estate. (2019, February 27). *Glen Tanar Estate Blog*. Retrieved from Important Notice: Capercaillie & Path Closures: https://www.glentanar.co.uk/blog/important-notice-capercaillie

McNay, M. (2007). *A Review of Evidence and Findings Related to the Death of Kenton Carnegie on 8 November 2005 Near Points North, Saskatchewan.* Fairbanks, Alaska: Alaska Department of Fish and Game.

McNay, M. E., & Mooney, P. W. (2005). Attempted depredation of a child by a Gray Wolf near Icy Bay, Alaska. *Canadian Field-Naturalist*, pp. 119(2): 197-201.

Mech, D., & Boitani, L. (2003). *Wolves: Behaviour, Ecology and Conservation.* Chicago: University of Chicago Press.

Melling, T., Thomas, M., Price, M., & Roos, S. (2018, April 28). Raptor persecution in the Peak District National Park. *British Birds*, pp. 280-286.

Müller-Schwarze, D., & Sun, L. (2003). The Beaver: Natural History of a Wetlands Engineer. Cornell University Press.

Natural England. (2019, February 13). *Department for Environment, Food & Rural Affairs (DEFRA).* Retrieved from Lynx reintroduction in the Kielder Forest: Natural England advice to the Secretary of State: https://www.gov.uk/government/publications/lynx-reintroduction-in-kielder-forest/lynx-reintroduction-in-kielder-forest-natural-england-advice-to-the-secretary-of-state

Nilsen, E. B., & Coulson, T. (2007, January 30). Wolf reintroduction to Scotland: public attitudes and consequences for red deer management. *Proceedings of the Royal Society B*, pp. 995-1003.

Nolan, P. (2019, March 7). *Town & Country Planning.* Retrieved from Why a new Northern Forest is worth the investment: http://communityforest.org.uk/resources/Northern%20Forest%20article%20for%20TCPA%20Journal.pdf

Parker, B. (1997, March). *North American Wolves.* Lerner Publications. Retrieved from International Wolf Center.

Perry, R. (1978). *Wildlife in Britain and Ireland.* London: Taylor and Francis.

Poole, T. (2011, September 29). *Habitat Requirements of the Capercaillie: The Future of Scotland's Woodland Grouse.* Retrieved from Forestry Commission: https://scotland.forestry.gov.uk/images/corporate/pdf/woodlandgrouseTimothyPoola.pdf

Putman, R., & Moore, N. (2002, May 1st). Impact of deer in lowland Britain on agriculture, forestry and conservation habitats. *Mammal Review*, pp. 28:141-163.

Ripple, W. J., & Beschta, R. L. (2012, January). Trophic cascades in Yellowstone: the first 15 years after wolf reintroduction. *Biological Conservation*, pp. 205-213.

Rosell et al. (2005). Ecological impact of beavers Castor fiber and Castor canadensis and their ability to modify ecosystems. *Mammal Review*, pp. 248-276.

RSPB. (2019, February 13). *RSPB*. Retrieved from Turtle Dove Extinction Appeal: https://www.rspb.org.uk/join-and-donate/donate/appeals/turtle-dove-extinction-appeal/

Sanchez-Bayo, F., & Wyckhuys, K. A. (2019, April). Worldwide decline of the entomofauna: a review of its drivers. *Biological Conservation*, pp. 8-27.

Thomas, J. W., & Toweill, D. (2002). *Elk of North America: Ecology and Management.* New York: HarperCollins.

Tree, I. (2018). *Wilding: The Return of Nature to a British Farm.* Pan Macmillan.

Wäber, K., Spencer, J., & Dolman, P. (2013, March 7). Achieving landscape-scale deer management for biodiversity conservation: The need to consider sources and sinks. *The Journal of Wildlife Management*.

Wegge, P., & Kastdalen, L. (2007, January). Pattern and causes of natural mortality of capercaillie, Tetrao urogallus, chicks in a fragmented boreal forest. *Annales Zoologici Fennici*, pp. 141-151.

Wilson, C. J. (2004, March 31). Could we live with reintroduced large carnivores within the UK? *Mammal Review*, pp. 34:211-232.

Woodland Trust. (2019, March 7). *Woodland Trust Blog*. Retrieved from Ten rarest woodland animals: https://www.woodlandtrust.org.uk/blog/2016/04/ten-rarest-woodland-animals/

Wright, J., Jones, C., & Flecker, A. (2002). An ecosystem engineer, the beaver, increases species richness at the landscape scale. *Oecologia*, pp. 96-101.