Enacting connectivity: woodland mammal conservation practices in England & Wales

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Abstract

In recent years ideas about connectivity have become increasingly influential in theories pertaining to wildlife conservation. These ideas range from concerns with spatial habitat linkages or species' movements, to the forms of connection existing between 'people' and 'nature'. This thesis is concerned with how these various forms of connectivity are enacted in wildlife conservation through varied spatial practices. Following Mol (2002), I suggest that these modes of connectivity are enacted not separately but as a multiple. Indeed, through tracing how connectivity is enacted in a series of conservation situations relating to woodland mammals in England and Wales (red squirrels, pine martens, and wild/feral boar), I suggest that these multiple spatial practices of connectivity shape the biopolitical possibilities for living with non-human life. Since the connectivity multiple is composed, following Latour (2010) I further argue that it can be recomposed. Thus, I make the normative suggestion that contemporary trends in conservation policy (towards larger-scale action, process-based objectives, and neoliberal modes of governance) might be rethought and differently articulated through a conceptual and practical approach I term **revitalizing conservation**. This thesis thus makes several important contributions to geographic literatures. Following a widespread (re)affirmation of nonhuman agency in social science (e.g. Latour, 2005; Callon *et al*, 2009; Braun & Whatmore, 2010), and particularly the agential capacities of animals (Wolch & Emel, 1998; Philo & Wilbert, 2000), it foregrounds the role of woodland mammals in enacting connectivity through developing the concept of **animal mobilities.** Furthermore, it engages with existing work tracing affirmative possibilities for conservation (bio)politics (Whatmore, 2002; Lulka, 2009; Hinchliffe *et al*, 2005; Hinchliffe, 2008; J.Lorimer, 2010, 2012, 2015), by illuminating the intersection of spatial practices of connectivity, and the potential these offer for alternative modes of 'living with' more-than-human lives.

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INTRODUCTION

"5. Wild boar became extinct in England at least 300 years ago. However, over recent years a small number of feral wild boar populations have become established as a result of escapes and deliberate releases from wild boar farms.
6. There are three established feral breeding populations; the largest, in Kent/Sussex was estimated in 2004 at approximately 200 animals in the core distribution area, the second largest in the Forest of Dean/Ross on Wye area, where there may be in excess of 50 animals, and the smallest, in west Dorset, where there are still believed to be fewer than 50 animals. Since winter 2005/6 significant escapes/releases have resulted in animals colonising areas around the fringes of Dartmoor and evidence of breeding in the wild has been recorded (Natural England data). These are considered as an additional single new breeding population and it is currently estimated (Natural England estimate, based on reports and records) that there are up to around 50 animals in this population. There have also been further release incidents in Devon in 2007, potentially resulting in many 10s of animals being left in the wild. The English feral wild boar population is estimated at probably no more than around 500 in the established populations, and almost certainly fewer than 1000 in total."

From DEFRA (2008:3) ***Feral wild boar in England: An action plan***

1. Introduction

It is a time of great change in wildlife conservation. Widespread failure to meet the 2010 target of halting biodiversity loss (Butchart *et al*, 2010) has shown existing modes of conservation to be inadequate. Static protected areas, a key part of the dominant approach (Adams, 1997; Brockington *et al*, 2008), are criticized as being necessary but insufficient (Rosenzweig, 2003); a shift of focus from species towards processes is gaining pace (Pressey *et al*, 2007; Bennett *et al*, 2009); and a raft of market mechanisms are being developed through which to achieve conservation goals (Büscher *et al*, 2012). For a period under what might be termed the 'biodiversity conservation' regime, theory, policy and practice in conservation were largely aligned. This is no longer the case. And as the paradigm of static, species-based conservation has begun to break down (albeit tempered in pace by an inevitable institutional and practical inertia), a diversity of innovative and experimental approaches to conservation have emerged (J.Lorimer, 2012; Lorimer & Driessen, 2014).

One of the key challenges to the traditional mode of conservation has come from the promotion of ideas about **'connectivity'** (Jongman & Pungetti, 2004; Crooks & Sanjayan, 2006). This notion has been understood in a variety of ways, of which the most influential in conservation theory relate to either spatial habitat linkages, or the functional movement of species through space (Lindenmayer & Fischer, 2006). The importance of these various forms of connectivity has been increasingly recognised by policymakers in many western jurisdictions, albeit at different speeds, and at a range of spatial scales (Ahern, 2004; Remm *et al*, 2004). In England, this recognition led to a government-commissioned inquiry into the status of the country's wildlife; the question was framed by the environment minister, thus:

> *"With the effects of climate change and other pressures on our land, now is the time to see how we can enhance ecological England further. Linking together areas to make ecological corridors and a connected network could have real benefits in allowing nature to thrive".*
>
> (Lawton *et al,* 2010:ii)

At the same time as structural and functional ideas have risen to prominence in conservation theories, the last several decades have also seen increasing attention paid to another form of connectivity: that between humans and 'nature'. Indeed, the increasing lack of such a 'connection' is a familiar culprit in analyses of environmental degradation; and a pressing need to 're-connect people and nature' is identified as a crucial step towards effective wildlife protection within much conservation discourse (HMG, 2011). This represents a somewhat different register of connectivity; but in this thesis, I make the argument that these varied forms of connectivity – relating to habitat contiguity, species' movements, and human-nature relations – are inextricably interwoven. Connectivity, I will suggest, is best thought as a multiple.

1.1 Key arguments and contributions

I begin by summarizing the key arguments advanced in the thesis, and outlining the contributions it makes to various geographic literatures.

Key arguments: In the chapters that follow, I suggest that various spatial practices within conservation (following Whatmore & Thorne, 2000) enact what I term **territorial, ecological,** and **socionatural** modes of connectivity. Furthermore, following Mol (2002), I suggest that these modes of connectivity are enacted not separately but as a multiple. Through tracing how connectivity is enacted in a series of conservation situations relating to woodland mammals in England and Wales, I suggest that these multiple spatial practices of connectivity shape the biopolitical possibilities for living with non-human life (following Haraway, 2008). Since this multiple is composed, following Latour (2010) I further argue that it can be recomposed. Thus, in the final chapters I suggest that contemporary trends in conservation policy (towards larger-scale action, process-based objectives, and neoliberal modes of governance) might be rethought and differently articulated through a conceptual and practical approach I term **revitalizing conservation**.

Contributions: This thesis thus makes several important contributions to geographic literatures. It engages with existing work tracing affirmative possibilities for conservation (bio)politics (Whatmore, 2002; Hinchliffe *et al*, 2005; Hinchliffe, 2008; J.Lorimer, 2010, 2012, 2015), by illuminating the intersection of spatial practices of connectivity, and the potential these offer for alternative modes of 'living with' more-than-human lives. Furthermore, following a widespread (re)affirmation of nonhuman agency in social science (e.g. Latour, 2005; Callon *et al*, 2009; Braun & Whatmore, 2010), and particularly the agential capacities of animals (Wolch & Emel, 1998; Philo & Wilbert, 2000), it foregrounds the role of woodland mammals in enacting connectivity through developing the concept of **animal mobilities.** And thus also, in attempting to take account of these animal mobilities, the thesis contributes to the contemporary interest in, and development of, **modes of attunement** as research methodology.

This chapter: My remaining aims in this introductory chapter are threefold. First, I suggest that connectivity practices in wildlife conservation are of significant and pressing interest in their own right. Species continue to go extinct, and contributory factors including environmental degradation, fragmentation and destruction remain prevalent in many places (Butchart *et al*, 2010; Di Marco *et al*, 2014); as suggested above, existing approaches to conserve wildlife are falling short (Hoffman *et al*, 2010). Ideas about connectivity are increasingly being seen as part of a new solution, in both theory and practice (Worboys *et al,* 2010). But whilst theories about connectivity have seen effusive conceptual development across many (mostly scientific) academic disciplines, actual practices of (multiple) connectivity in wildlife conservation have received scant academic attention.

Second, I discuss in more detail why the study of 'connectivity practices' is of wider interest to contemporary geographers. I suggest that it affords the development of post-binary concepts through which to make sense of the more-than-human relations and connections inherent in

environmental management in the 'Anthropocene' (see J.Lorimer, 2012). Furthermore, I suggest that it can contribute to building the interdisciplinary bridge that has long been mooted on the banks of physical and (more-than) human bio-geographic research streams (Spencer & Whatmore, 2001; J.Lorimer, 2010b).

Third, I codify the aims that guide this research: aims that focus on exploring the enactment of various (interlinked) modes of connectivity in conservation practice. I also briefly outline the criteria through which conservation practices relating to woodland mammals in England and Wales were selected for empirical analysis. In particular, the research focussed on the situations relating to three species: red squirrels, pine martens, and wild boar; each is introduced in turn. The introduction finishes by outlining each of the chapters that follows.

1.2 Connectivity and wildlife conservation

"Biodiversity conservation is a fundamentally spatial practice"
(Adams *et al,* 2013).

In this section I set the context for the emergence of connectivity practices within the theory and practice of wildlife conservation. I suggest that multiple forms of connectivity have been afforded greater importance and influence due to four main factors: (i) the inadequacy of existing protected areas; (ii) the implications of climate change for static spatial conservation strategies; (iii) evolving understandings of the dynamics of complex (eco)systems; and (iv) concerns about the implications of segregating 'natural' from 'human' spaces. I begin with some history.

Theoretical ideas about structural and functional connectivity have grown to prominence over the last two decades, at a time when wildlife conservation theory and practice has been dominated by a residing and historically embedded paradigm of spatial protection through reserves (Brockington *et*

al, 2008; Adams *et al*, 2013). The primary concern in wildlife conservation has long been to halt the accelerating trend of species extinctions, largely attributable directly or indirectly to human activity (Sutherland, 1998; Primack, 2006). Habitat loss is usually cited as the predominant factor, with (resulting) fragmentation also playing a significant role (IUCN, 2004). As such, protecting particular habitats through spatial protection has long been thought an obvious, achievable, and - on some measures, perhaps - effective approach.

Historically national parks, nature reserves, and many additional forms of protected area were created for a variety of reasons; they included wildlife protection, game management, the preservation of aesthetically valued landscapes, and tourism (Adams, 2004; Sinclair et al, 2006; Brockington *et al*, 2008). However, from the 1970's onwards much of the theoretical support for reserve creation came from a particular spatial imaginary: MacArthur & Wilson's (1967) equilibrium theory of island biogeography (Kingsland, 2002; Haila, 2002). The same period (the past four decades) also saw an explosive increase in the number of reserves, and the land area they cover. Drawing on UNEP's World Database on Protected Areas, Chape *et al* (2005) suggested that by the time of their report over 12% of the planet's surface had become subject to some form of protective designation; as they suggest (p.443), "*These areas represent one of the most significant human resource allocations on the planet".* As such, significant attention within biogeographic research has been focused on the most effective or efficient ways to select areas to protect (Margules & Pressey, 2000; Myers *et al* 2000; Margules & Sarkar, 2007).

Island biogeography's influence on reserve creation and design derives from drawing an analogy between terrestrial habitat fragments and oceanic islands; utilizing the theory's explanation of species richness patterns on the latter to inform management of the former (Haila, 2002). The theory suggests that for a given region or island chain, the two local factors determining the number of species on islands are: (1) the size of the island in question (reflecting the species area-relationship,

with area determining the extinction rate); and (2) the isolation of that island (distance from the mainland determining the immigration rate). Furthermore, it suggests that the total number of species per island would, over time, tend towards a dynamic equilibrium (Whittaker & Fernández-Palacios, 2007). Despite referring specifically to oceanic islands separated by a marine environment, the insights of MacArthur & Wilson's theory were increasingly applied to nature reserves separated by a terrestrial matrix of anthropogenically-impacted land uses (Massa *et al,* 2004). These reserves were thus theorised as 'islands', and their effectiveness again judged in terms of area and isolation (Wiens, 2006). In operational terms, this meant that conservationists mainly concentrated on increasing the area covered by reserves. Indeed, isolation was somewhat overlooked in comparison.

Emerging ideas about connectivity unsettle the protected area paradigm in two important ways. First, they place renewed emphasis on addressing isolation rather than area as a means to protect species diversity. Thus, staying within the logics of island biogeography, this shift in emphasis is significant because it affects the hierarchy of priorities for conservation action. Instead of simply focusing on increasing the size and number of static protected areas, theories of connectivity suggest that the isolation of a reserve is not simply a fixed factor of its spatial co-ordinates relative to other reserves (Lindenmayer & Fischer, 2006). Instead, isolation can be intervened upon, in structural and functional ways. Structural interventions include the creation of corridors of habitats between existing reserves, rather than increasing the size of the reserves themselves; functional interventions act to increase the permeability of the matrix between particular habitats for particular species (see chapter two). Both address the area-isolation determination of species diversity by acting on the latter of these variables. Such thinking draws on a long line of biogeographic thought in reserve design that can be traced back to the work of Diamond and others in the 1970's (Diamond, 1975; see also Triantis & Bhagwat, 2011). The difference in contemporary work is a renewed emphasis on connectivity, the effort to link existing reserves in more than structural ways, and the development of new tools to inform the establishment of connectivity at the design stage. Some biogeographers

go further, suggesting that addressing isolation rather than area is more than a matter of emphasis; existing protected areas, such authors argue, are hopelessly inadequate in size (Rosenzweig, 2003).

Second, emergent ideas about connectivity also challenge the reserves-as-islands analogy from the outside. Emphasizing landscape permeability undermines the notion of reserves as islands set in a hostile sea; landscapes are seen more as differentially fluid in terms of possible movements (Forman, 1995; Manning *et al*, 2009). The influence of landscape ecology is notable here, wherein the matrix is seen not as a 'sea', but as "*the largest background patch in a landscape, which exerts a dominant role on ecological processes*" (Lindenmayer & Fischer, 2006:142). Metaphors matter (Botkin, 1990; Väliverronen, 1998; Väliverronen and Hellsten, 2002). When framed as islands, reserves are imagined, constructed and enacted as separate spaces: they perpetuate a separation between the 'human' and the 'natural' which I will discuss further in later chapters. When, by contrast, reserves are instead framed as interconnected spaces set within a differentially permeable landscape, there is a significant shift in the metaphorical – and practical – imaginary. For example, Rosenzweig's solution to the problem of (always) spatially-inadequate reserves is "Reconciliation Ecology", which he describes as an approach that: *"discovers how to modify and diversify anthropogenic habitats so that they harbour a wide variety of wild species ... it seeks techniques to give many species back their geographical ranges without taking away ours*" (2003:201). Not separate, such habitats are understood as embedded and enmeshed. As the forthcoming chapters will endeavour to make clear, this has real and pressing implications for conservation practice at many levels.

However, whilst shifts in biogeographic theories have significant implications for the theory and practice of wildlife conservation, this is not to endorse a naïve linear model of 'theory leading practice'. As I will discuss later, much work in Science and Technology Studies (STS), and similarly inspired geographical research, demonstrates that the links between theory and practice are more entangled than such an idealized model suggests; with multi-directional flows, movements and

translations occurring between and amidst the various materialities within which theory, policy and practice are engaged (Law, 2004). Worlds, such authors remind us, push back (Thrift, 2008).

In the case of static protected area conservation, this push-of-worlds has been made particularly visible through four loose groupings of knowledge-practices. First, scientific, bureaucratic, and lay measurements of the biodiversity outcomes of protected area conservation repeatedly point to the inadequacy of small and fragmented protected areas in protecting the diversity for which they have been designated (Lawton *et al,* 2010, and references therein). Species extirpations and extinctions continue apace (Butchart *et al*, 2012). Organisms die in situ, move, or die trying. Put plainly: in aggregate, it hasn't worked.

Second, both observed and predicted movements of species linked to changing climates point to the inadequacy of static spatial protection in an ecologically and climatically dynamic world. Without connectivity, many species cannot move along with shifting climates; even with connectivity, some may not be able to move fast enough to cope with the speed of change widely predicted (Thomas *et al,* 2004; Loarie *et al*, 2009). The static reserves may, in time, be in the wrong places (Scott *et* al, 2002; Araújo *et al*, 2004). Protected areas that are dynamic in space and time may be necessary (Bengtsson *et al,* 2003; Rayfield *et al*, 2008; Game *et al*, 2009).

Third, further conceptual and theoretical developments in cognate fields have influenced the development of biogeographic theory, unsettled some taken-for-granted assumptions and opened up new directions of research. The shift from static to dynamic understandings within ecology is exemplary in this respect (Adams, 1997); including the development of metapopulation theory (Hanski & Gilpin, 1996), and the increasing emphasis given to concepts such as disturbance (Turner & Dale, 1998), resilience (Holling 1973; Gunderson & Holling 2002), patch dynamics (Pickett *et al* 1997), thresholds (Scheffer *et al,* 2001; Groffman *et al*, 2006), species interactions (Soulé *et al*, 2005), and

above all movement through space and time (Willis and Birks, 2006; Froyd and Willis, 2008; Manning *et al*, 2009).

Fourth, as alluded to above, the spatial protection paradigm has been increasingly problematized due to the inherent accompanying and constituting practices of exclusion. On one hand, reserves are explicitly created to protect nonhuman communities from anthropogenic impacts (Primack, 2006). Instances of the forcible eviction of human communities from traditional lands in order to create and manage nature reserves have been well documented (Brockington, 2002; Hoole & Berkes, 2010). As I will outline in chapter two, such actions rely on forms of territorialisation that deliberately curtail connectivity between 'human' and 'natural' worlds. But on the other hand, as suggested earlier, it is this very lack of connectivity 'between people and nature' that is being increasingly blamed for environmental apathy and ensuing degradation (e.g. HMG, 2011). Of course, many nature reserves are deliberately and actively managed to perform a particular type of managed human-environment interaction, as I will discuss in chapter five. However, the wider point about spatial segregation stands (see chapter seven), and thus contributes to the wider crisis with the protected-area-paradigm.

The result of the empirical & theoretical work noted above is a growing concern about the efficacy of the protected area paradigm in its current form. Static spatial protection made sense when valued communities of non-human life were imagined to be rooted in particular spots and developing towards an equilibrial climax; it makes sense somewhat differently in worlds marked by dynamic, shifting, disequilibrial ecologies (Adams, 1997). It is in this context that connectivity has emerged as an increasingly important (albeit diverse) set of ideas and practices. In chapter two, I explain several key ontologies of connectivity that have been developed within various academic disciplines concerned with wildlife conservation, and develop a series of concepts through which to make sense of associated connectivity practices. Here, the following section positions this concern with

connectivity as practiced in wildlife conservation, into a wider context of geographic work concerned with human-environment relations.

1.3 Connectivity and academic geographies

It has become almost obligatory in recent years to frame research into human-environment relations, particularly where such relations are evidently co-constitutive, in terms of the 'Anthropocene'[1]. Following a McKibbenite chain of reasoning, recognising humanity as a geologic force serves to undermine, once and for all, the binary separation of 'humans' and 'nature' (Castree, 2014a). Debates about whether such a binary ever made sense are, apparently, moot in the face of the inescapable collective agency of the species *homo sapiens.* Seemingly it doesn't matter whether 'pristine nature' ever existed. Perhaps the very idea was undermined by environmental historians, sociologists of science, and geographers (for examples, see Cronon, 1996; Latour, 1999; Castree, 2005a). Or perhaps humanity's thirst for fabrication, food and fossil fuels led to the end of nature (McKibben, 2006). Either way, we killed it; no use worrying about the dead. Of course, the real claim made through the Anthropocene concept relates to the level of humanity's impact on the rest of our shared world; it is the scale rather than the existence of human agency that is proposed as novel in the present era. But the danger with this concept is that used loosely it distracts attention from efforts to re-think human-environment relations in non-binary terms. Indeed, by presenting humans as a somehow dominating force (albeit a myopic and mostly ignorant one) over 'the natural world', the Anthropocene concept seems to re-establish the colonial binary of dominating humans on one hand, and a 'natural world' in need of (hu)management on the other (e.g. Neumann, 1996; Adams, 2003). Yet this very idea of planetary agency can also be read differently; Castree for example, finds in the work of both Clark and Yusoff the hope that, *"a proper recognition that we are both children of the Earth and yet now a planetary force in our own right might engender a new sensitivity and a new*

[1] Castree's three-part exploration of the Anthropocene concept suggests a somewhat limited prior engagement with the concept by geographers. Since his 2014 papers (and arguably before as well), there has been a proliferation of such engagements, particularly in non- or pre-publication events.

humility" (2014b:456). The Anthropocene can, therefore, be read in different ways (J.Lorimer, 2015); for example, Johnson & Morehouse (2014:444) suggest an affirmative reading that emphasizes, "*the space it opens for experimental socio-ecological practices*" in "*ecological politics*".

Wildlife conservation practices are very interesting in the context of debates about the Anthropocene (Lorimer & Driessen, 2014; J.Lorimer, 2015), and practices of connectivity especially so. In many ways, wildlife conservation represents the key site through which questions of connection, interaction, impact, management and responsibility are addressed. Within wildlife conservation, ontologies of nature are not simply discussed, they are performed: different understandings of the ontological status of nature lead to different conservation objectives, strategies, and action. As such, exploring how various forms of connectivity are enacted in wildlife conservation affords detailed reflection on the modes and manner of human-environment relations both envisaged and performed. Considering connectivity thus serves as an antidote to the broadbrush universals implied in Anthropocenic thinking; as well as pointing towards possible modes of engagement beyond such logics.

Geographers have tended to engage with modes of connectivity that relate either to the geometric relations between non-humans (traditional biogeography), or the topological relations between humans and the(ir) environment(s) (human geography); both are discussed in more detail in chapter two (as are the differences between topological and geometric forms of spatial thought). Practices of wildlife conservation are often foregrounded in both types of analysis. Traditional biogeographers, in conjunction with the cognate fields of landscape ecology and conservation biology, produce (nonhuman) connectivity analyses to measure, monitor, inform and guide conservation management practices (Crooks & Sanjayan, 2006; Worboys *et al,* 2010); human geographers turn a critical eye to conservation situations as telling exemplars of many aspects of human-nonhuman interaction, relation, domination or co-habitation (Whatmore, 2002*;* J.Lorimer, 2015). Occasionally physical

geographers have included humans in their analysis, although normally separated spatio-temporally as a downstream issue of management, support, and blackbox politics (Ladle & Whittaker, 2011). Much more frequently, human geographers have attempted to take seriously ecological materialities and agencies in analyses of conservation situations (Whatmore, 2002; Hinchliffe *et* al, 2005; Barua, 2014a; Lorimer & Driessen, 2014). However, and despite some recent and compelling exceptions (e.g. Mason, 2013), little work has as yet explored the ways in which multiple modes of connectivity are, together, enacted.

1.4 Aims, multiples, situations.

In section 1.2 I set out the context for the emergence of connectivity practices in wildlife conservation; and in section 1.3 I suggested why these are of interest to geographers in more broad terms. Following on from those discussions, here I clarify the aims of this research project, before introducing the empirical situations through which these aims were addressed:

> The central aim of this research is to explore ***how connectivity is enacted in conservation practice***.
>
> A further aim is to ***develop conceptual resources through which multiple modes of connectivity might be (re-)imagined.***

Within these aims, the central notion of connectivity is explicitly conceptualised so as to encompass both the various forms of connectivity found in conservation science, and the concerns about human-natural connections expressed in both conservation practices and academic theory. The suggestion implicit within such a framing is that connectivity can be re-thought as what Mol (2002) describes as a 'multiple'. The multiple, as Mol describes it, is "*more than one – but less than many …* [it] *is not fragmented. Even if it is multiple, it also hangs together*" (2002:55; also cited in Law, 2004). Law notes that multiplicity is not pluralism; the latter allows for many distinct realities, whereas the

former addresses the mess in which such realities "*overlap and interfere with one another"* (Law, 2004:61, emphasis in original). Mol's concept of the multiple has thus been utilised to conceptualise the ways in which difference is enacted through coherent multiplicities, such as salmon (Law & Lien, 2012) and badgers (Atkins & Robinson, 2013). Here, I use the concept of the multiple to understand connectivity as not so much as *constructed* (and therefore stabilized), but as *enacted* through practices (see Law, 2002; 2004:55-65).

In chapter two, I will explore what appear at first glance to be separate and distinct modes of connectivity practice. At first glance, demarcating habitat types, measuring their contiguity, and designating existing linkages as reserves are all very different practices, based on a very different understanding of connectivity, compared to musing about or trying to improve the 'connections' between 'people and nature'. On the face of it, structural and functional understandings of connectivity developed within conservation science have little to no common ground with the applied philosophies of posthuman and/or more-than-human geographers. And yet my aim in this thesis is to argue that there is such a common ground. Indeed, I suggest that rather than being so very different, instead these connectivities are, following Mol (2002:55), *"more than one, but less than many"*. As this introduction has suggested, connectivity in traditional biogeography is already enacted as a multiple; so the movement here is not from singularity to multiplicity, but towards an enriched multiplicity. Thus, this is not an attempt to synthesize various modes of connectivity into some kind of singular solution, and thus denying *"the possibility of an explicit ontological politics"* (Law, 2004:137); but rather an attempt to explore the messiness of connectivity practices in some situated (and overlapping) worlds of wildlife conservation. However, unlike the various enactments of atherosclerosis traced by Mol in the Netherlands' "Hospital Z", these multiple connectivities are *not* commonly thought to represent the same thing. Thus I use the notion of the multiple to do something different: not to proliferate an assumed unity, but to tie together (albeit not unite) an assumed plurality.

In section 1.2, I suggested that the notion of 'connectivity' has become increasingly important within conservation theory in recent decades. The intuition that sparked this research is that the increasing attention paid to connectivity in scientific theory will in some way influence, reflect, and/or intersect with wildlife conservation as it is actually practiced. If connectivity is given more weight in theory, perhaps it is given more weight also in policy, and on the ground. Yet, as Hinchliffe (2008) demonstrates, 'conservation in theory' and 'conservation in practice' are not the same thing. Tracing the development of theoretical ideas is important, but by no means sufficient to understanding contemporary practice. Instead, the aim here is to view the development, dissemination, and re-configuration of theory as a particular (and important) knowledge practice – or series of practices – that influences and interacts with many other forms of practice within enactments of wildlife conservation. These other forms of practice are diverse, and include the creation and implementation of policy; the designation and management of reserves; species-specific actions to promote or hinder the lives or movements of particular organisms; the assembly of interested peoples and publics; the identification, generation and/or utilisation of 'affective atmospheres' (McCormack, 2008); and the (un/intentional) acts of a variety of more-than-human actors. All these and more are encountered in what follows.

Selecting situations

'Wildlife conservation' is shorthand for a huge diversity of practices taking place all over the world. As such it is, perhaps, deceptive in the simplicity of its signification. Wildlife conservation might involve actions to protect coral reefs under the ocean, flowering plants in mountaintop refuges, endangered bird species within cities; these actions might be organised around individual organisms or particular populations, species and/or habitats, specific pieces of genetic code, or even around particular ecological processes; they might be informed by concepts including biodiversity,

ecosystem function, population genetics and/or connectivity (to name but a few); and could be initiated, performed, or funded by individuals, local groups, conservation organisations, government and international agencies (Sutherland, 1998, 2000; Hambler, 2004; Borgerhoff Mulder & Coppolillo, 2005; Primack, 2006). These are just some of the many possibilities.

Investigating the enactment of connectivity within wildlife conservation is thus, if envisaged exhaustively, the work of many lifetimes. As with much socio-ecological research, bounding is necessary (whatever Latour might say). As chapter two will demonstrate, existing texts seeking to draw together instances of 'connectivity conservation', in particular the few edited volumes compiled in recent years (Jongman & Pungetti, 2004; Crooks & Sanjayan, 2006; Worboys *et al*, 2010), have tended to focus on exemplary cases where connectivity – usually conceived in structural terms – has been the deliberate, explicit, and primary goal within a project. Such examples are interesting and important, pointing as they do towards emerging practices and the various new challenges thus encountered. However, such projects have also, for the most part, been deliberately restricted to a somewhat narrow view - in two senses. In the first sense, by restricting their enquiries to the exemplar cases of connectivity conservation, they have not taken account of the enactment of connectivity amongst wildlife conservation in more broad terms. And second, by focussing on a narrow, traditional biogeographic understanding of connectivity, they have often missed out on the richness that a more relational, re-thought conception of connectivity might provide, presage, or enable. On this latter point, Mason's (2013) doctoral thesis is an important and informative exception, in which ideas about connectivity are helpfully pluralized through exploring the role of canals as connective achievements. Therein, Mason develops the concept of "recombination" through a sustained engagement with Bennett's (2001, 2010) work on vital materialism, and particularly the notion of 'enchantment' (through which affective attachments are generated between all manner of lively actors). My thesis is resonant with Mason's, but adds to it through: (i) considering situations beyond exemplar cases of structural connectivity; (ii) an explicit focus on the

multiplicity of connectivity and the resultant implications for conservation (bio)politics; and (iii) by foregrounding of the role of nonhuman mobilities in enacting connectivity.

In this research, therefore, my aim was not to cherry-pick the best examples of corridor creation, habitat connection, or facilitation of functional movement. Nor was it to limit my enquiry to connectivity narrowly conceived. Yet widening the inquiry ran the risk of uncontrollable proliferation. In order to bound this research I sought to explore situations in which connectivity practices might be expected to be evident, but were not explicitly the main focus of action; situations that whilst not representative of wildlife conservation in either a broad or a narrow sense, were still informative about contemporary practices beyond their own particularities; and situations in which 'connectivity' was an **actor's category** – something that, for the human actors at least, framed and directed some aspects of conservation practice.

To select these situations, I made three decisions. The first was to select a political and physical geography for the inquiry, to see how different situations have and might occur within a broadly similar ecological, political, cultural and biogeographic context. The second, to focus on a specific type of habitat; once again, analogous to but not synonymous with the idea of 'holding things constant' within more reductionist forms of inquiry, the aim was to explore situations which shared certain socio-ecological similarities, but nevertheless differed in meaningful ways. The third decision was to foreground conservation activities in relation to a particular type (class) of species. There are, of course, compelling critiques of the species-focus within conservation (Biermann & Mansfield, 2014); there are also significant changes occurring within contemporary practice that perhaps de-emphasize the primacy of the species unit (Pressey *et al*, 2007); but species-logics (and species understood, constructed and governed as populations) continue to organize much conservation in practice. This species focus thus aims to reflect (but not represent) the dominance of species-based organisation for conservation activities in the particular geography selected, yet also to provide a

critical lens through which to reflect on significant contemporary changes occurring in this organisational regime.

Woodland mammals in England and Wales

Through this decision framework, the project was centred on conservation practices with respect to woodland mammals in England and Wales. I chose to focus on England and Wales for four reasons: (i) both countries have long histories and rich cultures of wildlife conservation (Adams, 2004); (ii) they are both marked by an ecology in which humans are a major influence, making them particularly relevant site for exploring the impact of changing conservation practices in the 'Anthropocene'; (iii) despite much in common, I suspected there might be important and perhaps telling differences between the ways in which connectivity is enacted between the two (united) nations; and (iv) I am personally interested and familially rooted in these places.

The decision to investigate conservation activities based in woodlands was not arbitrary, but neither should it be viewed as representative, at least in the sense where the example stands for the many. Woodland connectivity is not synonymous, nor often even analogous, to freshwater connectivity, or the aerial connectivity between far-flung wetland sites. Woodland connectivity is, however, the archetypal example of both structural and functional connectivity used in many textbooks (e.g. Primack, 2006) and policy documents (e.g. Lawton *et al,* 2010). Furthermore, forest fragmentation is measurable, quantifiable, and thus easily drawn into both ecological theory and planning (e.g. Zhou & Troy, 2009). Thus, if theories about connectivity have influenced and intersected with wider conservation practices, outside of the flagship projects of 'connectivity conservation', then woodland habitats are prime examples of situations of where this is more likely to occur.

Woodland habitats in England and Wales support a huge variety of species types, yet I chose to focus in particular on mammals. My reasoning was based in the priority that mammal species often gain within wildlife conservation relative to other taxonomic groups (Caro, 2010), as well as on the particular agency of mammals relative to other popular groups such as birds, butterflies, or various plants. Woodland mammals, unlike birds or butterflies, cannot fly between forest fragments, so ideas about structural as well as functional connectivity might be expected to have influence within conservation practice. Furthermore, mammals are especially interesting in the evolving policy context because they move on human timescales unlike, for example, trees. Finally, terrestrial woodlands and woodland mammals have been the disproportionate focus of many early attempts at promoting 'connectivity conservation' internationally (see Jongman & Pungetti, 2004; Anderson & Jenkins, 2006; Worboys *et al*, 2010); so it is likely that connectivity might be important even in woodland mammal projects not explicitly framed in such terms. Thus, woodland mammals seemed (and still seem) an appropriate choice for investigating connectivity in practice: they are a 'mainstream' example of wildlife conservation practices, which speak to diverse modes of connectivity, and live on a timescale where activities that aim to effect connectivity may be more visible.

Yet alternative paths were available. For instance, I could have focussed on a series of particular wooded places to see how ideas and practices of connectivity played out in particular locales for a variety of species, including humans. Mason, in her recent research on canals and connectivity, uses a similar site-based approach to great effect (Mason, 2013). However, the benefit of focussing on species was that it allowed me to compare and contrast how ideas and practices fared in a variety of spaces and places. Following mammals thus introduced a degree of mobility into the research design that fully place-based case studies might have denied (see discussion of multi-sited ethnography in chapter three). There is of course a bias, or irony, here that I need to make explicit. A key part of this thesis is the suggestion that enactments of connectivity play a significant role in a contemporary shift

away from a static, bounded-place approach and towards a new mode of landscape-scale, embedded, movement and mobility-based wildlife conservation (see later chapters). In an important sense, focussing the research design on mobile species rather than static protected places presumes this conclusion; it is a case of selective sampling. Deliberate, of course; yet also necessitating reflexivity in research practice.

Three 'types' of woodland mammal guide this research: red squirrels, pine martens, and wild boar. The first two are recognized in official policy as conservation priorities, whilst the latter sits somewhat uncomfortably within prevailing regulatory regimes and modes of wildlife management. Connectivity practices differ significantly between the three. For pine martens, connectivity (understood in structural and ecological terms) is desired and required; for red squirrels, it is to be controlled; for wild boar, the situation is unclear. The situations of all three species also raise interesting and informative questions about the forms of human-nature connectivity enacted through conservation practice. Thus, considered together, these three species afford ample opportunity to explore how connectivity is enacted as a multiple, and in a variety of seemingly conflicting ways. Below, I will introduce each species in brief; further detail is introduced as appropriate throughout the thesis.

Pine martens

To the surprise of some people, pine martens are not birds[2]; in taxonomic terms they are mustelids, carrying the designation *Martes martes*. Larger than stoats, weasels and polecats, they tend to be similar in size to a 'small domestic cat' (Birks, 2002:5). They are predatory carnivores but omnivorous feeders, existing on a varied diet of smaller mammals and birds, carrion, amphibians, honey, berries and invertebrates (Balharry *et al,* 2008); diet depends on place, time of year and thus availability,

[2] An observation from participant observation of pine marten conservationists interacting with various 'publics' during publicity events.

with small mammals often being their primary foodstuff (interviews). They display a marked preference for woodland habitats, and often den in tree-holes and existing dreys. As Balharry *et al* (2008:451) state in the Mammal Society's handbook entry: "[Pine martens are] *Adapted to exploit structurally complex, 3-dimensional habitats, especially woodland;* [they] *can exist in more open ground provided there are some pockets of tree or scrub cover. Strong avoidance of open areas in Scotland and elsewhere"*.

Widespread across continental Europe, pine martens are less abundant in Great Britain, due to a history of habitat loss and fragmentation, and persecution. By 1915, Yalden (1999:248) suggests, they were (in British terms) "*feared to be on the edge of extinction*", with Birks & Messenger (2010:19) estimating, on the basis of forest cover and likely densities at the time, that populations could have fallen as low as 100 in Wales, 400 in England (in the Lake District), and perhaps 1500 in Scotland (in the north-west Highlands). Since then, there has been something of a recovery in the Scottish population (Croose *et al,* 2013), but there remains some debate about whether populations in England and Wales have survived at all; if they have, it is at very low densities (Birks & Messenger, 2010). Yet this apparent scarcity has not dulled the enthusiasm of conservationists on the trail of these elusive mustelids, as forthcoming chapters will demonstrate.

Given their precarious status, pine martens are protected through the rubrics of UK wildlife legislation. However, protection from persecution is only part of the problem. Loss of woodland habitat has been suggested as a major cause of their decline (Yalden 1999), and as a result habitat measures such as afforestation and connecting existing forested areas have been proposed as part of the solution (Jordan, 2011). Indeed, as I will describe in chapter six, conservation actions aim at improving connectivity between forest fragments through a number of different means.

Red squirrels

Squirrels are a more familiar animal than pine martens in England and Wales, but often familiarity is with the grey rather than the red variety. Similarly to pine martens, red squirrels are interesting in the context of this research because: (i) they are subject of significant conservation attention; (ii) they are woodland dwellers; and (iii) aspects of connectivity are implicated in their current fight for survival. However, unlike the pine marten, the red squirrel is not so threatened by habitat loss and fragmentation, but instead by the spread of an invasive competitor and the diseases that follow in their wake.

The red squirrel, *Sciurus vulgaris*, is the UK's only native squirrel. They are arboreal rodents that survive on a diet of various tree seeds, standing around 18-24cm tall fully grown, and weighing on average around 280 to 300g (Gurnell *et al*, 2008a). Less formally, they are also, according to both wildlife magazines and those who work in red squirrel conservation, notably attractive and charismatic creatures from a human perspective (Beer, 2013; interviews). Widespread a century ago across England and Wales, red squirrels are now only found in isolated patches in West and North Wales, Northern England, and a scattering of islands including Anglesey, Brownsea, and the Isle of Wight. Their decline is largely a result of the spread of the invasive grey squirrel, through both interspecific competition and also the effects of the squirrelpox virus (SQPV) that greys are implicated in spreading (Gurnell *et al* 2008a; Gurnell *et al*, 2012).

Grey squirrels *Sciurus carolinensis* are larger than reds, prefer broadleaved forest to conifers, and have replaced red squirrels throughout much of their former range in England and Wales (Gurnell *et al*, 2008b; Yalden 1999). They were first introduced to Britain in the nineteenth century; famously in 1876 at Henbury Park in Cheshire but perhaps earlier as well; and Yalden suggests that in the period 1890 to 1920, significant and geographically widespread releases occurred across England and

Scotland in such numbers as to secure the permanent establishment of greys in Britain (1999:184). The charisma (J.Lorimer, 2007) of greys appears to be in the eye of the beholder: historically introduced as a novelty; these days a favourite in city parks, but the villain of the piece in red squirrel conservation.

As a result of their precipitous decline, red squirrels are the subject of significant conservation attention and action in the areas in which they remain. Like pine martens, they are legally protected through being listed on Schedules 5 & 6 of the 1981 Wildlife and Countryside Act, and were likewise treated as a priority species under the old Biodiversity Action Plan regime. But effective conservation requires action as well as policy, and in practice protection for reds means preventing greys from invading their territories. Structural and functional connectivity is thus inhibited rather than facilitated. But as I explain in chapters five and six, restraining one form of connectivity often necessitates encouraging another.

Wild/feral boar

Wild boar went locally extinct in Britain several centuries ago. Although there is uncertainty as to when exactly the final extirpation occurred, there is widespread agreement that free-living boars were indeed absent, and for a period that extended into hundreds of years (Yalden, 1999). In recent decades, a combination of farm escapes and deliberate (albeit unsanctioned) releases have led to the establishment of a number of feral populations in England (Goulding, 2003; DEFRA 2005, 2008). 'Feral' is, of course, a loaded term: as Gibbs *et al* (2015:56) explain in reference to camels in Australia, *"The term 'feral' has come to signify classes of organisms that are destructive and do not belong, frequently pitted against 'native' species, which are ecologically valuable and do belong".* Thus, and despite recent attempts to rehabilitate the term (Monbiot, 2013), the notion of 'feral' contains a lingering discursive negativity in conservation parlance.

Mammal guidebooks are less informative when it comes to describing England's newly wild boar. As a disparate, heterogeneous, and little studied group of ex-farm pigs, these boars are not only feral but hybrid: the result of selective breeding for agricultural purposes. Ecologists have suggested that, as a result, their fecundity is higher than found in 'wild' populations in Continental Europe (interviews). Furthermore, their behaviours, habitat and specific dietary preferences, and social organization cannot be assumed to follow that as described in European mammalian textbooks and guides. There will, of course, be many similarities. For example, feral boars in England seem to aggregate in 'sounders', maternal-led groupings of various sizes, akin to their continental brethren (interviews and personal observation); and diets are anecdotally reported to be broadly similar. Yet there may also be differences.

Boars are interesting in the context of this research because they raise significant questions about connectivity. The re-introduction of a large and sometimes dangerous mammal into a context in which wild-living, large and omnivorous nonhuman mammals are limited in type, conceivably challenges existing settlements of human-nature relations. Furthermore, the movement of these boars through fragmented forested landscapes enacts particular forms of functional connectivity, whilst also raising questions about preferences for structural linkages.

However, unlike pine martens and red squirrels, these newly-wild boar are not the subjects of established conservation attention. Neither officially celebrated as native fauna, nor castigated as undesirable aliens, they instead inhabit the murky classificatory undergrowth as 'former natives' (Warren, 2007). That is not to say that there are not those who attempt to enact their conservation. Indeed, various societal groups (of differing sizes and support) exist advocating either the protection or removal of wild/feral boar, and there is a distinct and sometimes fierce politics surrounding such situations. However, as yet these boars are not part of the conservation mainstream: they are not

protected by conservation legislation or policy, nor are there large funded projects working to ensure their survival. Indeed, for the most part, the debate focuses on the degree to which these nascent populations require control, rather than encouragement. The fecundity of pigs is a lesson in the mathematics of compounding, even before selective breeding.

Summary of situations

Within the chapters that follow, I focus in the main on the situations of pine martens and red (and grey) squirrels, rather than boar. In part, this is because they offered more possibilities for exploring *conservation practices* specifically, given their status and interest to established conservation groups. In part also, this was an artefact of my ethnographic methodology (see chapter three), in which I followed particular lines of interest as they unfolded, rather than sticking doggedly to a pre-conceived and rigid comparative framework. The situation of wild boar thus serves as a kind of "cross-check" in the following analysis; a boundary situation through which to check if interpretations make sense, or new concepts work, or simply to unsettle my own thinking. As such, and as I will outline in chapter three, I attempt to 'write the boar' in such a role. Thus, the boars appear furtively, between chapters, occasionally appearing for a snuffle in the soil only to disappear again; but traces remain to be drawn into a later discussion of connectivity (bio)politics (see chapter seven). The final section of this introduction sets out the narrative structure that follows, and summarizes the empirical material and the key claims made in each chapter.

1.5 Thesis structure

The structure of the thesis is as follows. In chapter two I identify and synthesize diverse literatures through which geographers have made sense of various modes of connectivity pertinent to wildlife conservation. Since these literatures hail from both the 'human' and 'physical' sides of the

disciplines, this chapter is more than a review of social science concepts; it is instead a more symmetrical effort to bridge the divide between different ontologies of (bio)geography (Spencer & Whatmore, 2001; J. Lorimer, 2010, 2012; Francis *et al*, 2012); and as a result, this is a lengthy affair incorporating analysis alongside review. Through considering the ontologies, epistemologies and politics of three particular modes of connectivity practice – which I term **territorial, ecological and socionatural practices** – and in particular through considering both their intersections and points of departure, I make the case for understanding connectivity as a multiple. I also introduce further key geographic literatures on which the rest of the thesis relies, in particular those relating to **space, mobility, affect**, and **(bio)politics.**

Chapter three details the methodology developed in and through this research project. It documents how the central research aim – **to explore how the connectivity multiple is enacted in conservation practice** – was made operational through a three stage process of: (i) ethnographic, (ii) auto-ethnographic, and (iii) empathetic enquiry and experiment. It explains how materials were generated, analysed, and the approach adopted herein towards representation.

Four chapters follow which, in various ways, describe and conceptualise the ways in which connectivity is enacted through conservation practices. The first of these considers the enactment of connectivity through the lens of nonhuman mobilities. It begins by considering how traditional biogeographers have accounted for animal movements, before engaging with alternative approaches to biogeography in order to explore **animal mobilities**. A series of experiments in 'attunement' are narrated through which I attempt to generate a form of speculative knowledge of these animal mobilities. Specifically, these experiments involve traditional techniques of expert-led instruction and armchair ethology, alongside more innovative attempts at multi-species empathy through attuning with canine assistance, and through running in woodlands. They are by no means an unqualified success; and the insights thus garnered remain partial, contingent, and modest.

Chapter five turns more directly to questions of **socionatural connectivity**, through an engagement with the prevalent policy discourse of 're-connecting people and nature', and through considering a detailed ethnographic account of the ways in which 'people' and 'nature' are connected in practices of pine marten conservation. The latter points towards the ways in which conservationists actively generate affective attachments between all manner of more-than-human actors and objects through the careful composition of '**affective atmospheres'** of curiosity; in order to assemble a kind of 'proto-public', connected but as yet not mobilised towards political ends. However, this affirmative reading of affective attachment is unsettled through considering the less affirmative affects generated in situations involving squirrels and wild/feral boar. The chapter thus makes the case for a sympathetic reading of the 're-connection' discourse that moves past the easy deconstructive tack of dualist critique, but also points towards the limits of affective connection in generating a convivial form of more-than-human politics.

Chapter six compares how the **connectivity multiple** is composed differently in situations of red squirrel and pine marten conservation in England and Wales. It builds on the consideration of ecological connectivity and animal mobilities presented in chapter four, and the discussion of socionatural (including political) connectivity in chapter five, by combining these and additionally incorporating considerations of the spatial practices of territorial connectivity enacted in wildlife conservation. It demonstrates how the connectivity multiple can be composed in very different ways, through comparing the spatial practices, techniques of management, and modes of biopolitics enacted in these two contrasting conservation situations. The analysis draws on, and in turn contributes to, three bodies of geographic/sociological theory concerned with: (i) mobility; (ii) places; and (iii) biopolitics (notably at the intersection with biosecurity literatures).

Chapter seven shifts scale somewhat, from the particularities of woodland mammals to the generalities of terrestrial wildlife conservation policy in England and Wales. Building on the previous chapter, it suggests that attention to how the connectivity multiple is composed provides grounds for re-thinking the possibilities of human-environment relations in practices of wildlife conservation. It begins by tracing the recent history of conservation policy in England and Wales, drawing together academic work about contemporary developments and considering how connectivity is enacted in this evolving policy context. Through a close reading of contemporary policy documents, supported by a series of interviews with governmental and NGO policymakers, it demonstrates how contemporary shifts in policy both shape, and are enabled through, a particular composition of the connectivity multiple. In conclusion, it engages with recent discussions of 'rewilding' to outline an alternative composition, here termed '**revitalizing conservation'**; informed by the previous chapters, and through which a re-thinking of connectivity can challenge problematic 'binary' spatial practices.

Finally, chapter eight summarizes the key arguments and conceptual developments, and points towards two compelling directions for future research. I reiterate the normative argument that runs throughout the thesis: that re-thinking the spatial practices of wildlife conservation can make room for alternative modes of action through which a more affirmative form of biopolitics might be enacted; with implications for both conservation practitioners, and academic theorists alike. The specific suggestion made herein is that conservation might be revitalized through a tendency towards generating shared spaces (wherein 'spaces' are understood not simply as fixed geometric grids but as contingent, relational socio-material achievements; see chapter two). I suggest that the notion of animal mobilities is crucial in such a re-thinking, and that the methodologies of attunement developed herein have an important role to play in attending to such mobilities as embodied, sensed and felt. As a result, I propose two strands of further work, that: (i) explore the composition of the connectivity multiple in comparative situations; and (ii) attend to nonhuman mobilities as lived experiences.

PROLIFERATION

BBC NEWS Wiltshire
30 January 2015 Last updated at 16:09

Wild boar concerns prompt survey of north Wiltshire
Growing concerns about wild boar numbers in north Wiltshire have led to official survey work being carried out.

MP James Gray has written to Natural England suggesting a "significant increase" of numbers could have "very worrying consequences". He said he was “uneasy” about the number of sightings and feared numbers were "out of control".

A survey of the area is now under way, led by the Department for Environment Food and Rural Affairs (Defra). The news came in a letter to the MP from Andrew Sells, chairman of Natural England.

Mr Sells wrote: "Following recent events and the apparent increase in the incidence of wild boar activity... I understand that Defra and the Deer Initiative are surveying the area to establish wild boar numbers and I am pleased to say that we have provided a member of staff to support that effort."

Feral boar populations are firmly established in the Forest of Dean, 20 miles (32km) away, but lesser known in the neighbouring county of Wiltshire.

The MP shared his concerns earlier this month following a fatal crash on the M4 that was caused by a wild boar. Two days later, a pig belonging to Princess Anne was killed after a wild boar got on to her Gatcombe Park estate. The work will include speaking to landowners about sightings and carrying out thermal imaging. A report is due in March.

Mr Gray, the Conservative MP for North Wiltshire, said he was pleased to see action was being taken.

www.bbc.co.uk/news/uk-england-wiltshire-31041671
BBC News website. First published 30.01.15. Accessed 05.02.15

2. Connectivity literatures: ontologies, epistemologies, politics

In this chapter my aims are threefold: first, to identify and synthesize diverse **connectivity literatures**; second, to illuminate **several important gaps** in these existing literatures relating to connectivity practices; and thus third, to **develop concepts** with which to make sense of the connectivity multiple as enacted in practices of wildlife conservation.

The diverse literatures concerning connectivity drawn together herein derive from distinct disciplinary positions, between which interaction is occasional rather than frequent. As such, the connectivity multiple has not hitherto been framed, conceptualised and discussed as a coherent multiplicity within the literature. Instead, therefore, this chapter proceeds by constructing an interdisciplinary framework through which connectivity can be understood in such multiple terms. Through drawing together a series of geographic theories relating to various ideas about connectivity, I will demonstrate how it has been imagined in very different ways across the discipline; but also how such understandings are mutually implicated. Specifically, I utilise existing literatures relating to structural, functional, and human-nature **ontologies of connectivity** in order to develop related concepts that afford description and analysis of **three modes of connectivity practices** that are presented in later chapters; these are: (i) territorial, (ii) ecological, and (iii) socionatural connectivity practices.

The chapter is structured in two parts. In Part One, I begin by detailing the **ontological groundings** of the three modes of connectivity practice introduced above, in each case highlighting what is connected in such understandings, through what spatial imaginaries, and based on what forms of mobility. In each case, discussion of existing literatures informs the development of a conceptual framework for exploring the connectivity multiple in later chapters.

In Part Two, further literatures are introduced as conceptual resources for analysing the enactment of the connectivity multiple. These are organised into two categories (albeit categories that inevitably overlap). First, two key **epistemologies** that underlie and inform various ontologies of connectivity are identified: conservation science, and more-than-human geographies. Second, four (related and again sometimes overlapping) approaches are identified as being particularly relevant to examining specific questions about the **politics of connectivity**: (post) actor-network theories, contemporary conceptualisations of material publics, political ecologies, and theories of biopolitics derived from Foucault. Both of these varied sets of literatures are introduced as a prelude to their utilisation in ensuing chapters.

This chapter thus identifies several important gaps in existing literatures regarding connectivity, and begins the process of conceptual development through which the thesis addresses them. First, it highlights the lack of existing work attending to the multiplicity of connectivity practices. Second, it identifies a narrow focus on structural schemes in existing work on connectivity conservation, and foregrounds the importance of asking questions about the wider influence of connectivity practices. And third, it suggests the need to engage with connectivity as enacted through lived experiences of mobility, rather than imagined simply through measured movements.

PART ONE: Ontologies of connectivity

In this section I explore the key approaches to connectivity made in diverse geographical theories *with respect to wildlife conservation*, and thus develop concepts for understanding three modes of the connectivity multiple: **(i) territorial; (ii) ecological;** and **(iii) socionatural**. These categories are not wholly discrete; indeed, they intersect in important and often constitutive ways. Their various characteristics are summarized in Figure 2a, below; the rest of the section then considers each mode of connectivity practice in terms of: (i) ontological assumptions, (ii) spatial imaginaries, and (iii) articulations of mobility.

Figure 2a: Ontologies of connectivity

Ontology: what is connected?	Spatial imaginaries	Mobilities	Mode of connectivity practice
'**Structures**': habitats; particular places	Geometric; discrete categories of space with identifiable borders	Constrained through borders and boundaries; enabled through spatial linkages	**Territorial**
'**Functions**': Organisms / Species / Ecological processes	Both fixed and mobile; geometric and relational	Specific; facilitated across space (and borders) by diverse features, affects, capabilities	**Ecological**
'**Humans and nature'**; or differently, non-binary socionatures	Relational (albeit diversely imagined); topological	Socionatural, relational achievements	**Socionatural**

(i) Territorial connectivity

In the introduction I suggested that wildlife conservation has, for many decades, been dominated by a paradigm of spatial protection (Adams, 2004; Adams *et al*, 2013). Various forms of nature reserve have been designated and, to varying degrees, managed and protected across multiple geographies, jurisdictions and scales (Ladle & Whittaker, 2011). I also suggested that, whilst widely considered essential by conservationists, such reserves are also increasingly viewed as problematic if not ineffectual: too often too small to conserve their complement of species in isolation (Jongman & Pungetti, 2004; Crooks & Sanjayan, 2006).

Ontology: structural connectivity

The simplest and most obvious remedy for the isolation of nature reserves involves linking-up existing conservation territories through the spatial extension of reserves, or through corridors of habitat, 'ecoducts' and other similar features at a variety of scales. Within traditional biogeography and landscape ecology, such territorial practices are usually described in terms of spatial "connected-ness" (Jongman, 2004) or "structural" connectivity (Forman, 1995), to differentiate them from more functional forms (see section ii). At its simplest, the concept of spatial/structural connectivity thus refers to the extent to which areas of similar habitat are linked or contiguous.

Improving the structural connections between similar habitats can be achieved in a variety of ways. The most simplistic is the corridor. "*Corridors are appealing",* explain Anderson & Jenkins, "*because they purportedly maintain or restore the very connectivity that fragmentation undermines. Whether in a backyard or across a landscape, everyone can visualize a corridor and associate it with connectivity"* (2006:4). Yet there is much debate in ecological literatures about their efficacy, based on concerns including: whether target species actually use the corridors; the prevalence of edge

effects within the corridors; the preferential facilitation of migration by generalist and invasive species; the ways in which corridors can act as a conduit for disease; and the unintended creation of sink populations, too small to survive without further immigration or habitat extension (Forman, 1995; Beier & Noss, 1998; Hilty *et al,* 2006). Yet the efficacy of corridors is also a function of scale, with regional-scale corridor schemes argued by some to transcend such issues (Anderson & Jenkins, 2006).

Alongside corridors, ideas about structural connectivity have also led to the development of a body of theory and policy concerned with the linkages between 'networks' of habitats (Noss & Cooperrider, 1994; Jongman & Pungetti, 2004). This line of analysis is often focused on the idea of "network" connectivity, which Forman defined as "*the degree to which all nodes are connected*" (1995:261). 'Network' ideas have been applied to the design of protected area networks to maximize structural connectivity (Saura *et al*, 2011); and the Netherlands' *National Ecological Network* is exemplary in this regard, linking together core areas through a proliferation of planned and delivered corridors, ecoducts and similar structural features (van den Belt, 2004).

Spatial imaginaries and mobilities

Structural connectivity relies on a particular form of spatial imaginary, wherein space is understood as a geometric surface that can be categorised into discrete units, and measured in absolute terms. Spaces are bounded, in that there is an inside and an outside: a habitat of interest, and a non-habitat. The network is, for the most part, assessed as a fixed and static entity (albeit with the understanding, and underlying motivation, that change is possible – habitats can be extended, rehabilitated, constructed). And the imaginary of a surface is key: networks are mapped and modelled in geometric terms. As such, they draw on an influential history of spatial theory/practice that Thrift has described as the "*gridding of space and time*" (2008:94); that is, a particular

geographic imaginary that emerged in the eighteenth and nineteenth centuries and that remains influential (and indeed is perhaps more so given technological developments in GIScience).

Species' movements are, within these logics, a function of structural connectivity; that is, the movements of particular organisms are understood as facilitated through structural connections, and prohibited by borders/disconnections. As an example, some of the highest profile connectivity conservation projects utilise, at least to some extent, this mode of understanding in enacting territorial connectivity through corridors, including the high profile Yellowstone to Yukon initiative in North America, (Locke, 2010), and the Mesoamerican Biological Corridor running from Panama to Mexico (Muller and Barborak, 2010). In both cases, the creation of regional-scale connected territories is enacted as a strategy to facilitate particular movements, often targeted at large mammals - both for their own sakes and as 'umbrella species' (Lambeck, 1997).

Mode of connectivity practice: Territorial connectivity

Here, I introduce the term **territorial connectivity** to describe the practices by which conservationists seek to enact forms of structural connectivity. These practices include the preparatory classification of ecosystems into particular 'habitat types'; the measurement of such habitats, their spatial extent and structural connectivity; and resulting moves to (re)territorialize adjacent or linking areas into schemes of conservation management and habitat creation. Examples of such forms of territorialisation are commonplace in existing connectivity literatures, that have tended to focus on large (often regional) scale projects aimed at delivering structural connectivity, often in mountainous areas between existing nature reserves (Crooks & Sanjayan, 2006; Worboys *et al*, 2010). Territorial connectivity is thus informed by traditional biogeographic ideas about structural connectedness, but also incorporates understandings of the processes through which human actors demarcate, designate, and manipulate landscapes, drawing on the concept of 'territorialisation' to do so. This

latter concept is used to refer to the diverse processes by which territorial spaces are made, unmade and remade (Deleuze & Guattari, 1987; Clark *et al*, 2008; Gregory *et al*, 2011; Raffestin, 2012).

(ii) Ecological connectivity

In this section, I introduce the concept of **'ecological connectivity'** through which to conceptualise conservation practices rooted in somewhat different theories of functional connectivity, and thus reliant on different forms of spatial practice. I also propose extending the concept of 'mobility', much developed within human geographic theory, to enable re-figuring nonhuman movements as **'nonhuman mobilities'**.

Ontology: functional connectivity

Within conservation theory, whereas structural ideas about connectivity focus on the linkages between habitats, functional understandings of connectivity instead grant conceptual priority to species' movements. Thus, rather than beginning by measuring and managing linkages between bounded blocks of similarly categorised vegetation, functional connectivity analyses depend on the attributes of species (and individuals) and the relative permeability of the (multiple) habitats in question. This form of connectivity is usually termed in conservation literature as 'functional' or 'ecological', but given the multiple ways in which the term connectivity has been used, some authors instead advocate the terminology of 'landscape permeability' for functional notions; Soule *et al* (2006:651) suggest the latter is a more helpful term because:

> *"(1) it suggests the importance of dynamic processes; (2) it reminds us of the species-specific nature of obstacles to movements, and (3) it requires conservationists to consider the landscape (including the "matrix" of unprotected country) as a whole, rather than focusing on narrow, defined corridors".*

Functional connectivity is also sometimes defined more broadly, encompassing not only organismal movement but also referring to the extent to which a landscape or habitat is adequately connected so as to facilitate ecological processes to occur (Jongman, 2004; Crooks & Sanjayan, 2006).

Two bodies of theory have been particularly influential in the development of ideas about functional connectivity: (i) landscape ecology, and (ii) metapopulation theory. In the first, Forman's (1995) landmark explication of landscape ecology proposes a threefold classification of landscape into: patches, habitat corridors, and the matrix. Crucially, this matrix is not considered as a hostile barrier to the movement of all species, but as a more or less permeable filter depending on the species in question. Movement within the matrix can thus be facilitated, disrupted or prevented through a range of structural features besides the contiguity of prime habitat, depending on the capabilities of an organism. A motorway affects the movement of forest dwelling mammals (for example) in a different way to a field of corn, an area of moorland, a river, a suburban housing estate, or a golf course. Permeability is thus affected by a range of structural features like the type of edge between habitats (Forman, 1995), the filtering effects of roads (Smith, 2004; Jaarsma, 2004) and other ecological barriers (Pungetti & Romano, 2004); but also by the behaviour, requirements and life history of the organism in question.

Second, metapopulation theory has also been notably influential (Moilanen & Hanski, 2006; Hilty *et al*, 2006). It describes the ways in which spatially distributed populations of organisms that are too small to survive independently nevertheless persist: as the larger 'metapopulation' facilitates an ongoing dynamic of local extinctions and re-colonizations (Hanski & Gilpin, 1996). Whilst there is debate in ecology about the extent to which different species actually operate as metapopulations, the analogy of metapopulation theory to a contemporary ecology marked by habitat fragmentation is powerful. Populations of species cleaved apart by human-driven landscape change are thus frequently imagined in such terms, and managed accordingly.

Developing the conceptual vocabulary of functional connectivity thus requires paying attention to the specificities of **species' movements**: the various ways in which different types of organism are able to, facilitated in, or prevented from moving. As Hilty *et al* (2006:50) explain, "*Since organisms vary tremendously in their abilities to travel (vagility) and in their motivation to leave their home area, the degree of connectivity in a given mosaic of biotic communities will vary greatly according to the perspective of each species".* Given this specificity, connectivity must also be understood as multi-scalar (Crooks & Sanjayan, 2006:5); trees, spiders and tigers move over very different spatial and temporal scales.

As a result of the focus on the movement of species, notions of functional connectivity have been developed in a variety of divergent ways within ecological and cognate literatures. For instance, whereas terrestrial metapopulation research articulates connectivity in terms of immigration between habitat patches (Moilanen and Hanski, 2006) or the rate of exchange of individuals between populations (DiBacco *et al*, 2006), researchers considering 'migratory connectivity' instead emphasize the links between moving organisms themselves, independent of habitat (Marra *et al,* 2006). Furthermore, where functional connectivity refers to movement between habitats, these habitats are not necessarily of the same type (as suggested in simple versions of structural connectivity). For instance, research has pointed to the importance of connectivity at land-water interfaces, or between different habitat types allowing for pollination in agricultural landscapes (Crooks & Sanjayan, 2006); and tools for systematic conservation planning have been developed which explicitly target maximizing connectivity across terrestrial, marine and freshwater habitats (Beger *et al,* 2010).

Spatial imaginaries and mobilities

The spatial imaginaries implied within functional approaches to connectivity might seem similar to those underlying the structural accounts considered previously, but there are crucial differences. There is still a legacy of bounded space, in particular through the classification of spaces into types – think, for instance, of the grounding of landscape ecology in Forman's distinction between patches, corridors and the matrix; but the permeability of this bounding is in marked contrast to the static in/out snapshot invoked in structural connectivity analyses. Sometimes, space is similarly conceived as a surface on which movement occurs, albeit that these movements are differentially possible through a range of habitats. Yet, whilst maps of structural connectivity serve to freeze space and time, models of landscape permeability attempt fluidity. That is, unlike the static vegetational cartographies invoked in structural connectivity analyses, the algorithms enacted in least-cost-path models of functional connectivity (e.g. Watts *et* al, 2010) attempt to incorporate ecological processes through the addition of time.

Reflecting more broadly on some of the (many) debates within human geographic theory about space (and time) is informative here; and Massey's (2005) collection of writings *for space* is a productive place to start. Therein she criticizes thinking about space as a surface, because doing so suggests it is continuous and given rather than created through a heterogeneity of what she refers to as histories, stories and/or trajectories. Viewing space as a surface is a political move that affords particular – often domineering and colonial – acts; forms of what might also be termed territorialisation. This is a critique of relevance for some particular practices of wildlife conservation, in relation to both people and nonhuman organisms, given fraught histories and presents of 'fortress conservation' (Brockington, 2002) and green militarization (Lunstrum, 2014). Instead, Massey develops an understanding of space that, rather than being 'static, closed, immobile, the opposite of time' (2005:18), is (in her language) relational, formed through multiplicitous practices, durations

and trajectories that coexist simultaneously, and is in process (and thus never closed, finished, or determined). Engaging with a line of thought about space, time and process stretching through Whitehead and Bergson to Deleuze, she argues that space is neither synonymous with time (the simplistic 'four dimensions view'), nor subdued by or to it; rather, that they must be thought (distinctly) together. Her motivation is explicitly political: to think space as a 'sphere of possibilities' (including for politics); rather than as a closed, static, and hidden justification for (i) the enclosures of colonialism and modernity, (ii) the linear narrative of progress exported and imposed by western nations, and (iii) for neoliberalism – all of relevance to contemporary conservation practice, in which postcolonial forms of enclosure continue, often at the behest of western 'experts', and increasingly through neoliberal means (Igoe *et al*, 2010; Büscher *et al*, 2012). I will return to these themes in chapter seven.

Massey's work stands here as an exemplar of (nuanced) relational approaches to the spatial; others could fulfil a similar role in the following comparison (e.g. Whatmore, 2002; Thrift, 2008; Jones & Merriman, 2012). Thus, whilst in most traditional biogeography 'space' is conceived as a pre-given surface, bounded and fixed through locating and demarcating specificities, for Massey by contrast space is none of these things – and thus neither is connectivity. In her articulation of space, connectivity does not relate to spatial contiguities but is more dynamic in form; as she puts it, " … *the interconnectivity of the spatial* ... [is] *not between static things but between movements, between a plurality of trajectories*" (2005:76). In this, it shares some commonalities with a diverse but connected body of work that conceives of spaces in terms of topologies (Mol & Law, 1994; Law, 2002; Whatmore, 2002; Martin & Secor, 2013) and intersecting lines (Ingold, 2009; 2011).

Massey's idea of space-time connectivity thus appears to have some resonance with the focus on movement in the concept of functional connectivity. However, functional connectivity models measure the extent to which a habitat or group of habitats is linked by organismal movement; *they*

do not, at least usually, imagine space as created by and through such movements. Space, in these models and understandings, remains the pre-given geometric surface upon which movements occur. Furthermore, rather than imagining a simultaneity of movements (as in Massey's conception), or of intersecting flows, paths or lines, the focus is on a specific subset of movements: for one species, or groups of species, or abstracted group of species; everything else is fixed, inert, held constant. Yet neither the reduction to a single set of movements, nor the imagination of space as pre-given and static, need be *necessarily* presumed by functional connectivity theory. These assumptions could instead be formulated as concerning spaces that are made through heterogeneous organismal movements (and indeed are practically imagined in such ways in some forms of modelling). Instead, it is the way that these assumptions have been developed, in relation to and in engagement with wildlife conservation that gives them their current form. This is important, because assumptions made about space and time have a distinct politics. Different spatial imaginaries both reflect and inform different spatial practices, as later chapters will demonstrate.

Mode of connectivity practice: Ecological connectivity and nonhuman mobilities

In this thesis I propose that the phrase **'ecological connectivity'** be understood in a particular way. Not as synonymous with theories of functional connectivity, as in much of the conservation literature, but relating to the *practice* of functional connectivity. The distinction is an important one: 'ecological connectivity' thus refers not to theoretical concepts, but to the actual space-generative movements of organisms, and to the practices of conservationists working to facilitate such movements.

As such, ecological connectivity becomes a concept that refers to more-than-human practices; and this beyond-human extension has important consequences, not the least of which is the inadequacy of the term 'movement' as used above. Within functional connectivity theory, 'movements' are

measurable shifts of organisms in time and space: co-ordinates that can be mapped, plotted and modelled. Furthermore, movements can be partially explained in terms of landscape ecology (permeability differentials), metapopulation ecology (immigration events) and wider biological literatures (life histories, feeding requirements, dispersals etc). Such explanations are important and valuable, as far as they go. However, they do little to address the specificities of species' experiences nor the alterity of nonhuman lifeworlds. Thus, talking simply about 'movements' in such a way does not take nonhumans seriously in the way that contemporary animal and more-than-human geographies demand (Whatmore, 2002:31-32; Latimer & Miele, 2013).

In their influential contribution to the re-boot of animal geographies as a sub-discipline, Philo & Wilbert (2000) suggested the pressing need to consider both the ways in which animals are variously 'spaced' by human actions, as well as attending to the 'beastly places' in which these nonhumans live their (perhaps meaning-full) lives. The latter requirement rests on a wealth of geographic writing on the notion of 'place' – a literature too large to neatly summarize in a single phrase, but perhaps united in agreeing that places are more than simply locations, and that part of the 'more' comes from the intersection of locations and lives and meaning. Cresswell, writing within a similar human geographic register, makes a parallel distinction between movement and mobility, thus: '*If movement is the dynamic equivalent of location, then mobility is the dynamic equivalent of place*' (2006:3).

Mobility, Cresswell suggests, involves and is enacted through the construction of meanings and practices in contexts of power; and he continues to outline three '*relational moments*' of mobility: (1) at its most basic, as empirically measurable motion (and thus almost synonymous with movement); (2) as a collection of ideas about meanings (of movement, of mobility), and (3) as something that is '*practiced … experienced … embodied*' (2006:3). It is a concept that has become increasingly influential in human geography in recent years, with various conceptual developments remaining

linked by the idea that mobility is about more than movement: it is movement as always entangled with power and meaning (see Cresswell, 2010, 2012b, 2014). Whilst the concept of mobility is usually explicitly humanist in conception and application, I suggest that it travels well in more-than-human terrain. Indeed, Cresswell makes a similar move in the last of three recent 'Progress reports' on mobilities research, where he considers work pertaining to "*animal mobilities*" (Cresswell 2014); however, therein he seems to limit the concept to little more than a consideration of anthropocentrically influenced animal movement. I thus propose the notion of **nonhuman mobilities** – and, where applicable, specifically **animal mobilities** – to conceptualise the ways in which ecological connectivity is generated through movements that are always more than shifts of matter through spatial co-ordinates, but rather entangled with diverse agencies and more-than-human meanings.

The rich ontological possibilities of attending to animal mobilities as modes of becoming are developed in Lulka's (2004) engagement with Deleuzean philosophy. Therein, Lulka is concerned with the violence made possible through essentialist theories of wildlife (especially 'species' understood as 'genes'); and turns towards what he terms 'movement' as a way to attend to the indeterminacy of nonhuman ontology. Given his concern with the lived experience of, and transgressive capacities enabled through 'movement', Lulka's concept is much closer to what is here termed 'nonhuman mobility'. In this thesis, I will demonstrate how rethinking animals through an ontology of mobility provides a means through which the spatial practices of conservation might be re-thought.

Clarifications

Before moving on to consider a third ontology of connectivity, it is worth pausing for a quick clarification for the sake of avoiding confusion. The theoretical concepts of structural and functional connectivity, as developed within conservation theory (including traditional biogeography), are by no

means synonymous: but they do, at times, overlap. Structural connectivity (e.g. corridors) may facilitate functional connectivity (e.g. mammal movement through corridors); it is sufficient, but not necessary. Likewise, conservation actions to promote ecological connectivity (e.g. mammal movements) may rely on practices of territorialisation (e.g. the creation of corridor reserves). Furthermore, ecological connectivity (e.g. mammal movements) may in turn undermine such (human) territorialising practices (e.g. through transgressing reserve boundaries). These various ideas about and practices of connectivity thus need to be understood as often interwoven – as will become abundantly clear in later chapters. In the next section, the blurring of connective categories will become yet more pronounced with the introduction of ideas about socionatural connectivity.

(iii) Socionatural connectivity

Theories about and practices relating to socionatural connectivity relate to a somewhat different register of connection – albeit one that is also crucial in understanding enactments of connectivity within practices of wildlife conservation. Whereas traditional biogeography has been more influential in developing theories about structural and functional connectivity, socionatural linkages have remained primarily the purview of alternative biogeographies (notwithstanding some influential interventions within conservation biology – see Wilson, 1984). This is because, put simply if problematically, socionatural connectivity is concerned with the connections between 'humans' and 'nature'. This is, then, a very broad category of connection, incorporating the material, embodied and emotional relationships people have 'in' and 'with' various natures, alongside discursive traditions and cultural understandings of 'nature' and 'connections with nature' (as a set of ideas idea, and as material relations). As I will detail in the following section, these diverse representational and more-than-representational aspects of socio-natural connectivity have received much recent attention within various strands of cultural and more-than-human geographic theory.

Ontology: 'humans and nature'

There has been a widespread, engaged, and copiously documented re-thinking of the ontological status of 'nature' within human geography in recent decades (Bartram & Shobrook, 2000; Eden, 2001; Castree, 2005a; J.Lorimer, 2012). Influenced and informed by critiques of Cartesian dualism within feminist theory and science studies (Haraway 1991; Latour 1993, 1999), geographers have increasingly interrogated, problematized, and largely rejected dualistic modes of thinking about nature/culture, mind/body, subject/object, thought/matter, human/animal and so onwards (Whatmore, 2002; Demeritt, 2002). Dualistic ontologies that separate worlds in such terms have been largely relegated to the margins of contemporary geographic thought, outshone by the dazzling possibilities of posthuman (Braun, 2004; Wolfe, 2010), relational (Hetherington & Law, 2000; Whatmore, 2002; Castree, 2003; and non-relational: Harrison, 2007), materialist (Bennett, 2001, 2010; Kearnes, 2003; Roe, 2006; Braun & Whatmore, 2010; Kirsch, 2013), and sometimes vitalist (Hinchliffe *et* al, 2005; J.Lorimer, 2010; see Braun, 2008), modes of thinking about how worlds cohere (Panelli, 2010). Thinking about the connections between 'humans' and 'nature' in such terms is seemingly both necessary and impossible: necessary because the relations that enact more-than-human worlds are the key site for analysis and action; impossible because relational modes of thought irredeemably unsettle the coherence of both categories – both a nature without humans, and humans without nature, become unthinkable (Bingham & Hinchliffe, 2008). Neither 'nature' nor 'culture' seems to have the conceptual strength to subsume the other without inevitable slippage towards environmental determinism at one extreme and social determinism at the other; and dialectical modes of interaction seem to rely on the very binaries that most (human) geographers seem keen to reject (Braun, 2003).

Relational modes of thought provide a route out of this conceptual impasse by abandoning both prior categories ('humans' and 'nature'), but a successor terminology has yet to become established

or widely agreed upon – despite many suggestions. Instead, hybrid compounds such as 'socionatures' (Swyngedouw, 1996), 'naturecultures' (Latour, 1993; Haraway, 2003; Latimer & Miele, 2013) and a variety of other blends seek to transcend dualistic thought whilst also serving as a reminder of the sort of thinking they explicitly reject. In this thesis I opt for the term socionature; not in a dialectical sense, as is sometimes found in political economy; and not because I am unaware of the discursive benefits of the non-anthropocentric ordering of natureculture; but more to hold on to something of the sense of *association* inherent in this relational ontology (Latour, 2005). 'Natureculture connectivity' is also something of an alliterative mouthful.

Whilst theoretical developments concerning ontologies of socionatural relations continue apace within the seminars and journal pages of human geography and cognate fields, traditional wildlife conservation theory remains somewhat adrift from this *avant garde*. Therein, the focus is not on the ontological status of naturecultures, but on the tricky yet essential relationship between 'the natural world' on one hand, and 'human factors' like management, politics or finance on the other. That is, in the main the nature/culture dualism, so roundly rejected within human geography, remains alive and well (although there are important exceptions; see, for example: Rosenzweig, 2003; E.Ellis *et al*, 2010). Frequently conservation texts (e.g. Pyle, 2003), practical management guides (e.g. Worboys *et al*, 2010), and policy documents of many types (e.g. HMG, 2011) – informed by a desire to show they have learned the lessons of the conservation movement's somewhat misanthropic past – explicitly and loudly incorporate their understanding of, and recommendations for, connecting 'people' with 'nature'. Thus, and for example, ideas about 'community-based conservation' have become increasingly influential, albeit not always living up to their rhetorical promise (Alexander & McGregor, 2000; Selfa and Endter-Wada, 2008). Indeed, the focus of much recent research into environmental policy explicitly addresses the *work* that is required in order to insert environmental concerns into social practices; and in such situations, assuming the ubiquity of hybridity might act to

obscure, rather than illuminate, constitutive socionatural dis/connections (Asdal & Marres, 2014:2057).

In chapter five I will explore the ontological politics (Mol, 1999) of 'nature' and socionature in more detail, but the points to make here are as follows. First, wider ontological claims about the status of 'natural', 'human', or 'socionatural' worlds have significant implications for the manner and mode of connectivity enacted within/between such worlds. Second, and as I will expand upon below, some of these implications relate to conceptions of space: as bounded and given, as open and relational, or as both. And third, the spatial ontologies thus generated have implications for how mobilities might be understood, or indeed practiced. In the remainder of this section, I will consider the latter two points a little further before moving on to consider epistemologies of connectivity in Part Two.

Spatial imaginaries and mobilities

In the earlier section on ecological connectivity I introduced some of Massey's ideas about the ways in which movements/mobilities do not occur in, but are constitutive of spaces. This relational mode of thinking about space is influential in, and informed by, the non-dualistic ontologies of socionature discussed above. Indeed, the idea that spaces are generated through a heterogeneity of movements is not limited to Massey's work, but is increasingly widespread in contemporary (human) geographic accounts (Merriman, 2012). In contrast to the lack of attention paid to implicit spatial imaginaries within most of traditional biogeography (excluding the significant, ongoing, and theory-generative attention paid to the difficulties of representing space and time within GIS, see for instance Goodchild *et al*, 2007), the development of spatial theory within human geography is both high profile, and part of a broader 'spatial turn' occurring across the social sciences and humanities in recent decades (Martin & Secor, 2014). Much of this recent thinking on space (and time) draws on various versions of post-1968 French cultural theory, from Lefebvre and de Certeau, through Augé

and Virilio, to Deleuze & Guattari and latterly Latour (Conley, 2012). Although highly diverse in their particulars, Conley suggests the broader trend in such work is towards a relational understanding of space as constructed through practice, and thus able to be re-fashioned (see 2012:154); and both Massey's and Thrift's (see below) writings should be seen in, and as part of, this context.

For instance, in proposing an understanding of topological *"movement-space"*, Thrift (2008:102) highlights three recent (albeit not new) trends in theorizations of space: (i) an understanding of space as relative, folded and animate; (ii) as multiplicitous and generative; and (iii) as "*open-ended rather than enclosing*" (98). In incorporating these ideas, movement-space makes a radical departure from grid-space (119); yet he also maintains that relative notions of space continue to rely on an underlying and "*carefully constructed absolute space*" (98). For Thrift, this line of thinking leads to a rejection of hierarchically scaled and/or nested notions of global-local spaces, in favour of an emphasis on the connectivities operating through a range of registers including but not limited to 'the social' (Thrift, 2008). Indeed, it is this proliferation of connectivities that is important in the present account. Connectivity becomes a property not simply of space, but of space-times/time-spaces; and both the things connected, and the means by which such connections operate, proliferate. As Crang (2012:2122) notes in commentary on a recent collection of work concerned with such timespaces, *"any given moment and place is conjunctural and determined by relationships that connect it to other times and places. It is not simply how large or how long, but also always what it is connected to that happened previously and what will follow after"*; for Crang, the exhortation thus becomes to focus on the kinds of spaces, times and connections drawn together in particular timespaces. Thus, the nuanced relational approach to space-times developed by Thrift and Massey, amongst others, foregrounds the necessity of focussing on the various (socio-material) connections through which space-times cohere. Such an approach, unsurprisingly given the shared conceptual underpinnings, fits neatly with a socionatural ontology in which connectivity is always both more-than-human and more-than-natural.

Relational and more-than-human approaches to spacetimes have been usefully developed in (and applied to) geographic accounts of human-wildlife interaction and particularly wildlife conservation (Whatmore, 2002; Hinchliffe *et al*, 2005; Hinchliffe & Whatmore, 2006; Hinchliffe, 2008). Notable amongst such work (and explicitly drawing on Thrift's earlier writings on 'spatial formations') are Whatmore and Thorne's relational accounts of "*topologies of wildlife"* (1998), and the "*spatial formations of wildlife exchange*" (2000). Such topologies, Whatmore explains, afford a "*notion of wildlife"* understood as "*a relational achievement spun between people and animals, plants and soils, documents and devices in heterogeneous social networks which are performed in and through multiple places and fluid ecologies"* (Whatmore, 2002:14). Thus, in the latter piece these authors trace how elephants are 'caught up' in various 'social networks', and seek to account for the social agency enacted through the "*spatial practices*" of a range of actors, including both living elephants (drawing on feminist science studies approaches to 'experiential subjects') and technologies and artefacts (drawing on Actor Network understandings of 'objects'). Elephants, they suggest, are "*mobilised*" through "*multiple spatialities*" (2000:187); and it is the various ways in which elephants are "*on the move in the spatial formations of wildlife exchange"* that should concern us (ibid:202). In a related but somewhat different endeavour, Hinchliffe *et al* (2013) have more recently re-thought the spatial practices of biosecurity in animal management through a topological lens. Moving away from fixed territorial or even geometric networked notions of space, they instead conceive of zoonotic diseases in topological terms; arguing that biosecurity in practice is more about managing 'borderlands' than defending the 'purified spaces' demarcated through 'borderlines'.

A topological approach is well suited to tracing the spatial practices through which various modes of socionatural connectivity are enacted. However, it is important to retain conceptual clarity between notions of topological and relational space. The former – despite much debate – is usually understood in human geography as a non-Euclidean spatial imaginary in which multi-dimensional

foldings afford diverse connections to be made, unmade and remade without resulting in ruptures or tears, and thus allows for change whilst retaining certain defining relations (Murdoch, 2006; Martin & Secor, 2014); strictly speaking, however, Euclidean space is a particular form of topology (Martin & Secor, 2014). Topologies are, therefore, multiple. The latter – relational space – refers to non-essentialist understandings of space in which the relations between subjects/objects are spatially generative. Thus topologies are relational forms of space, but the forms of relation will differ between different topologies. For example, developing the notion of fluid space as a particular type of relational topology, Law explains how it is formed through relations, but notes that "*no particular structure of relations is privileged"* (2002:99). As he also observes, all forms of space are enacted, but some more obviously and visibly than others.

Returning from this necessary diversion into topological thinking, and in summary: shifting from a dualistic ontology to a relational one, in which binary and separate 'human' and 'natural' worlds are re-configured in terms of socionatures, has (and in turn relies upon) various spatial implications. Absolute space is not completely abandoned, but re-thought in conjunction with relational and topological understandings to account for spacetimes as generated through and by multiplicitous movements (and mobilities). Socionatures thus produce and are produced in socio-material space through their constituent relations; and accounting for particular socionatures requires paying attention to the various forms of connectivity through which they cohere.

Mode of connectivity practice: socionatural connectivity

Socionatural connectivity thus provides a conceptual basis for re-thinking the connective practices through which wildlife conservationists enact particular more-than-human worlds. It forces attention towards the forms of socio-material connections through which conservation spaces are generated and maintained (Whatmore, 2002); towards the heterogeneity of actors and objects thus connected

(Latour, 2005); and towards the possibilities of and for particular forms of ethical practice (although see Ginn, 2014). Actor-network approaches have been influential in developing these concepts of the socionatural; and they provide a useful way for thinking through the politics of connectivity, which I will address in more detail in section 2.3. First, however, I consider the epistemologies of connectivity theory-practices in more detail.

PART TWO: Epistemologies and Politics

In this second part of the chapter, my aim is to introduce a series of literatures with which to engage further with the connectivity multiple. They are categorised in terms of 'epistemologies' and 'politics', although these categories say more about the use to which they are put herein than their theoretical status. Thus the two sets of literatures introduced as 'epistemologies' are framed as such because, in different ways, they have or can be utilised to generate knowledge claims regarding the ontologies of connectivity detailed in Part One. The second set of literatures are similarly organised according to their task in this thesis, which is to make sense of particular aspects of the politics enacted through the connectivity multiple in the specific conservation contexts which the later chapters address.

Two epistemologies of connectivity

(i) Connectivity science

(ii) More-than-human geographies

The aim of this section is to explicate more fully the knowledge practices and processes that the ontological claims discussed in Part One either generate or rely upon. Here, I focus in more detail on two main types of knowledge construction underpinning those claims: (i) connectivity science; (ii) more-than-human geographies/ alternative biogeographies. However, these epistemologies **do not map neatly onto the different modes of connectivity** detailed above. In the first case, connectivity science indisputably provides the epistemological foundations of structural and functional ontologies of connectivity, and more besides. In the second, alternative biogeographies provide conceptual support for re-thinking both 'humans' and 'nature' in non-binary terms, as has been outlined earlier; but such approaches can be helpfully utilised in consideration of all three modes of connectivity

practice outlined. Thus in this second case my claim is somewhat different: it is that these approaches are particularly well equipped to help conceptualise how connectivity might operate through *more-than-human* worlds.

(i) Connectivity science

> "*conservation science is a form of power that generates particular truth claims in the name of fostering life" (Biermann & Mansfield, 2014:269)*

Conservation science is an interdisciplinary affair, bringing together biologists, ecologists, zoologists, ethologists, geneticists, soil scientists, biogeographers, landscape ecologists and yet more specialized knowledge production communities. Connectivity science is a sub-field of this broader discipline, and as such inherits this plurality of traditions, modes of operation, and approaches to knowledge construction – albeit with some specific biases towards spatial thinking. As such, it would be foolhardy to suggest that a particular epistemology dominates 'the field': such a claim would either collapse into a caricature of 'reductionist science' that the likes of Latour and Callon have done so much to debunk (Latour, 1993, 1999; Callon *et al,* 2009); or proliferate endlessly into an encyclopaedia of caveats. Instead, my aim here is to trace the development of connectivity science in recent years, and through such a genealogy to point to some of the key epistemological influences apparent in assembling this approach. In so doing, I am informed by a broader tradition within the sociology of scientific knowledge (Latour, 2005), in which epistemologies are seen not as pure theory but instead as a series of interconnected knowledge practices and the development of technologies through which particular understandings are constructed, circulated and reproduced.

Although ideas about connectivity have been emerging in various guises over a matter of decades, there has been a marked acceleration in theoretical – and practical – developments since the turn of the century (Crooks & Sanjayan, 2006). Aided by the collation of voluminous syntheses of ecological

research findings (e.g. Lindenmayer & Fischer, 2006), conceptualisations of connectivity have been further elaborated, with additional dimensions recognised (e.g. evolutionary process connectivity) and nuance added (e.g. between connectivity of 'landscapes' as categorised by human observers, and 'habitats' as used by nonhumans). Connectivity corridors have received ongoing attention, with several publications produced aimed at both academics and practitioners, and schemes implemented at various scales and in multiple geographies (Anderson & Jenkins, 2006; Hilty *et al*, 2006). Likewise, landscape ecologists have collaborated to describe existing, and inform future, ecological network and greenway projects (Jongman & Pungetti, 2004). Particularly influential has been a strand of thought and action relating to connections between large-scale terrestrial mountain regions and protected areas situated within them; and the International Union for the Conservation of Nature (IUCN) has facilitated a series of conferences and resulting publications in this area (Worboys *et al*, 2010).

The differing definitions and understandings of connectivity within and between the various contributing scientific disciplines have led, unsurprisingly, to a diversity of approaches towards measuring connectivity (e.g. see Crooks & Sanjayan, 2006: part II); these approaches, in turn, have benefitted from the revolution in GIS availability, usability, and capability in the past few decades. Structural, including landscape, connectivity can be measured through analysing the spatial patterns of different habitat types and the various linkages between them (Lindenmayer & Fisher, 2006:124). Models of functional connectivity focus instead on the possible movements of organisms through such habitats, given assumptions made regarding the permeability of various categories of habitat and the probabilities of organismal movement. Unlike models of structural connectivity, the aim here is to replace human perspectives with those of particular non-human species (Verboom & Pouwels, 2004). Such models can be targeted at specific species of concern; or, as is often the case, built around a 'focal species' (Lambeck, 1997) that is either selected or created to reflect, represent, or encompass the requirements of a larger group of organisms.

These various epistemologies of connectivity have seen significant and continuing development, particularly through various forms of modelling. Within terrestrial connectivity research, there has been a proliferation of measures designed to measure the connectivity of habitat networks (Kindlmann & Burel, 2008; Rayfield *et al*, 2011), often incorporating graph theory (A.Fall *et* al, 2007; Minor & Urban, 2008; Galpern *et al*, 2011; Saura *et al*, 2011; Baranyi *et al*, 2011; and see Moilanen, 2011 re: limitations), least-cost path (e.g. Wang *et al,* 2008; Landguth *et al*, 2012), or circuit theory approaches (Mcrae *et* al, 2008). Technical refinements continue to be developed and reported (Arponen *et al*, 2012); and new syntheses of these and (many) further variants of connectivity modelling have been produced (Kool *et* al, 2013). Historical cartographies are affording analysis of changes in habitat connectivity over time (Hooftman & Bullock, 2012). Genetic tools have been developed to assess dispersal histories and possibilities (Baguette *et* al, 2013), and combined with more traditional methods of monitoring and measurement (Lowe & Allendorf, 2010). More nuanced understandings of behavioural responses to fragmentation are being recognized (Baguette & Van Dyck, 2007). Another strand of modelling work has focused on the challenges of climate change, and how connectivity may facilitate species migration (Meier *et al,* 2012; Wasserman, *et al*, 2012; Nunez *et al,* 2013); and, related, there has been continuing debate regarding the effectiveness of 'connectivity conservation' to address these challenges (Hodgson *et al*, 2009; Doerr *et al,* 2011). An emerging body of work looks at connectivity in terms of its contribution to ecosystem service provision (Mitchell *et* al, 2013). Applied measures to improve connectivity for conservation purposes continue to be assessed (Olsson *et al*, 2008; Downs & Horner, 2012), barriers to connectivity examined (Frair *et al,* 2008), and the importance of connectivity to species persistence empirically documented (e.g. Fitzgibbon *et al,* 2007). The ongoing work on marine connectivity is even more effusive, but not considered here given the terrestrial focus of this thesis[3]. All of these various types of model can be performative, inasmuch as they influence the ways in which conservation policy

[3] Indeed, the sheer volume of work on marine connectivity is perhaps testament to the fluidity of the marine environment, where connectivity is less something to be achieved than a starting point; within human geography, Mason (2013) has drawn interesting links between connectivity within watery environments, and the metaphors of fluidity within contemporary relational takes on sociological theory.

and/or practice is enacted. Little existing work has attended to this performativity, despite its foregrounding in other environmental contexts (Whatmore & Landström, 2011); I consider this in more detail in chapter four.

The points to draw from this brief descriptive review of contemporary 'connectivity science' are fourfold. First, it is a diverse field of enquiry that continues to bring together many different forms of speciality around a particular theme, albeit that the theme – connectivity – continues to be constructed in myriad different ways. Second, there is therein an epistemological commitment to a form of science that revolves around techniques of prediction. Thus, the diverse recent developments listed above share an approach to scientific knowledge construction in which the primary objective is increasing the technical accuracy of predictive models of various kinds. Utilising the concepts developed in section 2.1, and as will be explained through detailed empirical examples in chapter four, such forms of science are more concerned with forecasting species' movements than with attending to nonhuman mobilities. Third, particular technologies – especially various forms of GIS-enabled computer modelling – have thus become crucial in the production and circulation of connectivity knowledges. And fourth, as detailed earlier (in section 2.1), such models rely on particular spatial imaginaries, often but not always geometric rather than topological, and that reproduce particular forms of politics. In the chapters that follow, I seek to trace how such scientific knowledge practices inform and intersect with conservation practices 'on the ground', through exploring several situations (that are introduced in more detail in chapter three).

(ii) More-than-human, alternative biogeographies

The term 'alternative biogeographies' denotes a range of approaches within human geography (and cognate fields) united by a determination to explore geographies of life without recourse to a nature/culture dualism (Lorimer & Hodgetts, forthcoming). Therein attention is focused not solely on

nonhumans or 'nature'; but instead on the more-than-human relations that cohere in and constitute particular situations (Whatmore, 2002). Similarly to its traditional cousin, alternative biogeography has had much to say about, to and within the field of wildlife conservation (J.Lorimer, 2010; Barua, 2014b). Yet whereas traditional biogeography either excludes humans from the frame of analysis, or articulates human involvements through the downstream logics of 'impacts' on a pre-existent 'nature', or the 'politics' through which to address such impacts (Ladle & Whittaker, 2011), alternative biogeographies by contrast do not adhere to such forms of prioritisation. That is, as Head *et al* (2014:3) explain, "*Although* [traditional] *biogeography would in theory claim a holistic remit that includes humans as part of earth's biota, its usual practice has reinforced humans as different from and separate to the rest of nature"*; for alternative biogeographies, by contrast, there is neither a prior 'nature', nor a separate human realm (Bingham & Hinchliffe, 2008).

Encompassing a diverse and oftentimes eclectic body of work, these approaches are united by recognition of the need to account for the materiality and/or liveliness of more-than-human social worlds in sociological research (Whatmore, 2002). For animal geographers, this tends to be combined with a desire to take nonhuman animals seriously as subjects/actors rather than inanimate objects (Wolch *et* al, 2004; Hobson, 2007; Johnston, 2008; Buller, 2013a), often combined with an implicit or explicit commitment to improving animal welfare imagined either individually or as species (Wolch & Emel, 1998; Philo & Wilbert, 2000; Buller, 2013b; Lorimer & Srinivasan, 2013). For plant geographers, the liveliness and agency of plants as actors gets greater emphasis (Head *et al*, 2014). For material geographers, such questions of agency – of humans, technologies, and inert matter – take centre stage (Clark *et al*, 2008; Barry, 2001, 2013). And for alternative biogeographers considered broadly, such animal and lively material concerns are often combined (e.g. Whatmore, 2002; Dempsey, 2010; J.Lorimer, 2010; Barua, 2014a). Indeed, J.Lorimer (2012) has combined such more-than-human concerns with developments in non-equilibrium ecologies to propose the need for an interdisciplinary, 'multi-natural' biogeography. 'Multinatural' is a term he takes from Latour, "*for*

whom", he suggests, *"it describes both the multiple trajectories along which any ecology might evolve and the various ways in which they can be sensed, valued and contested"* (2012:594). This builds on Lorimer's earlier notion of a 'lively' and 'convivial' biogeography, which advocates incorporating an effervescent vitalism into the rubrics and practices of bio-geographic analysis, through a variety of ethological, historical, and visual methodologies (J.Lorimer, 2010). Adherence to such epistemological positions thus enacts forms of 'ontological politics' (Mol 1999; Law, 2004); in that normative assertions regarding the procedures and direction of knowledge construction derive from (and/or generate) debates about what Mol terms the 'conditions of possibility' (1999:75).

For alternative biogeographers, then, it is not sufficient to simply map species, but also necessary to ask what is included, and what left out, through such forms of cartographic practice. A common answer to the latter question is nonhuman experience; and a common epistemology for attending to such experience is through notions of 'affect' and 'learning to be affected' by nonhuman organisms (Despret, 2004, 2013; Hinchliffe *et al*, 2005; J.Lorimer, 2007; Candea, 2010; Mason, 2013). Taking nonhumans seriously in practices of knowledge construction requires a shift in perspective, particularly when those nonhumans are animals as in the chapters that follow. Such a shift has become commonplace within more-than-human geographies and cognate studies (Hobson, 2007), but still contrasts with both the humanism evident in many fields of contemporary sociological enquiry, and the object-orientated epistemology evident in some (but not all) approaches to connectivity science.

Epistemologies of 'affect' have been developed significantly (although not exclusively) through the non-representational theories (Thrift, 1996; 2008; Anderson & Harrison, 2010) that emerged as a response to perceived imbalances resulting from the 'cultural turn'. The latter led to a period in which social research became very much focussed upon analysing representations: discourse, texts, symbols, and meanings of cultural artefacts of all types. For many, whilst necessary this move went

too far, and in so doing overlooked and underemphasized the more-than-representational facets of life. NRT-inspired work has thus explored (human, bodily) experience before mediation: the realm of practices, the pre-conscious, and the notion of 'affect' (Anderson & Harrison, 2010). It also foregrounds an explicit concern with movement: as the basis of human existence; as capturing the 'animic flux' as well as the 'joy' of life; and as a source of potentialities (Thrift, 2008:5; see also McCormack, 2013).

Affect is a notoriously tricky concept to pin down. In a landmark paper, Thrift (2004) traced multiple genealogies of 'affect'-as-concept, drawing in turn on phenomenology, psychoanalysis, Delueuzian philosophy and evolutionary theory, before tracing a commonality whereby each of these notions "*depends on a sense of push in the world, but the sense of push is subtly different in each case"* (2004:64). The differing assumptions and traditions have sparked continuing (and sometimes vociferous) debate regarding the status of 'affect' within geographic theory (see Thien, 2005; Pile 2010). In this chapter (and thesis), rather than add to such debates, I seek to utilise a particular understanding of affect as developed within non-representational theories, where Anderson (2012:28) has described affect as pertaining to "*the aleatory dynamics of lived experience"*. Here, affect relates to what McCormack (2008:414) terms "*a field of pre-personal intensities"*, with the related categories of *"feeling as that intensity registered in sensing bodies; and emotion as the socio-cultural expression of that felt intensity".*

Considering the affectivity of atmospheres has proven a productive way to think about the concept of affect, its materiality, and overcoming the dichotomy between material and cultural understandings through relational thought. As McCormack notes, following Ingold, atmospheres are commonly conceived separately as either material phenomena (the gaseous atmospheres in which people live, breathe, move etc), or as immaterial dimensions of culture (the joyous atmosphere of a party in full swing). Seeking to transcend such division, McCormack embarks on an air-balloon

propelled theoretical exploration of ways in which atmospheres might be re-thought "*in terms that are simultaneously meteorological and affective*" (2008:414). His aim is to develop an account that is at once attuned to both the materiality of atmospheres and their affective qualities, which are theorized inter-subjectively and as simultaneously 'definite and indefinite', singular and general (Anderson, 2009:77). Subsequent work on atmospheres has either focused on the cultural sense of collective moods, exploring how these are transmitted (pre-cognitively) in railway carriages (Bissell, 2010), generated in urban places (Duff, 2010; Shaw, 2014), or enrolled in the governance of emergencies (Anderson & Adey, 2011); or it has followed McCormack's twin sense of the term in exploring the distinctive im/material atmospheres of megacities (Adey, 2013), or as generated through retail air conditioning systems (Healy, 2012) or in aeroplane cabins (Lin, 2015).

'Connectivity' is not a frequent or explicitly-framed concept in either the existing work on affectual atmospheres, or in the burgeoning literature on affect more broadly. However, ideas about connectivity are crucial in such writing. Indeed, thinking about affectual atmospheres facilitates an understanding of connectivity as both 'material and ethereal' (McCormack, 2008). Since atmospheres of weathery-air and collective-mood are simultaneously sensed through bodies, connectivity can thus be thought of as the multiple relations that allow such arrangements and movements to register in bodies as affects, and (where possible) be sensed as feelings (see also Stewart, 2011; McCormack, 2013). Connectivity in the affective sense is thus never static, but is registered through its 'taking place' (Anderson & Harrison, 2010).

Non-representational approaches thus draw attention to the ways in which humans can register, and be affected by intensities in more-than-representational ways. These ideas can also be (and are) applied beyond the human; if not directly, then through forms of empathy and openness in research practice, as will be outlined in chapters three and four. As such, they afford an understanding of the ways in which affective connectivity operates in more-than-human worlds. However, non-

representational theory is not without shortcomings. It has been criticized on multiple grounds, not limited to the following: overemphasizing the pre-cognitive at the expense of the rational; failing to attend to gender and power; failing to recognise its debt to previous strands of humanist, phenomenological work; struggling to account for consistencies and stabilities; as (like ANT) too flattening of diverse agencies and capacities; and as being too 'texty' (Tolia-Kelly, 2006; Barnett, 2008; Cresswell, 2012a; Mohammad & Sidaway, 2012). Such criticisms are not wholly unfair, but neither are they fatal. Instead, non-representational thought is utilised herein with an awareness of its partialities and capabilities and deployed where it proves useful for thinking-with.

Four approaches to exploring connectivity politics

(i) Post-Actor-Network-Theory

(ii) Environmental Publics

(iii) Biopolitics

(iv) Political Ecology

In this final section, I consider four conceptual approaches through which to make sense of the politics of connectivity in conservation practice. These are: (i) post-ANT approaches to political assembly; (ii) related contemporary theorisations of environmental publics, drawing in part on the pragmatist tradition; (iii) post-Foucauldian readings of biopolitics; and (iv) political ecology. Each is utilised within the forthcoming chapters to highlight particular facets of how the connectivity multiple is enacted; each is discussed in more depth in the context of the empirical chapters. In the remainder of this chapter, therefore, I introduce some of the key literatures pertaining to each approach, whilst also tracing their various outlines.

Addressing the politics of connectivity is essential to understanding what (if any) form of connectivity is enacted in conservation practice. Surprisingly little research has thus far been conducted into this area. That which has tends to focus on the human politics of high profile corridor-type connectivity schemes (e.g. Chester, 2006; Evans, 2007; Goldman, 2009); or the human politics involved in creating or designating ecological networks (van den Belt, 2004; Jongman & Pungetti, 2004), the installation of structural linkages like ecoducts (Metzger, 2014a), or the difficulties in establishing cross-border or regional co-operation for connectivity (Worboys *et al*, 2010). The intersection of what I have termed territorial, ecological, and socionatural modes of connectivity practices, by contrast, has received very little attention, Mason's (2013) work on canal socio-ecologies notwithstanding (see chapter one). The influence of this 'connectivity multiple' on the politics of wildlife conservation more broadly, away from the high profile structural projects, has been largely ignored.

(i) Post-ANT approaches to politics

I take the term politics in its widest sense, not limited to sites of human government and legislative contest, but extended to incorporate the many associations that cohere in, and are constitutive of, particular situations. As such, I draw heavily on actor-network and what might be termed post-actor network theory (post-ANT) approaches. Also, and perhaps more accurately, described as the 'sociology of associations' (Latour, 2005), the use of actor-network theory is well established within contemporary human geography (Cresswell, 2013:250-4). Both its strengths, and its drawbacks, have provoked much debate (Thrift, 1996; Woods, 1998). ANT-inspired research tends to be marked by: (i) the development of a material politics in which agency is diffused amongst actors, objects and technologies; (ii) a commitment to trace the various associations and connections through which such a politics is enacted; and (iii) an understanding that pre-existing socionatures do not explain particular situations, but are instead enacted in them. As such, when done exhaustively it requires and affords 'slow' research that is rich on specificities but difficult to pull off (Law, 2004; Latour,

2005). Despite important differences, it pursues a similar agenda to much post-structural and post-humanist work concerned with accounting for agencies beyond the human (e.g. Haraway, 2003, 2008). Yet in allowing agencies to proliferate, ANT and post-ANT approaches are accused of failing to adequately account: for the particularities of specifically human agencies as well as the residual effects of structures (Gregson, 2005); or more problematically, for differential power dynamics between variously situated and capable actors (Bloor, 1999). The criticisms are well known, and far from insurmountable (see Thrift, 1996; Latour, 2005).

By the term 'post-ANT' I mean work that is inspired by the associational approach of ANT, and that may adopt many of its concepts ('assemblages', 'actor networks', 'translations' and the like), but that does not hold rigorously to the approach as outlined and practiced by its architects. In particular, much work in animal geography holds to ANT's account of diffused social agency, but departs from its approach to 'nonhumans' – a term that tends to be applied to artefacts and technologies, that in turn tend to be theorized as objects-with-agency, and that thus leaves little room for differential understandings of animals as nonhuman 'experiential subjects' (Buller, 2014). Instead, such work turns to alternative accounts of animals as embodied, sensing, and lively nonhuman actors (see Whatmore & Thorne, 2000; Whatmore, 2002; Haraway, 2008; Ingold, 2013); and tends to foreground, rather than obscure, the distinctive differences between different nonhumans (Lulka, 2009; Head *et al,* 2014). Post-ANT approaches to political assembly inform the accounts of connectivity politics that develop throughout the empirical chapters, specifically with respect to the relational competencies of a diffuse cast of conservation actors.

(ii) Environmental publics

In chapter five, I also engage with contemporary theories regarding the assembly of environmental publics. These theories share much common ground and analytical heritage with the post-ANT

approaches outlined above, but also introduce another line of thinking through a re-worked and re-invigorated form of pragmatist political philosophy (Marres, 2007). Such work tends to focus on the role of environmental controversies as 'generative events' in the formation of publics (Callon *et* al, 2009; Whatmore 2009:588; Lane *et al* 2011). The plural is important here, as such events may lead to conflict and discord and multiple publics. The emphasis, therefore, is on publics as actively composed (Latour, 2010) rather than *a priori*. I take this concern with composition further through tracing processes of affective 'attachment' (Marres, 2007) that work to assemble publics in the *absence* of explicit controversy. In particular, I engage with Eden & Bear's (2012) concept of "performative publics" that are assembled through everyday environmental practices rather than discursive controversies, through which to analyse the practices of conservationists assembling more-than-human publics through generating affective atmospheres (see previous section) of curiosity.

(iii) Biopolitics

Foucault's work on *governmentality*, and particularly the concepts of *biopower* and *biopolitics*, have increasingly been utilised by geographers in the analysis of situations of environmental governance in many forms (Rutherford, 2007; Rutherford & Rutherford, 2013a,b). Indeed, the concept of governmentality has become very influential within wider social science over the past several decades, and can even be considered as a subfield of study with the advent of dedicated journals and courses (Senellart, 2009:390-1). Usually defined concisely as "*the conduct of conduct*", governmentality has seen a proliferation of further conceptual development as various authors grapple with the implications of Foucault's insights about precisely *how* different forms of 'rationality' are enacted through diverse practices of government and governance (Rutherford, 2007). *Biopower* refers to such governing practices that target living bodies (individually or collectively) as key sites for the exercise of power; and *biopolitics* is used (by Foucault, and subsequently, for the most part) to refer to the exercise of biopower at the level of populations

rather than individuals to produce particular "ways of living" (Braun, 2007; Lorimer & Driessen, 2011:250).

Despite Foucault's resolutely anthropocentric approach, the concept of biopolitics has proven notably useful for more-than-human geographers concerned with the governance of nonhuman lives in diverse contexts (Buller, 2008; Enticott, 2008; Hinchliffe & Bingham, 2008; Holloway et al, 2009; Lorimer and Driessen, 2011; Collard, 2012; Hennessy, 2013; Hinchliffe & Lavau, 2013; Srinivasan, 2014; Biermann & Mansfield, 2014; Braverman, 2014). In chapter six, I engage with such work to trace the ways in which different modes of biopolitics shape and space the lives of various more-than-human actors in woodland mammal conservation. In particular, and through also engaging with related work on the notion of biosecurity (Dobson *et al*, 2013), I concentrate on a line of thinking that seeks to trace more 'affirmative' modes of 'living with' more-than-human life (Hinchliffe *et al*, 2005; Haraway, 2008; Rutherford & Rutherford 2013b; Hinchliffe & Ward, 2014; J.Lorimer, 2015).

(iv) Political ecology

And finally, in chapter seven, I draw on political ecology (Robbins, 2012) analyses of neoliberal governance regimes to explore the emerging relationship between particular enactments of the connectivity multiple and the rise of 'ecosystem services' as a governing logic of conservation practice. Neoliberalism is a broad term that has been interpreted and applied in diverse and sometimes conflicting ways (Bakker, 2010). Herein, I utilise Castree's typologies of neoliberal governance, which highlight practices of: privatisation, marketization, deregulation (to shrink the state), reregulation (to support marketization), the use of market proxies, the encouragement of non-state actors, and the creation of 'self-sufficiency' (2008a:142; 2010:1728). Political ecology-style critiques have increasingly been applied to practices of wildlife conservation, highlighting the commoditization of 'nature' (McAfee, 1999) and the continued dominance of powerful interests

despite discursive commitments to more local and community-based form of management (Selfa & Endter-Wada, 2008; Brockington & Duffy, 2010). Political ecology has less to say about nonhuman agencies, and much more to say about the role of economic and political governance regimes (Bakker, 2009), than the posthuman political analyses utilised in more-than-human geography (see previous section); despite many recent exhortations to 'materialize' political ecology as a field (e.g. Barua, 2014a); and excepting the infrequent (but very informative) combination of such concerns (e.g. Maye *et al*, 2012; Leap, 2014; Barua 2014b). This thesis is far from being a work of political ecology, but I engage with these literatures to highlight particular aspects of contemporary conservation policies relating to economic and political governance, where they have proven notably insightful.

Chapter conclusions and contributions

This chapter had three aims: to **review existing geographic literatures** about connectivity, to **illuminate several important gaps** in those literatures regarding the multiplicity of connectivity, and through that process to **develop concepts** to make sense of enactments of connectivity in conservation practice.

Three axes of literature were considered. First, various literatures pertaining to different ontologies of connectivity were presented, relating to structural, functional, and human-nature theories of connectivity. Second, two sets of literature were presented which in different ways speak to the epistemologies of connectivity (i.e. ways of knowing modes of connectivity): these were conservation science and more-than-human geography. Third, further theoretical resources were introduced that will be drawn on in later chapters to make sense of the politics of connectivity practices, including: post-ANT theories of assembly; related contemporary approaches to environmental publics; neo-Foucauldian theories of biopolitics; and political ecology. These three sets of literature are herein

heuristically separated, but of course they each resonate across the various ontological, epistemological, and political axes thus traced.

Furthermore, I identified several important gaps in existing literatures. First, whilst research into the theory of different modes of connectivity is well developed in distinct and usually separate fields/subfields, little existing work has attended to how these modes of connectivity (necessarily) cohere. This thesis utilises Mol's (2002) notion of the multiple in order to do so, introducing the concept of '**the connectivity multiple'**.

Second, whilst theoretical engagements with connectivity in wildlife conservation are legion, practical manifestations have received less attention. This chapter thus draws on various literatures to develop three concepts (**territorial, ecological and socionatural connectivity**) through which to make sense of how connectivity is practically enacted through multiple ontologies; concepts that underpin the empirical analysis in the following chapters.

Third, critically considering how each ontological theory of connectivity imagines both space and mobility afforded drawing a conceptual distinction between nonhuman movements and nonhuman mobilities. This distinction provides the theoretical grounding for the move in later chapters to explore the importance of nonhuman perspectives on connectivity, theorised through the lens of specifically **animal mobilities**, developed in conversation with non-representational theories, and thus contributing to existing attempts to 'take animals seriously' in geographic research.

And finally, this review points to the lack of sustained research into the politics of connectivity in contemporary wildlife conservation, beyond work concerned with high-profile corridor schemes of structural connectivity. In particular, the political import of the connectivity multiple in widespread

conservation contexts has received very little attention; a lack that chapter seven, in particular, seeks to remedy.

ATTUNEMENT

Based on field diaries, April 2012.

A classroom, and a woodland, in England.

"Don't be disappointed, but we are very, very unlikely to encounter any wild boar today", said Keith the ecologist, underpromising.

The rest of us, overhoping, didn't listen. Bags were already being hurriedly stuffed with the morning's scrawlings, and coats rescued from the backs of chairs. Grins were being exchanged across the classroom. The "*we are about to do something cool*" type of grins. Expectant ones, almost childlike in their anticipatory glee. And immersed in this atmosphere of expectant gleeful grinning, we ventured outside.

It didn't take long to find sign of the boar. Uprooted turf, scratchings and scrabblings and snufflings and nuzzlings, across patches of the forest floor. Nosings through and under, snouting towards worms and bulbs and tubers like hungry drills through softwood. Evidence enough. But no boar.

Lots of excitable chat, nevertheless. All the group – more than a dozen, less than two – were united by our enthusiasm for these porcine vagabonds. Professional conservationists, ecologists, and amateur enthusiasts; undergraduate students and their tutors, university academics from both sides of the divide; some quiet, some garrulous; some old friends, some new. All of us here to learn about the return of wild boar to England's forests. And maybe to meet one or two.

Narrative justice says that we should, at the last minute, have found them. After overcoming some kind of obstacle. After having our hopes raised, and then dashed, only to be raised once again. Actually, we just came upon them on our walk. Around the corner, and there we all were. No big fuss. Keep on digging girls. A matriarch and her piglets, six in all, stocking up. We watched them eat. I had a sweet. Some of the group took photographs. We all grinned.

Amazing, we agreed, in the car park about to depart. The smile lingered.

3. Method

> "*The making, unmaking and remaking of the world is a constant and ongoing process. It is taking place all around us, all of the time, and on many different scales. Yet it is not just happening* around *us: everything we do, or choose not to do, is caught up in this making, in its own little way."* (Clark & Massey, 2008:417)

In the Introduction, I established that multiple forms of connectivity have become increasingly important in wildlife conservation, suggested this emergence is both understudied and of significant import to geographers, and outlined how this project seeks to explore such emergent connectivity practices through a focus on the situations of three woodland mammals in England and Wales. A literature review followed, in which I assembled a diverse collection of theoretical work relating to various types of connectivity, and developed three concepts through which to make sense of connectivity practices (territorial, ecological and socionatural enactments).

Here, my aim is to detail the methodological approach through which the study was performed. Materials were generated (Whatmore, 2003) in three stages, which might be termed: (i) ethnographic; (ii) auto-ethnographic; and (iii) as experiments in inter-species empathy. These were not temporally distinct processional stages, but analytically compounding stages that occurred sometimes together, sometimes apart. The various stages are united by a focus on practices: both as the subject of research, and as a means through which to explore diverse worlds. In this chapter, I begin with a reminder and further elaboration of the research aims; continue by briefly contextualising the turn towards practice; before outlining the practicalities of each methodological stage.

3.1 Research aims elaborated

The central research aim of this project, as set out in the Introduction, is to explore **how connectivity is enacted in conservation practices**. In practical terms, this central aim was further specified through the elaboration of two related lines of exploration, thus:

(1) What forms of connectivity practices are enacted in the conservation situations here considered?

(2) What is the wider significance of connectivity practices within wildlife conservation?

Specifying the aim of the project in these terms serves to both ground the project within contextual specificities, whilst also keeping a weather-eye on any wider ramifications of the connectivity practices encountered (without overreaching or over-extrapolating). The respective narrow and broad foci implied through these lines of exploration do not map directly onto the ensuing chapter structure; but there is a definite direction from the narrowly specific towards wider generalities of wildlife conservation as the chapters progress. Thus chapter four describes several experiments in exploring nonhuman connectivity; chapter five explores the enactment of more-than-human (and political) connectivity in wildlife conservation through using pine marten projects as a relevant example; chapter six narrates the various modes of connectivity enacted in (some, particular) red squirrel and pine marten conservation projects in England and Wales; and chapter seven explores the significance of connectivity practices more broadly, through considering their import, promise and shortcomings with respect to three of the most significant and constituent trends in contemporary conservation. The movement is thus from attuning to animal mobilities (four), to the ensuing assembly of conservation publics (five), to the enactment of spatial conservation strategies

across varied landscapes (six), and to the wider policy context in which these are enacted and which they duly influence (seven).

Practices

In introducing non-representational and (post-)actor network theories in the previous chapter, I suggested that their emergence was in part a response to perceived inadequacies with the strictly discursive focus of the 'cultural turn'. Such forms of genealogy perhaps over-simplify shifts in diverse bodies of theory, and various forms of practice theory both long pre-date the turn to discourse, and have remained influential within certain strands of sociological research. Thrift (1996:17), for example, identifies in particular the work of Heidegger, Wittgenstein, Merleau-Ponty, Bourdieu and de Certeau as "*theorists of practices*"; all of who, in differing ways, force attention towards "*what people do, not what they say they do*" (1996:10). Yet it is fair to say that such thinkers have enjoyed something of a renaissance within the pages of human geography journals and texts in recent years, as their work has been (re)discovered, (re)considered and (re)applied.

In chapter one, and drawing on the various writings of Mol and Law (together and separately), I described how understanding connectivity as a multiple requires attention to the practices through which such multiple enactments occur. As Law & Lien (2012) explain in a later work, such an approach requires attending to the textures, choreographies, successes, failures, and the elusive aspects of practices; particularly when it comes to those involving humans and animals in relational encounters.

Attention to practices does not necessarily negate the importance and usefulness of discursive analyses, but rather suggests that these are not sufficient on their own to account for the messiness (to use Law's term) of social worlds (Law, 2004). Thus, diverse approaches have been developed

through which to combine various forms of discursive and non-discursive empirical material, with post-Foucauldian material-minded scholars continuing to emphasize the former (e.g. Barry, 2001, 2013), hybrid geographies (following Whatmore, 2002) and (post-)actor-network approaches (following Latour, 2005, & colleagues) steering something of a middle ground, and the avowedly non-representational approaches giving much greater emphasis to the latter (e.g. Thrift, 2008; Anderson & Harrison, 2010). However, this rough continuum, informative as it is, does injustice to all parties: Foucault, especially in later work, foregrounded embodied and affective concerns alongside the discursive (Philo, 2012); and non-representational work is often better described as more-than-representational (H.Lorimer, 2005). Conceptual injustices aside, herein I pursue something of a middling course with occasional forays to either extreme.

3.2 Stages one & two: generating ethnographic and auto-ethnographic materials

"*The objective of ethnography"*, suggests Tim Ingold, "*is to describe the lives of people other than ourselves, with an accuracy and sensitivity honed by detailed observation and prolonged first-hand experience"* (2011:229). Traditionally, for anthropologists this has usually involved years rather than months of immersive fieldwork, living with the communities being studied. The primary methodological technique in such approaches is often participant observation; the primary tool, the field notebook. Detailed and voluminous notations of everyday practices are contextualised through further techniques and tools, including but not limited to key informant interviews, linguistic and discursive analyses, surveys, exercises in participatory mapping, contextual histories, and the like. Theories are usually grounded in such data, pursuing inductive lines of reasoning for the most part.

Ethnographic approaches towards generating materials within human geography research draw on, but sometimes differ to, the anthropological ideal (Crang, 2005). Thus, human geographers have adopted (or coincidentally developed) many of the same methodological techniques and tools:

extended participant observation, field notebooks, combinations of interviews, discursive materials, cartographies, histories, archaeologies (Cook & Crang, 1995). However, geographers tend to use these techniques to explore subtly (or sometimes very) different questions, which often require different combinations of such methods, and notably shorter periods of participant observation; deductive modes of reasoning may also play a more prominent role.

In this project, the ethnographic approach was: (i) more-than-representational (H.Lorimer, 2005); (ii) mobile (Cresswell, 2012b), and (iii) multi-species (Kirksey & Helmreich, 2010). The first, according to Vannini, extends ethnographic practice towards, or at least particularly emphasizes, five key 'qualities': *"vitality, performativity, corporeality, sensuality, and mobility"* (2014:2; see also Spinney, 2014). Such a non-representational focus is essential in a project aspiring to engage with animal enactments of embodied, sensed and felt mobilities (see chapters two and four). The second refers to the practice of conducting research on the move: not only comparing multiple sites (Marcus, 1995), but following research subjects; that is, instead of focussing on a particular place (or places), the aim is to follow relevant actors, objects, practices and processes through multiple locations to trace the geographies being enacted (Cook, 2004). Such logics are prevalent in, and here inspired by, the actor-network style of work introduced in chapter two (see Latour, 2005). As Brockington & Duffy (2010:471) observe, *"Studying conservation policy, organisations and natural resource management frequently requires multi-sited ethnographic research"*; I concur (see also Ellis & Waterton, 2005; J.Lorimer, 2008). The third, 'multi-species' approach, refers to the practice of extending ethnographic concern and attention beyond the human (Ingold, 2013), and has seen significant recent development and utilisation within both anthropology (Song, 2010; Kohn 2007, 2013; Candea, 2010) and more-than-human geography (Hinchliffe *et al,* 2013; Head *et al*, 2014; Buller, 2014). There has been some debate about the incorporation of the problematic term 'species' within this approach, with some preferring alternatives including 'etho-ethnology and ethno-ethology' (Lestel *et al*, 2006), 'beyond human anthropology' (Ingold, 2013), or 'more-than-human'

ethnography (Barua, 2014a); but given the implicit species-focus of this work, the former term will suffice (and thus also highlight the implicit shortcomings inherent herein). The aim in all such work is to take seriously the agency of multiple organisms and objects in enacting more-than-human social worlds. Thus, Lestel *et al* (2006:155) suggest such an approach would, "*study the hybrid communities comprised of humans and animals sharing meaning, interests and affects, and would try to account for the complexity of interspecific sociabilities";* and similarly, Kirksey and Helmreich (2010:545) note that, "*multi-species ethnography centers on how a multitude of organisms' livelihoods shape and are shaped by political, economic and cultural forces"*. Furthermore, multi-species ethnography goes further in de-privileging human actors in such communities – as Smart (2014:3) explains, the approach, "*acknowledges that interactions between different non-human species is not necessarily mediated (only) through their interaction with humans".*

Multi-sited, multi-species and more-than-representational ethnographic techniques are thus uniquely well-suited to exploring the more-than-human connectivity practices with which this project is concerned; and participant observation was utilised as the primary methodology (see next section for details). This latter research technique has become far more widespread in geographic work since Crang mused on its unfortunate under-utilisation at the start of the century (Crang, 2002); particularly within approaches informed by post-actor network, feminist science studies, and relational-material more-than-human geographies – no doubt because such theoretical approaches rely on such forms of generative tracings.

The auto-ethnographic stage of the research was performed through the well-known shift from 'participant observation' towards 'observant participation'. Thus, I quite literally 'became conservationist'. There were four reasons for this shift towards active enactment rather than passive observation as a mode of exploration. First, it afforded a particular ethics in research practice. Instead of becoming a burden on time-and-resources-restricted conservation projects, through

'becoming conservationist' in a meaningful sense (i.e. for months rather than days) I was able to give as well as receive. This was more than a knowledge-exchange (as valorised by contemporary research councils), but also a labour-exchange. Second, it afforded the development of a level of trust, between the conservationists and myself, which would not have been possible had I remained a detached (and by implication, critical) observer. It is much easier to get along working side-by-side, rather than with someone watching over your shoulder (notebook in hand). Third, becoming conservationist afforded a focus on practices as they were enacted, not as they were recounted after the event (or even 'performed' in the theatrical sense, i.e. for an audience). Thus, I make the claim that the materials thus generated are, in an important sense, more authentic. And finally, personally enacting connectivity affords the development of knowledge through the self – bodily, affectual, and first-hand – which serves to complement materials generated through more detached means. Not a replacement for, but an addition to, traditional observational techniques. Working auto-ethnographically affords a 're-definition of the field' (Söderström, 2011) in which notions of detachment necessarily dissipate, and understandings of research as always-already a coproduction are forcefully illuminated. This approach has been rightly criticized when it strays towards unreflective and unproductive navel-gazing about positionality (Crang, 2003:496-8); although positionality, of course, remains important (Shaw, 2013); but conducted carefully, it enables further dimensions of understanding to emerge.

Applying the auto/ethnographic approach

I spent three months working full time alongside conservationists on a pine marten project in Wales, and two months similarly engaged with a red squirrel project in England. The projects were selected on the basis of explicit concerns with connectivity, albeit on very different registers (see chapter six). In both cases, becoming conservationist involved both the humdrum and outdoors fun, from days spent preparing budget forecasts, stuffing envelopes and colouring-in maps, to unforgettable

adventures in mountainous forests and suburban supermarkets. It often involved long weeks of long days, made all the longer by the need to transcribe field notes into coherent diary entries at the end of each day. I did not live with the conservationists with whom I worked, but I certainly lived the work. Several additional multi-day periods of participant observation occurred on additional squirrel and marten projects in further English and Welsh locations. For much of this time I was accompanied in the field by my canine research assistant Hester (who features in chapter five).

Situations involving wild boar, by contrast, were explored mainly through interviews and site visits with people involved in boar management in various forms; and contextualized through discursive policy & media analyses. In part, this reflected the lack of established 'boar conservation' projects in England and Wales to observe (see chapter one); in part also (and related) it reflected the ways in which the research process evolved to focus in the main on the other mammals. Of course, given this imbalance, it would have been more than feasible to excise boar from the finished account; the thesis could have been narrated solely through the stories of squirrels and martens. Yet to do so would be to repeat the ways in which boar – a once native mammal – are also excluded from the rubrics of conservation policy: something that the thesis seeks to foreground rather than obscure.

The extended periods of participant observation/ observant participation were augmented through targeted interviews, attendance at relevant events, and discursive analyses. In total, a series of 32 in-depth supporting interviews were conducted with a variety of policymakers, geographically-spread conservationists and volunteers; which bolstered the many questioning conversations had whilst working on the conservation projects; as did attendance at four multi-day practitioner conferences, and visits to a range of more-or-less connected localities (see Appendix 1). Interviews and in-field conversations of various types involve diverse challenges in conception, performance, and interpretation; and a vast literature explores these particularities at length (e.g. Crang, 2002); I do not go into these here, except to say that each such interaction was marked by its own set of pitfalls

and promises. The interviewees were purposively selected through following particular ethnographic leads, and occasionally through snowball introductions and suggestions. Likewise, site visits followed the mammal guides, and human suggestions. The conferences were serendipitous. On site visits and at conferences, I used pen and paper to record notes which enabled more detailed diaries to be typed-up later in the day or as soon as practically possible. Interviews were all recorded using a hand-held digital recorder, and fully transcribed (apart from one, where I inadvertently turned off the recorder whilst helping to untangle a stray sheep from a woodland fence; in that case I made notes from memory).

Most interviews, and most of the far more numerous impromptu conversations (during the observant participation), took place face to face, often outside; although in a minority of cases I utilised the time-space compression qualities of the telephone system. When face to face, my dog Hester was frequently in attendance. I noted the affectual qualities of my canine assistant, and mention these here as they don't appear to be covered in the existing literature on interviews. When people are wary of dogs, it takes but a few seconds to observe the visual manifestations and hear the spoken clues; for example, the unintentional recoil or grimace, or a tendency to refer to female dogs (despite female names) in masculine terms. In such cases, Hester was quickly excused. However, in the (far more numerous) instances in which Hester's enthusiastic wagging met with a positive response, the impact in research terms was significant. Many people seem far more willing to talk to a man with a dog, than a man without; and seem more effusive, trusting, and open when doing so. Whilst I do not have the data to prove this observation in reductionist terms, it is one I will continue to take note of in future research.

Textual analysis, of policy documents, legislation, position statements, scientific papers, NGO publications and reports also played a significant part in 'generating materials' with respect to all three case studies and the wider conservation context in England and Wales (Whatmore, 2003).

Here, Hester was less help. My aims were to explore discursive enactments of connectivity across a variety of channels, rather than the discovery of particular hermeneutic patterns, frames or linguistic logics. These media included academic articles in conservation journals, such as the literatures introduced in the 'conservation science epistemology' section of chapter two. Thus, and as is documented in the next chapter, scientific papers became primary materials in their own right.

My technique for dealing with textual data was thus more akin to collage than traditional discourse analysis, as I collected telling examples of connectivity practices from a range of relevant media. The implication in epistemological terms of such an approach is the suggestion of a verificationist bias; i.e. the problem with collage is we find what we are looking for. However, my aim was not to discover a singular truth, but to narrate multiple truth-stories. As such, conscious selection is necessary.

3.3 Stage three: conducting experiments in attunement

Multi-species ethnography requires attending to the agency of nonhuman organisms in enacting social worlds. In part, such agencies can be addressed through the traditional ethnographic tools and techniques outlined above; and that is, for the most part, how multi-species ethnographies have been conducted to date. However, as I suggest in chapter two, a fully more-than-human approach requires more; for nonhuman animals, it should attend to both the spacing of animals by human actors, but also to these animals' own geographies (Hodgetts and Lorimer, 2014). In turn, herein this suggests concern not simply with animals' movements, but also with their nonhuman mobilities.

Exploring the enactment of nonhuman mobilities requires methodological innovation. In this research I utilise Despret's (2013) ideas about inter-species empathy in order to (further) develop the notion of **attunement**. My suggestion is that, through attuning to squirrels, martens and boar, we

might be able to consider dimensions of movement as more than simply shifts in location. As I shall explain in more detail in chapter four, attunement can thus be conceptualised as a process of developing empathetic connection, as 'learning to be affected' (Hinchliffe *et al*, 2005:648). The aim is explicitly speculative: to attempt to explore the perspective of an/other through active engagement. But – and importantly – attunement does not involve *becoming other*. Thus, unlike stage two in which I literally *became* conservationist, I did not seek to become marten, squirrel or boar. Of course, there are some (unconventional) strands of ethological research in which 'becoming animal' is the explicit goal (Bekoff, 2002). And some forms of socionatural theory attempt also to go this far, particularly those inspired by ethological thought. Yet such an approach is limited by two significant issues: temporal and philosophical. The temporal problem relates to the time required for such an ethology to be conducted; often necessitating years of painstaking observation, it was not practicable within this research design. The philosophical problem is perhaps more intractable, and involves the difficulty in transcending alterity. However, the aim here is somewhat more modest: not to become animal, but to try and attune.

Applying attunement

I thus draw on existing work within human geography and cognate fields, in which techniques of multi-species attunement have been developed, so as to attempt to explore the enactment of non-human connectivity. In practical terms this involved two strands of research. The first was an investigation and analysis of how such connectivity has been approached within traditional biogeographic accounts. Here my focus was on the ways in which models describe and predict movements of squirrels, martens and boar, whilst simultaneously closing down possibilities for thinking about their mobilities. Second, I engaged in a series of multi-species experiments through which to attune to these mobilities. These experiments involved utilising tracking and tracing techniques to attune to various mammal mobilities. They included traditional techniques of multi-

media immersion and learning from experts, alongside more innovative attempts at multi-species empathy afforded through working with dogs. I further experimented with a form of embodied empathetic mobility, seeking to recover something of what was lost through the modelling processes encountered earlier. This largely involved running woodland landscapes, to experience something of what might be implied by sterile concepts such as 'dispersal distances', 'permeability', or the experience of 'cost' in a 'least-cost-path'.

I frame the latter methodological approaches as 'experiments'. I use this term not in its traditional sense of a lab-bound exercise in falsificationist hypothesis-testing; indeed, in geography (Davies, 2010) and wider social science (e.g. Callon *et al,* 2009), there have increasingly been moves to re-think the nature of experiments in broader terms. Instead, I conceptualise 'experimenting' as a form of instigated but loosely-framed speculative practice in which the outcome is neither pre-empted nor predicted in design. I draw on Lorimer & Driessen's concept of the 'wild experiment', and adhere to at least two of their axes of difference with 'experiments': drawing on immanent ontologies of non-dualist socionatures, and enacted through epistemologies "*designed to generate surprises"* (2014:172; the third axis, relating to a dialogic politics of experiment, is precluded by the type of speculative practice conducted – albeit that the experiments described herein could be re-performed along such lines – and interestingly, could well generate different 'results').

3.4 Collecting and analysing materials

In total, fieldwork occupied 12 months (November 2012 to September 2013). Somehow, this year of experience became condensed into the drawers of a single filing cabinet and a replicated USB stick. In turn, the cabinet seemed tardis-like in its ability to spew forth enough material to decorate an entire room: desk, floor and walls. I resisted the temptation to further the process of abstraction by importing this text into a computer programme for thematic coding, despite the best efforts of the

software companies to provide training. Instead, analysis proceeded through an iterative process of reading field diaries and transcripts, looking at visual materials, carefully navigating policy documents and their unspoken silences, remembering, writing, reading, thinking, sending the odd follow-up email, questioning the materials, questioning my interpretations, remembering, writing, reading, writing. This analytical process is not replicable; although it is (perhaps) traceable. Analysis was (and to some extent still is) on-going: as the chapters were written, I put them 'at risk', re-visiting some of the places and people on whose performances they are based, to see if they resonated as written; for the most part they did, but more links were made, emphases altered, and directions taken. The preparation of this thesis performs another iteration, as will the ensuing viva, as will any modifications that result.

As I suspect is often the case in projects of this type, I ended up with more material than could sensibly fit into the chapters that follow. But perhaps not more than was necessary. Thus the conclusions here both rest on, and are shaped by, much material that is not included. The metaphor of an iceberg, therefore, is perhaps appropriate in describing what follows: the thesis represented by the visible portion of blue-green ice, with the nine-tenths of material not included herein submerged below the waterline; essential for buoyancy, but unseen.

In an effort to bring-forth and re-vitalize some of the unseen materials generated through this research, I attempt in places some experimental forms of writing. Once again, I utilize the term 'experimental' in its open sense of creating possibilities (Stewart, 2011). These exercises in narrative experimentation fit within an emerging trope in cultural geography and cognate fields; as H.Lorimer & Parr explain, such writing attempts to 'induce feeling', to 'generate mood', to 'attune to affective worlds', and to utilise description towards conceptual ends (2014:544). Such is my aim. Herein, these attempts are perhaps most evident in the multi-directional narrative excursions in chapters four, five and six; but the various porcine vignettes should also be viewed in this light. In all cases I am inspired,

in part, by the books that I read with my daughter. She cannot yet read alone, she is too young; but the books require both of us to actively engage. I take the role of the narrator, and she helps to open the flaps. It is through these flaps that the possibilities of each page are multiplied; different narrative routes become possible, different visual and tactile sensations, different imaginaries. As readers we work with these possibilities, and the book expands before our senses. Such, I suggest, is the role that experimental writing can play within a thesis of this type: like the flaps in my daughter's books, it serves to multiply possibilities. This has two benefits that are of interest. The first is to condense generative possibilities into a compact text that proliferate upon reading: to fit more in less space. The second is related, but refers to the ways in which authorial agency is thus diffused somewhat. The text becomes a little more readerly, and a little less writerly. Of course, in a sense this is no more than a rhetorical trick. Yet it is a trick that once played, cannot always be contained.

3.5 Limitations

In the preceding sections of this chapter I have detailed the methodological tools and techniques through which this project was conducted; in this final part, I attempt to anticipate likely criticisms of the approach. In particular, I identify two significant issues that need further consideration: (i) the inherent limitations of case-studies; and (ii) the flip-side of inclusion, i.e. what is left out.

Case-study research works through detailed investigations of particular situations that, in turn, speak to a wider context. As Castree (2005b:541) suggests, it thus rests on a productive tension between the nomothetic (general patterns) and the idiographic (context as constitutive); not through a logic of 'either/or', but rather a 'both/and'. The aim is to identify situations that are both specific *and also* share certain commonalities with other situations, in order to allow for comparative analysis (Castree, 2008); and both the commonalities and the specificities require attention. There are thus two primary issues of concern when designing case study research: (i) what is the 'case' a case of;

and (ii) how to make cases comparable, without losing sense of these contextual contingencies. However, answering both questions is far from simple. In the design of this project, situations relating to woodland mammal conservation in England and Wales were selected for the reasons detailed in an earlier section. However, the limitations of these case-studies are evident to see. Mammals are not molluscs. The commonalities between cases of 'conservation' might, perhaps, dissipate as the contextual differences multiply.

Furthermore, focussing on woodland mammals introduces some specific biases to the chosen cases: notably, rural ecologies are not urban ecologies. Through focussing on woodlands, there is thus an explicit bias towards 'rural' rather than 'urban' places in this project – suggested by the concomitant location of the majority of conservation action, but problematic and limiting nevertheless. Indeed, there has been a significant and productive body of recent work on 'urban natures' that has unsettled traditional dualistic understandings of nature/culture as well as rural/urban, and that work towards more relational modes of enactment, encounter and political action (Hinchliffe *et al,* 2005; Braun, 2005; Hinchliffe & Whatmore, 2006; J.Lorimer, 2008b; Karvonen & Yocom, 2011).

I attempt to balance the nomothetic/idiographic tension in this research in two ways. First, I avoid making sweeping claims based on the detailed descriptions of a few conservation situations. Where I do make wider conceptual moves, I do so tentatively. Indeed, the concept of the connectivity multiple allows for the simultaneous recognition of similarity (that the multiple is composed in conservation practices) and specificity (that it is composed in different ways). Second, whilst limiting myself to a particular 'case' (woodland mammal conservation practices in England and Wales), I introduce something of a comparative methodology internal to the case through exploring different mammalian situations. My aim is to trace both similarities and differences in comparative terms.

Not only does this methodology focus on specific situations, but it also approaches these with specific forms of question. There is, notably, an implicit epistemological focus on more-than-human actors and objects; conceived through relational ontologies and spatial imaginaries. Conducting research according to these logics leads to the inclusion of, or focus on, particular things, events, processes. Nonhuman actors, in particular, get more priority than in traditional humanist approaches to sociological enquiry. But it leaves out other actors and factors, and de-emphasizes other approaches to knowledge construction. Thus, and for example, the epistemology outlined asks fewer questions about the structures of political-economy that cohere in, and are generative of, particular conservation practices than one constructed through the logics of political ecology would require. Such questions are not unimportant here, but they are de-emphasized. Likewise, this research has little to say about the ways in which socio-economic differences or divisions, between various human societal groups (variously conceived), play out in connectivity practices; yet research could very reasonably proceed along such lines. There is most definitely something to say about capital, land tenure and social class, for example, and the ways in which red squirrel conservation practices are enacted in various places in England and Wales; red squirrels have (human) friends in high places. So: alternative approaches are, and were, available. However, for addressing the specific aim of this project, the techniques outlined here were the most appropriate choices in theory, and they delivered in practice.

3.6 Summary

In this chapter I have detailed how the central aim of this project was made operational through a focus on conservation practices, and set out three methodological stages through which research materials were generated. These stages were: (i) ethnographic; (ii) auto-ethnographic; and (iii) empathetic. They proceeded sometimes together, sometimes apart. Each of these stages utilised a variety of techniques, including participant observation/observant participation, key informant

interviews, site visits, textual analyses, walking with dogs and running in woods. Further detail regarding the innovative empathetic methodologies is included in chapter four. I continued by describing how the materials thus assembled were analysed; how decisions of inclusion/exclusion were made; and reflected on how attempts at experimental writing were included in an effort to snorkel the iceberg. Finally, the chapter considered shortcomings of the approach thus outlined, concluding that it proved appropriate for the project, if inherently limited in scope.

POPULATIONS

Half of wild boar face cull in Forest of Dean amid concern over dog attacks and spooked horses

By Alice Philipson 9:39AM GMT 10 Mar 2014

Half the population of wild boar in the Forest of Dean may have to be culled amid concerns they are attacking dogs, spooking horses and causing severe damage to people's gardens.

The Forestry Commission plans to reduce numbers to around 400 in a highly controversial move that has divided the community.

The Commission says the population is expanding at an extremely fast pace, with each sow producing up to nine offspring per year.

However some local residents disagree with the way the cull is carried out. Kevin Stannard, deputy surveyor in the Dean, described the cull as a "very sensitive and very controversial subject".

www.telegraph.co.uk/news/earth/wildlife/10687133
Telegraph.co.uk. First published 10.03.2014. Accessed 05.02.15

4. Animal mobilities

SEAN

So if I asked you about art you could give me the skinny on every art book ever written ... Michelangelo?

(beat)

You know a lot about him I bet. Life's work, criticisms, political aspirations. But you couldn't tell me what it smells like in the Sistine Chapel. You've never stood there and looked up at that beautiful ceiling.

Excerpt from Damon & Affleck (1998:71) *Good Will Hunting*

"Non-representational ethnography emphasizes the fleeting, viscous, lively, embodied, material, more-than-human, precognitive, non-discursive dimensions of spatially and temporally complex lifeworlds"
(Vannini, 2014:1).

In this chapter, my aim is to explore nonhuman enactments of connectivity, in terms of nonhuman lived experiences. To do so necessitates both conceptual and methodological innovation. In conceptual terms, I further develop the notion of **nonhuman mobilities** that was introduced in chapter two. Methodologically, and as outlined in chapter three, I both reflect on existing methods of exploring nonhuman connectivity used in traditional biogeography, and attempt a series of 'experiments' with alternative forms of biogeography through engaging with various forms of 'multi-species ethnography' (Kirksey & Helmreich, 2010) and related techniques for 'inter-species empathy' (Despret, 2013).

Various engagements with three types of woodland mammal – boars, martens, and squirrels – inform the following account. First, I consider the ways in which traditional biogeographic models have been used to map and predict animal movements; and how such models rest on, but also serve to obscure, such animals' experiences. In particular, I highlight how animals are transformed in such models into 'rational actors' pursuing 'cost and benefits', in a seeming inversion of the traditional human-rational/animal-irrational double binary. Second, I turn to techniques of attunement developed in alternative approaches to biogeography (and also within wider social science), and often ultimately deriving from ethological research. I describe the conduct and outcomes of three 'experiments' in attuning to woodland mammals: (i) focussing on **animal bodies** using traditional observational and informational means; (ii) focussing on **animal sensings** through tracking with canine assistance; and (iii) focussing on **felt emotions** through running in the woods. I use the term 'experiment' in its speculative sense of facilitating surprise, rather than according to a deductive logic of hypothesis testing (see Lorimer & Driessen, 2014). All these experiments have serious limitations (especially the last), but all also enable a degree of speculation about nonhuman mobilities that can helpfully add to existing knowledges of nonhuman movement. Specifically, they enable the composition of an account of **animal mobilities as *embodied, sensed and felt*** in particular ways – ways that are obscured through the dessication of modelling.

4.1 Modelling movement

Traditional forms of biogeographic analysis have long been influential in wildlife conservation (see chapter two), and remain so with respect to measuring, mapping, and where possible predicting the movement of particular types of aggregated organisms (Ladle & Whittaker, 2011). These maps and models measure or speculate about movements through time and space, of genes and organisms and species-populations, and across categorised habitats and ecological communities. Connectivity

mapping for mammals is often concerned specifically with both the location of organisms, as well as the spatial spread, shape, and structural connectedness of supportive habitats. Traditional techniques like scat and hair-tube surveying, mark-and-recapture, or radio tracking, bolstered with newer developments including PIT tags, GPS, DNA analysis, and camera tracking, allow for the empirical study of organism location and movement through space and time. Where it exists, directly captured data regarding movement can support connectivity modelling; where it is lacking, locational data can be cross-referenced against habitat maps to draw inferences regarding the permeability of habitat types; and where locational data is also absent, predictive modelling can be based in 'expert' assessments of likely habitat permeabilities.

Mapping movement with empirical data: pine martens in Scotland

A recent paper about pine marten movements in Scotland is exemplary of connectivity analyses that are based on direct data. Authored by Caryl *et al* (2012), and published in the *Journal of Mammalogy*, it explores the permeability of non-forested matrix habitats based on data about the movements of 4 male and 7 female animals. These martens were captured in live traps, fitted with radio-collars and subcutaneous tags, and their wanderings through various categorised habitats recorded (tussock, heath, agriculture, scrub etc.). Locations and movements were entered into ESRI's biogeographic mapping software ArcView GIS, and analysed with the 'Home Range Extension' tool. Combined with existing data on martens in 5 additional landscapes, the authors set about exploring the permeability of matrix habitats, finding that, *"the nonforested matrix is not homogenous from the perspective of a pine marten"* (2012:472). Indeed, contrary to traditional understandings of pine martens as forest-dependent, these authors note, *"Consistent selection of these* [various non-forested] *habitats suggests the matrix is not only penetrable but utilized by martens".* The paper is set up as follows:

> *"In this study we investigated how both forest and matrix habitats are utilized by martens by measuring the structural and trophic components of habitats occupied by martens. Predation and winter severity are major limiting factors to European marten populations that directly influence habitat selection … We therefore predicted martens would select structurally complex habitats that provide protective cover from predators and temperature extremes … irrespective of whether those habitats occur within forest or the matrix. We also predicted martens would select habitats in which their preferred prey was found (i.e., tussock grassland …) ... Because there is considerable sexual size dimorphism within Martes species, we predicted smaller-bodied females would be more risk-averse than males and would avoid those habitats that offered the least structural protection from predators."* (2012:465)

Three points in this extract are of particular note: (i) the inclusion of bodily difference; (ii) the inclusion, but subsequent masking, of animal emotion and/or affectual response; and (iii) the dominance of rationalist logics. First, in attending to and discussing the different movements and habitat selections performed by male and female martens, there is a degree of attention to bodily difference that is not simply subsumed to species aggregates; yet there are, of course, issues regarding the gendering of assumptions with respect to risk aversity[4]. Second, whilst discussions of emotion and embodied experience are unsurprisingly absent in this traditionally-framed scientific text, considerations of affect are not entirely absent. The authors make predictions about how martens 'perceive' matrix habitats by highlighting the importance of possible predators (red fox and golden eagles), structural features affording cover from these predators, as well as the ways in which vegetation affords availability of prey (various vole species). Thus, this work implicitly incorporates ethological ideas about differential perceptions of landscapes between types of organism, such as that developed in Von Uexküll's concept of the *Umwelt* (Manning *et al*, 2004; see later discussion); but it does so in a very particular way. Anthropomorphic accounts of marten fear, feelings of safety, or the affectual affordances of various scents are silently sidestepped through incorporation instead into an unexamined cognitive logic of perception/response. This leads to the third point: consistent with the traditions of the field, there is an assumed (and thus unstated) reliance on the rationalities of cost and benefits that informs both the experimental structure and the subsequent discussion. It is

[4] Haraway (1989) has demonstrated how such gendering of assumptions permeates the assumed objectivity of biological science practice throughout the history of primatology, and the assumption regarding gender/attitude to risk in the pine marten paper appears to follow a similar pattern.

understandable but also limiting, as emotion and affect become subsumed within the rational logics of the map-model. Indeed, in an ironic reversal of philosophical history, the role of emotion in decision-making enacts a human/nonhuman binary, but this time with animals conceived as rational actors; after all, contemporary research in the field of public policy increasingly recognizes the non-rational, affectual and emotional aspects to *human* decision-making (see Whitehead *et al*, 2011).

Modelling movement with or without empirical data: grey squirrels in Cumbria

In many cases, however, mapping the movement of species/organisms is more problematic. Locational and movement data might be lacking for a variety of reasons, including the rarity of and/or difficulty in monitoring certain species, and the desire to ask questions about currently uninhabited landscapes (particularly in the light of changing climates or species (re)introductions). In these contexts, traditional biogeographers increasingly resort to statistical modelling techniques that afford predictions about how various organisms *might* move through particular habitats and landscapes. Influential amongst such methods is the use of 'least cost path' (LCP) modelling (Kool *et al,* 2013). Rather than measuring structural connectivity (the extent to which particular preferred habitat types are spatially connected), least-cost approaches take a functional approach to connectivity. The models are constructed through categorising various habitat types within a GIS, and applying permeability scores to represent the ease of movement of a particular species through each type. However, this species-specificity is often less useful for conservation planning where multiple species are affected by fragmentation. For a broader analysis still based in functional logics, 'generic focal species' approaches have been incorporated into least-cost models. Watts *et al* (2010:1306) describe the generic focal species as "*a conceptual or virtual species, whose profile consists of a set of ecological requirements or traits which reflect the likely needs of real species for which comprehensive data is unavailable"*.

The best of both worlds occurs when least cost path models can be 'validated' through cross-referencing their predictions with empirically measured movements. Here, contemporary work on invasive grey squirrels is exemplary: a recent report published by the Forestry Commission's research arm into grey squirrel connectivity demonstrates the utilisation of this form of biogeographic technique in a live policy/practice situation. Entitled '*Modelling ecological networks and dispersal in grey squirrels*' (Stevenson *et al*, 2013), the report adopts Watts *et al*'s 'BEETLE' least-cost path modelling tool in order to assess the various connective paths open to and used by grey squirrels in Cumbria. Their first step is to build the least-cost model. They set it up thus:

> *"Least-cost analysis is a GIS modelling technique that combines detailed habitat and landscape matrix data with behavioural characteristics of species. This produces measurements of the connectivity of habitat within the landscape and indicates possible movement areas or probable movement paths."* (2013:2)
>
> *"To use least-cost modelling, land cover types were assigned a resistance score that was based upon the facilitating or impeding effects upon species movements. In this study, scores were derived using a combination of resistance sets from previous studies, expert opinion on the ecology of the grey squirrel and distribution data. Resistance scores derived from literature review and expert opinion are seen as subjective. Therefore, further empirical investigation through genetic analysis and telemetry were used to validate the model outputs"* (2013:3)

The least-cost model they constructed suggested two separate networks of possible connectivity for grey squirrels in Cumbria – one in the north of the county, and one in the south, separated by habitat fragmentation and a mountain range. The genetic analysis conducted supported this mapping of two separate networks through establishing genetic difference between northern and southern grey squirrel populations. Finally, nine grey squirrels were fitted with GPS radio collars and released; the devices were set up to record location data every three minutes, for up to five days. Five of these collared squirrels were re-captured, and the data selected for analysis showed that their actual movements were within the predicted network for 95% of the data points.

Again, there are a number of points to make about this research: (i) this model, and others like it, have agency; (ii) it maps movement rather than mobility; (iii) it relies on, but silences, animal experience. The first is the simple recognition that such models have agency; they are not merely theoretical exercises that exist apart from the places they map, but instead are active interventions in live situations. Indeed, geographers (often drawing on work in science studies) have often noted the agential capabilities of, and politics enacted through, such techniques and artefacts in conservation and wider environmental management practices; for example, with respect to remote sensing and cartography (Robbins, 2001a,b), species databases (Bowker, 2000), algorithmic modelling of species' populations (Braverman, 2014), census models (J.Lorimer, 2008), population viability modelling (Biermann & Mansfield, 2014), and forest exploitation (Nobert, 2013). In all of these situations, the specificities of modelling practices inflect management practices and afford particular forms of (bio)politics. Indeed, the authors of the report in question draw on their findings to suggest how grey squirrel control measures can (and should) be targeted at 'pinch points' within the connectivity networks they have identified: to do so is more efficient and cost effective, they argue. As a Forestry Commission document, it is well placed to inform future policy development in this way. Indeed, similar modelling exercises conducted for the possible spread of wild boar in UK landscapes make comparable claims towards policy relevance (e.g. Holland *et al,* 2007).

Second, and as with the pine marten mapping considered earlier, this is an account of movement rather than mobilities; squirrels are constructed as objects, with the movement of five individuals made universal. Indeed, subjectivity is to be avoided at all costs: we are told that even expert opinion and peer-reviewed literature is to be viewed as too subjective. Third, (again) this model relies on but serves to obscure animal experience. Thus, despite the significant effort to demarcate movement, the authors note the ways in which the actual five squirrels defy their neatly drawn polygons: *"The squirrels did not take the most direct route between habitat patches; instead movements were longer and followed landscape features including field edges, habitat edges, paths, rivers/streams, roads,*

road verges and tracks … The GPS points were recorded close to landscape features and were not recorded in open areas, showing the importance of landscape features to grey squirrel movements" (2013:4). There is no mention of confidence or fear, hunger or tiredness in such comments; indeed, if there were an explanation offered, the normal language in this disciplinary context would involve talk of costs and benefits; but such affectual experiences are important and silently incorporated nonetheless.

Modelling movement: summary

Traditional biogeographic maps and models utilise a variety of empirical and predictive techniques to measure and predict species' movement. These maps and models reduce the affectual experience of the animals involved to the logics of costs and benefits; this is useful for explaining and modelling *movement*, but is limited when it comes to exploring *mobility*. The lively affectivity of habitats thus becomes decimally rendered: a hedgerow might gain a permeability score of 0.9; an arable field, 0.3 perhaps. Indeed, these scores might themselves represent temporal modes or means: the field might be passable in summer when the crop affords cover from aerial predators, but near-suicidal in winter when bare stubble. Affectual intensities and emotions (fear, anxiety, confidence and relief) thus become quotients; cells in a database obscured beneath the map. Similar moves occur with regard to the specificity of organisms, with individual animals in particular locations having their movements first averaged and then universalized – for the aggregate species, across aggregated space. Taking aggregation and reduction further, the use of 'focal species' in models creates an abstract animal geography that only ever lives inside the circuitboards.

How such models map the present, and predict futures, is important because models and expectations are performative (Porter & Randalls, 2014). These various connectivity maps and models thus do important work in re-presenting the need for movement within fragmented

landscapes for many non-human species; furthermore, such models also provide a possible way to address the inherent tension between single species and ecological processes in conservation planning (see chapter seven); and, rightly, they guide policy. In practice, therefore, such models have the potential to enable certain types of movement (and mobility) whilst closing down alternative possibilities. The contention to be made through thinking with alternative biogeographies is not that connectivity maps and models are invalid, but rather that such approaches always remain partial: that is, they are necessary, but not sufficient, engagements with non-human connectivity. In the following sections, I seek to add to such accounts through a series of experiments in attunement – and thus move from geographies of movement towards geographies of mobility.

4.2 Attuning to mobilities: embodiment, sensing, feeling

> *" … as de Certeau suggests, stories <u>are</u> spatial practices that bear within them ghostly reminders of our journeying to and fro; they convey in words a sense of the body-subject occupying, inhabiting and traversing space, transforming it into places and specific presences …"*(Whatmore, 2002:7; emphasis in original)

Alternative biogeographers have increasingly engaged with the 'ethological turn' in sociological theory (J. Lorimer, 2008:379), drawing on a diversity of writings from the history of ethological science (Von Uexküll, Lorenz) to the poststructuralist philosophies of Deleuze & Guattari, and from Haraway's concerns with interspecies communication to the beyond-human anthropology of Ingold (see also H.Lorimer, 2010). For example, Thrift draws on the ethological theories of Von Uexküll to argue that animals live in different Umwelten, and thus that *"animals exist in spaces and times which mean that the relation that they have to the things in an environment may be radically different from ours and each others"* (2008:156). If animals live in different worlds, then relational approaches suggest that the interaction of these worlds occur through attunements: "*as the work of von Uexküll shows, we should not believe that this interaction is taking place in one world. Rather it takes place in a whole series of worlds which are more or less attuned to each other and which have more or less*

resonances in and with each other" (162) (see also H.Lorimer, 2010; Ingold, 2011). The result of numerous geographic-ethological engagements is a rich and varied body of work that, in different ways, explores various attempts at attuning to the non-human – and particularly with animals (H.Lorimer, 2010; Eden & Bear, 2011; Greenhough & Roe, 2011; see also review in Buller, 2014). Such exercises in attunement are often evident in, and constitutive of, existing conservation practices – particularly when it comes to establishing species presence (Hinchliffe *et* al, 2005; Hinchliffe, 2008; Nygren & Jokinen, 2013). For example, J.Lorimer (2008) describes in some detail the ways in which conservationists attune to corncrakes in order to generate meaningful accounts of abundance and distribution. But these writings often go further than simply describing existing practices, and instead develop the notion of attunement towards a particular end - as a mode of encountering nonhumans upon more level, albeit always (humanly) embodied, terms. Indeed, in developing an 'epistemology of movement', Buller (2012:141) has suggested that attention to embodied movement is the means through which such an attunement or "*mode of connectivity … with non-human animals"* might be achieved; as he suggests, "*Movement then is a way of bridging the human/non-human divide, the positive knowledge of sharing movement with animals through encounter, through being together, whether on the farm, at home, in the wild and so on …"* (2012:146).

'Attunement' can be conceptualised as a process of developing empathetic connection: at its most basic, involving a fostering of curiosity about nonhuman lives; and in more expansive versions consisting of attempts to be affected by, engage and/or communicate with nonhuman organisms. Hinchliffe *et al* (2005:648), following Latour, describe the process as 'learning to be affected'; and J.Lorimer (2007) theorises this process in terms of charismatic affects, where 'tuning in' is a bodily as much as a cognitive practice. Despret (2013) makes the link with empathy explicit. In a review of a series of bodily encounters from the annals of ethological fieldscience, she uses the term '*embodied empathy'* to describe the, "*feeling/seeing/thinking bodies that undo and redo each other, reciprocally though not symmetrically, as partial perspectives that attune themselves to each other … empathy is*

not experiencing with one's own body what the other experiences, but rather creating the possibilities of an embodied communication" (2013:51). For Despret, embodied empathy can be enacted in various ways as a tool, to attune and respond to, communicate and correspond with non-human animals. Becoming attuned to another is thus a process; a skill that, as Hinchliffe *et al* (2005) suggest, needs to be cultivated. Skills, suggest Ingold, are developed within particular environments, and combine actions and perceptions in "improvisational" abilities (2011:16, 62, 94). This, then, is a reading of skill that emphasizes practical experience rather than, or in addition to, expert instruction (Pálsson, 1994).

In a move reminiscent of, and informed by non-representational theory (Thrift, 2008; Anderson and Harrison, 2010) attunement thus involves meaningful engagement with the affectual and emotional as well as the rational[5]. As Thrift notes, there is a significant body of existing research suggesting that, *"animals have rich affective lives, though it is clear that they rarely display emotions in quite such a transparent way as human beings"* (2008:227). As such, attuning to and with non-humans might be conceptualised in similar terms to inter-human empathy, albeit with the caveat that nonhuman emotions remain harder to read. For example, in an account of the ways in which conservation communities are drawn together, Pratt (2012) utilises a non-representational approach to affect, emotion, and practice to trace a particular situation in which shared experience affords a performance of communal togetherness to emerge[6]. She suggests that when considering people, *"not only are practice and emotion nearly impossible to separate, emotions help make doing-in-common intelligible"* (182); recognizing further that the non-representational is "*punctuated by representational moments along the way – a burst of rage, a loving embrace, a look of serenity. These readily recognized expressions and exchanges help us register what others are feeling and in*

[5] See, for example, the discussion of consciousness and affect in Despret's (2004) narration of the 'Clever Hans' controversy.

[6] As noted in chapter two, 'affect', according to McCormack (2008:414) refers to "*a field of pre-personal intensities"*, with, "*feeling as that intensity registered in sensing bodies; and emotion as the socio-cultural expression of that felt intensity"*.

turn make us feel in new ways" (183). People thus recognise and respond to emotional states in others through both shared experience of affects and recognition of others' emotional responses (and the additional affects thus generated). Her account concerns communities of human actors, but might be usefully brought to bear upon notions of interspecies attunement, where attending to affect, emotion and practice are fundamental (Despret, 2004). However, doing so necessitates engaging with the critique of anthropomorphism, which can be understood as the claim that non-human alterity prohibits recognition of human emotions in non-human beings.

In recent years the strictly patrolled border between human and non-human has increasingly been disputed (Haraway, 2008). The fundamental insight is an old one: imputing love into the stare of an animal might be unjustified, but recognising fear and suffering in an-other being is an ethical necessity (Bentham, 1789, cited in Singer, 1993; see discussion in Roe, 2010). Fear and suffering are feelings expressed as emotions through bodily representation and practice; so too are joy and happiness. Greenhough and Roe (2011) have thus traced how attunement to animal emotions has become important in laboratory spaces on the grounds of both experimental efficacy and animal welfare; and this recognition of the affectivity (and effectivity) of bodily representations of emotion has wider relevance. Indeed, in the field of animal behaviour, 'Qualitative Behavioural Assessments' are being developed which aim at linking emotional states in animals to their embodied actions; that is, through attempting to understand animals' own "body language" (Wemelsfelder *et al*, 2012:3652; see also Fleming *et al*, 2013). Such emotions are, of course, more affectual and – perhaps – comprehensible when recognized in animals that are more like us. Following Nagel (1974), it is not possible to gain complete objective knowledge of any such subjective experience – a human cannot know what it is for a dog to be scared or happy, for example. But empathy relies not on totality, rather it depends on some level of 'communal intelligibility' (following Pratt, 2012). A dog pricks her ears; jumps to four paws and cocks her head, first left ear up, then right; then she barks, five or six quick and low; a human listens for footsteps in the gravel outside. Why do they listen? Because of a

rational understanding of possible cause (intruder?) and effect (dog barking); because they recognise this performance of movement and vocalization to mean 'there's something outside'; or do they listen first pre-cognitively, responding to the affectual intensities generated by the dog's sudden alarm, their eyes following her ears, their pulse quickening to the growl, both hackles rising? I suggest all of these, and probably more.

Attunement is thus about attending to both the cognitive *and* the affectual – responding empathetically to the practices of another organism whilst also reflecting on what might be going on (see Despret, 2004). As such, it is evidently harder with organisms less 'like humans' – the awkward, the monstrous, and the very small for example (J.Lorimer, 2007; Ginn *et al*, 2014). It necessarily goes beyond the visualism that Franklin suggests "*partially disembodies relations with the natural world"* (2001:66), instead drawing on multi-sensory, affectual and embodied ways of knowing. It relies on what Johnston (2008:643) has termed a "*responsible and informed anthropomorphism"*, which she formulates through an engagement with Ingold's phenomenological approach to 'dwelling' as:

> *"… a way of knowing about and knowing with animals not based on our shared sentience, our shared place in the world or any other such abstract philosophical argument, but on our actual relationships, our day-to-day living and working. While this offers no guarantees, it at least demands that we engage openly, honestly and practically not only with our own ideas and beliefs, but also with the real nonhumans who are so often the subjects of them."* (646).

(i) Animal bodies: Attuning with field-guides, internet video, experts and binoculars

Interview with an ecologist, abridged (2013):

Interviewer: in broad terms, how do they move?

Interviewee: Well, it's a good question. They're basically woodland mammals, in Britain they're nocturnal, become increasingly nocturnal with persecution, or management if you like, getting culled.

Interviewee: so the ones in Kent would be I guess more nocturnal than the ones in the Forest of Dean?

Interviewee: Probably. Probably but they're both nocturnal. The Kent and Sussex ones are supposed to be pure wild boar, and the ones in the Dean are believed to be hybrid – feral pigs really. So they're not pure wild boar. They tend to rest up in woodland during the day and then move around foraging at night, which can include going out of the woodland into farmland or not – you know, they might stay in the woodland. They move over a few, home range is typically a few hundreds of hectares. So they might move half a kilometre, a kilometre in a night very typically, on occasions a few kilometres.

Interviewer: Are they happy wandering across open fields?

Interviewee: Yes, but they associate with woodland edge more. So they stick to woodland edge, and more so if they're moving in daylight hours.

Interviewer: So they'll use hedgerows to an extent? Or?

Interviewee: Yeah, I guess so. I mean the radio-tracking data – we haven't looked at hedgerows as such, we just looked at their movements in relation to the woodland edge, but it shows a strong affinity for cover. So they use fields, but don't like, they seem to reduce their exposure to open areas.

The first set of experiments relied upon tried-and-tested methods of observational and informational approaches to attunement. These included poring over field-guides (*Bang et* al, 2001; Harris & Yalden, 2008), species-specific monologues (e.g. Goulding, 2003), pamphlets (e.g. Birks, 2002), reports (Birks & Messenger, 2010), and inches of scientific papers. They included perusing video footage of squirrels, martens and boar, either professionally produced and packaged, or available as single clips from repositories including ARKive and YouTube; or produced in the course of fieldwork with several types of camera. They included spending time with experts of various kinds (ecologists, conservationists, foresters, film-makers, and hunters), walking in woodland habitats, asking questions about how squirrels and boars and martens move, what they might experience; attending to the multi-sensory, embodied knowledges of these various guides (see, for example, Franklin, 2001 regarding hunters; and J.Lorimer, 2008, regarding ecologists). And, most importantly, but less successfully, they involved ethological techniques of observation; less successfully because boars proved elusive, martens impossible to find despite months of trying, and because ethological research done 'properly' takes years rather than days. All such methodologies have been utilised within human geographic research, and their various pros and cons discussed and debated (see, for example, on learning with experts: J.Lorimer 2008; on ethological techniques: H.Lorimer, 2010; and

on learning through watching and making video: J.Lorimer, 2010b, Laurier, 2014; Bates, 2014); I refrain from discussing these at length so as to be able to spend more time reflecting on the innovative methodologies adopted in the second and third series of experiments.

From combining these various methods, I learned a great deal that is already known to many people, about how martens and squirrels and boars move. I learned about their embodied capabilities: the importance of claws for tree-climbing, snouts for snuffling, bushy tails for sheltering in the wind and the rain. I learned about styles of movement: the swish-sway-flow characteristic of martens as they cross the forest floor; the seeming ambivalence of boar as they work a patch of bulbs, like a meandering plough in no hurry; the arboreal acrobatics of squirrels squabbling over favourite trees. I learned about the importance of weather, food availability, and possible threats when trying to predict animal movements. I learned about stillness: both as part of mobility, and as necessary to observe mobilities (see Adey, 2009; Cresswell, 2012b). In particular, and suggested independently by ecologists, conservation practitioners, hunters and film-makers, I learned to 'think like prey': not articulated in terms of the least-cost-path, but the safest-seeming one. I was encouraged to think about the possible threats from goshawk and fox if I were a marten; from martens if I were a squirrel; and from humans and dogs if I were a boar. Within ecology, such logics are framed in terms of an "ecology of fear", wherein the behaviour of 'prey' species is understood to adjust to the presence or absence of possible predators; indeed, such logics facilitate the aggregation of individual behaviours into models of predator-prey dynamics (Brown *et al*, 1999). Seemingly contradictorily, I also learned about the importance of communal animal paths to species like martens that communicate through scent marking on prominent rocks and stumps. And most importantly, I learned that attunement requires imagination and curiosity.

Combined, these informational and observational modes of attunement pointed strongly towards the importance of considering animal mobilities as well as movements. They suggested that animals

experience their passage through worlds as more than simply shifting coordinates. They suggested that nonhuman connectivity is influenced by embodiment, by various forms of perception, and by (nonhuman) emotion. It is these three aspects of animal mobilities that I sought to explore in more experiential terms through the next two series of experiments.

(ii) Sensing: Attuning with a dog called Hester

" … the problem of how to understand dogs and, especially, how to live with them – and how dogs, in turn, come to understand and live with people – calls for an analytical framework that goes beyond a focus on how humans represent animals to an appreciation for our everyday interactions with these creatures and the new spaces of possibility such interactions can create"
(Kohn, 2007:4)

Fieldwork stories (2013). ***Calibrating eyes and noses***. *The rest of the country has been gripped by a series of winter storms and their stifling snows, but in west Cornwall it remains relatively mild. Each morning Hester and I begin our day with a walk up to the lighthouse and cliffs beyond. We are walking bound by a lead, to keep us from chasing rabbits and choughs over the edge (and contributing to the Coastguard's alarming statistics about human-dog cliff rescues). Halfway along our route, the path passes through a gate in an old tussocky wall. Each day as we approach, Hester becomes increasingly excited. Her nose is closer to the ground, her sniffs more frequent and vigorous, bent legs lowering her torso so that she seems to dance, crab-like, to-and-fro. When we pass through the gate, this moment of excitement seems to ebb, and we walk on. Each day, a similar performance. And then one morning we join the rest of the country with our own fleeting mat of sticking snow. Today, Hester's movements inform me, is more exciting than normal. There is more sniffing, more chasing of scents. And when we reach the gate through the wall, I can for once see what Hester smells each-and-every morning. For whilst in the fields there are sparse animal tracks here and there, through the gate there is a veritable melee of recent traces, excursions large and small. For her, the snow seems to*

heighten her senses, or at least her excitement; for me, the snow makes scent-lines visible, and makes sense of her dancing.

My second series of 'experiments' involved working with a canine research assistant to attempt jointly-attuning to squirrels, martens, and boars. Dogs have long co-operated with humans in tracing other lives; and this co-operation has shaped both dogs and humans, culturally and biologically (Haraway, 2008; Kohn, 2007, 2013; Bradshaw, 2011; Rowlands, 2013). These days, dogs work in a wide variety of occupations beyond their traditional hunting and guarding niches: to trace lost humans; to uncover hidden, illicit and deadly substances; to care for, assist, and provide company; to haul and to harry, preserve and protect, and much more besides (Urbanik, 2012). In contemporary wildlife conservation, dogs are still sometimes present in the assemblies gathered around particular lives, albeit playing different parts than historically. Within pine marten projects for instance (see chapter five), professional and 'lay' canine research assistants aid in locating pine marten scat – key to surveying species abundance, distribution, and to mapping connectivity. Given the long history and contemporary ubiquity of dogs and humans working together to achieve particular aims – work that often, if not always, requires forms of two-way inter-species communication and understanding (albeit always partial, always incomplete) – human-canine modes of attunement offer a promising means through which to explore the development of multi-species empathy. Indeed, Brown & Dilley (2012) have conceptualised human-canine communicative encounters through Haraway's (2008) notion of 'response-ability': that is, a curious engagement in listening and dialogue, through an engagement with human-animal 'contact zones' (see also Kirksey & Helmreich, 2010).

In the following experiments, I co-operated with a springer spaniel called Hester, with whom I share a home; in Lestel *et al's* terms, we live "*shared lives"* (2006:156). Both Hester and I are enthusiastic amateurs when it comes to surveying for various forms of wildlife; we both have rudimentary training and particular, material talents; we both have areas in which we are less proficient. Neither

of us are professional conservationists, and as such what follows is not an account of polished practice. Through reflections on our surveying for martens, boars, and squirrels, I wish to draw out some of the possibilities – and some of the caveats – that this form of multi-species attunement offers towards generating an account of mobility as well as movement.

Fieldwork stories (2013). *February, Cornwall, a wooded valley. Hester and I are surveying for grey squirrels on behalf of a local group, trying to ascertain their abundance and distribution in the area. There is an accepted method of squirrel surveying in England that involves slowly walking along a 1km transect, stopping for 5 minutes every 100 metres to look and listen and wait. The guidelines say nothing about whether you should do this with your dog, but I can see why it may be problematic, perhaps skewing measures of abundance, even when dog and human are bound together on-lead. The presence of Hester seems to encourage squirrels to flee to the trees, and escape is often audible and visible. Particularly when she barks. Off the floor, up the trunk, along spindly branches from tree to tree, connectivity is an obviously three-dimensional process for squirrels. It also appears to be an affectual one, as our presence re-configures the possibilities for movement; previous movement-possibilities gain new meanings. Descriptions of squirrel flight in terms of rational cost/benefits, or in terms of emotions like fear and safety, might seem overly speculative; but the intensity of flight, the skittish actions, both point towards understanding their escape as more than mechanistic movement.*

May, West Wales, East of Pontarfynach. We are bound once again, this time on a long-lead so that I can see her movements. Luna, the professional scat-sniffing Labrador we met last week, works off the lead; Luna is trained to locate scat and 'show' it to her human colleague. Hester and I have had no such training, so the lead keeps us connected whilst I look where she sniffs. I've let her smell some sample pine marten scat, but being honest I'm not sure she understood my attempts to explain the game. Instead, I know from experience that she will be drawn to

'interesting smells', and her nose will lead my eyes towards them. And it works. My eyes are becoming nosy. As we walk through the woods, my eyes are often drawn to the animal paths tracing through the bilberry; but Hester's to-and-froing performs a more contemporary tracing. Something went this way very recently, her movements tell me. Probably not a pine marten though – in my experience, she usually saves this particular sniff-dance for the presence of rabbits. Amongst the trees she finds a couple of scats that I wouldn't have seen, and to my nose they smell more sweet than foxy – definitely worth bagging for the lab and later analysis. Pine martens, like many mustelids, are a markedly olfactory species: they communicate over time and space through scent – rubbing, glanding, and scat marking their lives, their lines. Is it any surprise that through gaining nose, I gain a better window on their world?

June, West Wales, Cwm Rhaidol. Hester is not with me today; a day-off to play ball. I'm setting camera traps with a pine marten conservationist in a steep, wooded river valley. We are walking along a little used (by humans, at least) trail, when I find myself remarking, "I can smell fox". This is an unusual statement for me to make. He agrees, and we decide to set a camera trap as he has some ideas about fox/marten interaction that he'd like to explore. As we are fixing the camera to a tree, a fox cub comes to investigate, getting to within an arm's reach before backing off, perhaps deciding that a little more distance might be a good idea. I wonder about how Hester perceives the world, smelling before seeing.

August, Gloucestershire, the Forest of Dean. Bound once again, but unlike for the squirrels, this time it is for our protection. Boars and dogs have had a series of deadly encounters in these woods, and the advice from the Forestry Commission is clear: keep dogs under close control. This time I can see the sign of boar clearly enough on my own. Their rooting behaviour upturns large areas of turf or forest floor, leaving a trail even an amateur like myself would struggle to miss. But rooting is evidence of past inhabitation, and I am no tracker – I do not have the

expertise to tell how recently these rootings occurred. Once again, we look to each other. I think Hester can tell I am more-than-usually alert, an edge in the way I stand, the way I speak; dogs seem to read such moods. I look to her for any signs of something amiss – I know she will smell or hear any boar before I do. We are both, I think, affected; both concerned: I am alive to the excitement but possible danger that encountering boar might presage; Hester's ears are raised, her torso pushed forwards as she sniffs at the breeze and looks at me as we collaborate on direction.

Lestel *et al* have written that, *"we need to understand how humans and animals cooperate and change each other (socially, of course, but also cognitively and physiologically) in the course of shared actions wherein each may call upon different skills"* (2006:156, emphasis in original). Woodland is experienced differently as a humandog collective. Possible animal tracks, marked by small-footed paths through the bilberry, are given a temporality through the performance and observation of intense sniffing. Invisible paths across uniform forest roads are made visible by the same means. Eyes become nosey. At one level, this is simply about translation: as olfactory clues, whilst not experienced directly, or in any of their complexity, by the human part of the collective are still made available at some level. Specificity remains a canine experience, but intensities are bodily translated. But this translation is not only a representational achievement. Attuning does not rely only on cognitive interpretation of bodily practices, but instead on a form of embodied empathy as described by Despret (see earlier discussion). It is as much engaged as it is detached, to use Candea's terms (Candea, 2010). Thus the translations that occur between human and dog are felt as much as they are interpreted. The dog crouches; the human's muscles tense. The human sees movement and holds still, looking; the dog pricks her ears, tilts her head, and again.

The aim of these experiments in multi-species attunement was to gain insight into the mobilities of boars, squirrels and martens. Experiencing their habitats as part of a humandog collective afforded

several lines of informed speculation, relating to: (i) multi-sensate worlds; (ii) scale and dimension; and (iii) emotion and permeability. The first relates to an experienced appreciation of the difference that diverse sensory capabilities make with respect to connectivity and mobility. This sensory difference is made even more apparent through multi-species attunement, as Hester's actions served to show me what I could not see. I saw an empty path; we experienced a path alive with recent traces, movements, and meanings. After all, not all lines can be seen; not all movements smelled. Of course, this is something well understood by conservation biologists and landscape ecologists, and is often incorporated into map-models in various ways. For example, because of the understanding that animals have different perceptual ranges, and thus perceive habitat fragmentation differently, there have been moves to incorporate perceptual ranges into ecological modelling (Pe'er & Kramer-Schadt, 2008). However, as I suggested in the previous section, such models incorporate but simultaneously silence such knowledges. Witnessing sensory alterity, recounting it as more than simply a taken-for-granted, is a role well suited to alternative forms of biogeography (see, for example, Whatmore, 2002:33).

Second, attuning with Hester to various mammal movements highlighted the embodied species specificities of both scale and dimensional movements; as Latour has observed, "*scale is the actor's own achievement*" (2005:185). Connectivity models tell us that different forms of habitat are differentially permeable; but observing the ease with which squirrels navigate the canopy, Hester the forest floor, or boars the Forest of Dean visitor centre car park, generates greater understanding of how such permeabilities are practiced. Witnessing such movements, their ease or difficulty, speed or slowness, confidence or apprehension, re-invigorates the statistics.

Third, and related, attuning to mammal movements is suggestive of the affectual and emotional aspects of mobility – albeit speculatively so, through embodied empathy. Thus, I speculate that the squirrel's flight from Hester and I involved a sense of fear (however squirrel-fear might or might not

manifest), through comparison with the shared affectual experience that Hester and I had in the presence of boar, and that I experienced as a kind of shared fear. I was, by contrast, struck by the ambivalence of a sounder of boar that I experienced whilst walking without my canine friend; and by comparison, learned something more. This is not simply to reduce all mobilities towards a rationalist 'ecology of fear', although such understandings are well developed within biological models of mammalian interaction (Brown *et al*, 1999); but instead, to re-emphasize the ways in which emotions and affects are felt through and constitutive of more-than-human mobilities.

In each case, these experiments in multi-species attunement generated no novel or unique insights; perhaps nothing that would even catch the attention of an ecologist. That is, however, not the point. Instead, what such methods afford is a way to access the animal vernacular – and through attention to the everyday movements of mammals, provide the beginnings of an account of their mobilities.

(iii) Feeling: Attuning through running the woods

> "We found interaction between two affective moments in the surveyors' work: a) attunement to reading the clues, bringing out capacities to understand the life of an elusive animal and b) attunement to the forest, which enables them to feel a sense of the forest. This interaction works through gradients of intensities. We call it the *circle of affective learning*"
>
> Nygren & Jokinen (2013:87), emphasis in original,
> describing practices of flying squirrel surveyors in Finland.

It was a good day to move. With the rain showers blown to the north and the puddles following course, the ground was firming and the air warm and moist. I filled two plastic water bottles and put them in my pack with a collection of highly processed sports-energy supplements, a photocopied

map, a mobile phone, some cash and similar ubiquitous detritus, before lacing my shoes and driving to the car park[7].

The first part of this chapter argued that the emotional non-human geographies of connectivity are at best opaque within traditional maps and models, reduced as they are to permeability probabilities and habitat preferences. That is, these maps and models represent the likelihood of squirrels crossing rivers or martens traversing moors, but they tell us little about the visceral experience of individual organisms in such situations. The third set of experiments, therefore, sought to body-think these mobilities as lived experience rather than through spatial statistics.

Used to running with the incessant aid of an optimistic soundtrack, all fastbeats and euphoric trills, today I listened instead to my footsteps in the ground, to the distant movements of cars and the distinctive bass hum of HGVs delivering online shopping, to the birdsong and beebuzz, dog barks and urgent calls, to the occasional plane whir and the ever-present white-noise orchestras hidden amongst the trees. In the woods the sounds were muffled, in the fields tinny and stark. The path smelt of drying rain.

There are obvious methodological challenges in such a course. Whilst modes of transformation and non-human embodiment are a common trope in science-fiction and fantasy, the possibilities open to contemporary biogeographers are somewhat limited. I cannot inhabit or possess the body of a boar, or swap places with a squirrel. And whilst real-life developments in virtual reality systems point towards intriguing modes of re-scaled multi-species encounters (Normand *et al*, 2012), these are limited to the highly artificial environments of the virtual laboratory. Instead, the onus is on exploring animal mobilities through (human) bodily engagements with the animal places of those organisms concerned. Yet emphasizing subjective knowledge of specifically human bodily perceptions seems to

[7] The italicized sections are dramatizations narrating auto-ethnographic fieldwork experiences.

widen rather than narrow the species divide; indeed, such is the critique of phenomenological approaches as being overly humanist in both conception and delivery. Thankfully, this challenge does not necessarily hold. Returning to Nagel's (1974) argument that objective knowledge of any subjective experience – human or otherwise – is impossible, empathy becomes a matter of degree, distance and alterity. The corollary is that steps might be taken to bring things closer. For understanding human experience, this might involve walking in another's shoes; an apt analogy when considered in itself, since your shoes may fit you but not me, thus problematizing any insight I might hope to garner thereby of what it is for *you* to walk in your shoes. Any knowledge gained this way is partial, requires imagination, and is essentially creative as much as affective; but this does not mean it is invalid, uninteresting or without use (see discussion in Despret, 2013:69-73).

Running with a map and a satellite photo, locating points of reference, bringing the images to life – four-dimensional, in motion, in-play. Tracing a route from woodland to woodland, trying to bodily-think alterity: cover, opportunity, threat. A lone bus shelter on a quiet country road; if it was raining, I could stop there. This tree would serve for a squirrel; that old oak for a marten, maybe. Nonhuman rationalities seem easier to think with than non-human emotions; perhaps because we are used to seeing even human rationalities as convenient fictions, I wonder? Rationalities are not anthropomorphic; evolution is not subjective; safe ground for science, perhaps. Yet rationalities <u>are</u> anthropomorphic, just disguised. Not enough in any case. What is it to move through this fragmented wood-land on four feet or paws, or hooves?

In recent years human geographers have attempted various phenomenologically-inspired experiments in bodily engagement with particular places, landscapes and environments (Wylie, 2007; Vannini, 2014). Often these are conducted through the practice of walking, be it on contemporary coastal paths (Wylie, 2005), or through historical landscapes of reindeer herding (H.Lorimer, 2006) and elephant hunting (J.Lorimer, 2010), as well as through the related practice of

running (H.Lorimer, 2010); and thus drawing on long histories of walking and running as means to access particular knowledges of material natures (Thrift, 2004b, 2008). However, rather than ruminating on the extent to which self and landscape are mutually constitutive through practices, histories and various relational enfoldings, the aim here was to apply such techniques to the specific question of non-human mobilities; enacted as a form of 'go-along', inspired by non-representational approaches to mobilities research (Spinney, 2014). Another exercise in 'embodied empathy'.

I move on paths and trails; I move in the footsteps of many ancestors. Many mammals make similar paths. We walk and run the way that our bodies and the bodies surrounding, intersecting, and co-habiting afford. My path is not that of the marten, but we each have our possibilities. As I run on the path by the roadside, protected from death-by-steel through the customs of kerbs, I pass a de-cultured badger squashed flat to the tarmac. I gag involuntarily; it has begun to spread. I muse on the fate of boar in the west of England in particular, where traffic accidents are not infrequent: cull by combustion engine. Do they fear the tarmac? As I run through the woods, I watch as a grey squirrel scoots across the forest floor before ascending into the skies, flitting from branch to trunk to branch, away and out of sight.

Here, I wish to explore the possibilities afforded by this notion of empathetic experience. My hypothesis, if it is deserving of such a term, is in two parts. First, that certain aspects of nonhuman mobility that are lost in translation (reduced in models to 'movement') can be explored through human bodily engagements with animal places: in particular, engagements that involve movement, exertion, and permeabilities. That is, through a form of cross-species phenomenology. Second, that these explorations are amenable to some form of (re)presentation. Both parts require creative experimentation.

I'd been running long enough now to feel the salt, dry and coarse, on my neck, and to wish I'd brought more water. With precious little shelter in the fields, the sun had burnished its welcome. 'I'm back', it seemed to say; 'I never left'. Thanks, but enough. A big field for me; even bigger for a thirsty squirrel, I suspect. In a while I'd reach the next woodland – cooler air, shadow and respite, a seat amongst the branches. For now, I had to keep moving. Still, the sun stalked me through the corn.

My method was to traverse a landscape of fragmented woodlands, such as those modelled for woodland mammals, and to compare the experience thus gained with the possibilities afforded through connectivity maps and models. I selected an area in the South Downs of England with which I am personally familiar but not intimate, for three reasons. First, the area contains significant blocks of coniferous and broadleaf woodland that are fragmented by tracts of agricultural land, small human settlements and a network of small and large roads: the sort of fragmented landscape in which connectivity analyses are often conducted. Second, it was chosen as an example of speculative possibility, akin to the modellers' predictive mode of potential habitat analysis. This part of the South Downs National Park is uninhabited by any of the target species (boar, pine martens, red squirrels), but could perhaps prove amenable to inhabitation given the right conditions. Feral populations of boar less than 100 miles to the east, and occasional (unconfirmed) reports of pine martens in the New Forest 40-odd miles to the west, point to possible futures; as does the habitat suitability for red squirrels as evidenced by an abundance of greys. Third, my rusty familiarity with these woodlands allowed for a mode of encounter that was embedded but uncertain, and exploratory in an open-to-experience rather than a colonial or appropriative sense. Specifically, I focussed on an imagined set of connectivities between two national nature reserves: Butser Hill, and Kingley Vale, and ran within and between these areas several times over the course of several months.

Later, climbing a steep incline, on a broad track skirting a grid-planted conifer plantation, I'd settled into a slow shuffle, glad for the path, and the shelter it afforded from the windy rain. Tired, damp,

and a little pissed-off with myself for taking a wrong turn and adding another half hour to an already long day. Time was catching up with me now; time and a lack of energy. I needed to get back to the car, with its extra water and box of food and heated embrace. I needed to get there with enough strength to drive home safely. Then I rounded a corner and a deer sprung across the track, there-then-gone, back into the woodland and away from me.

As mentioned earlier, various conservationists suggested 'thinking like prey' as a way to attune to woodland mammals, and to me this suggested running rather than walking through these lands. Walking through a landscape seems to imply a comfort, security, and predatory confidence inappropriate to this experiment (notwithstanding Wylie's insistence on the anxieties generated through multi-day hikes, 2005). By contrast, I hoped that running would temper this mode of dominance, through the imposition of physical stress. Such a practice is perhaps unhelpfully suggestive of tropes of 'heroic', masculinist and colonial exploration and research (see discussion in Vivanco, 2004); furthermore, attempting to 'think like prey' appears to construct an imaginary of 'nature red in tooth and claw'. But my aim was very different: to engage in running as a curious practice that, through opening various vulnerabilities, made possible particular forms of inter-species empathy. Thus, unlike Plumwood's petrifying encounters, this was not an exercise in "*becoming prey*" (see Fullagar, 2000); but rather an exercise in generating embodied empathy with, rather than the direct experience of, the emotional facets of mammal mobility. Yet the bio-chemical affectivity of running can also have the opposite effect, temporarily boosting confidence. Bodily experiments are not, after all, conducted in closed systems. H.Lorimer points to the complex possibilities of running, thus:

"*[Running is] a means to get outside myself, and then, to better get back inside my skin too. When the setting is right, and for precious spells, senses seem to reach beyond their normal range, such that inner and outer worlds become more closely aligned. Science recognizes this as the 'runner's high', a short-lived neurological phenomenon brought on by the body's production of endorphins during exercise. Though no sports scientist, I'm most familiar with the immediate heady rush, and lingering*

sense of well-being … [thus] The simple pleasure of 'going out running' can be said to operate simultaneously as an individuated, molecular 'release mechanism' and *as a catalyst for a less autonomous, transpersonal sensing of life".* (2010:72)

Personally, I am no stranger to the intoxicating pleasures of endorphins, but I have also found through experience that this initial pleasure tends to dissipate with distance. As muscles tire, hunger returns, and the bounce in my step ebbs, confidence can quickly turn to anxiety; runners recognize this as the approach of 'the wall'. Yet this seeming contradiction is nothing of the sort: it is exactly this mixture of confidence and anxiety that I want to suggest can be productive of inter-species empathy.

I am lost. Not totally – I know roughly where I am, and the compass tells me my direction (as does the sun, and the direction of branch-growth and the moss on stones and many other things if I but listen), but I am also, in a very localized sense, lost. Sitting on a tree stump somewhere in the woods to the east of Queen Elizabeth Country Park, musing on permeability. It had seemed a good idea to leave the path. The darkwoods loomed above me – monocultured with mats of acidic needles, yet to be thinned, no way through. Permeability score for me: 0.0; maybe 0.1 with a chainsaw. Squirrels and martens would score the full 1.0, this three-dimensional maze of branches like a covered walkway, as easy for them as I find the moving steel-carpets in airport terminals that flow to distant gates. Easy to move they say, these conifers, but not much food; a motorway short of services. Easy for you maybe. Not so easy for me, or for boar for that matter. We are more suited to the broadleaves next door.

In many ways, my experiments with running animal mobilities were an abject failure. I did not become marten. I could not skip through the treetops. I was not hunted by goshawk. I could not experience nonhuman emotions. I learned nothing that would change the assumptions made in a least-cost path model. And caveats proliferate. Why running, after all? Why not drive, or cycle –

these are no more artificial, no less real. In fact, couldn't I have more usefully just stayed home, put up my feet, and turned on the Discovery Channel?

Yet on the other hand, I feel that something useful came of it: a sense of vitality, contingency, anxiety, and individuated relationality. Moving through these habitats afforded perception of their topologies and topographies in a visceral sense not communicated through either maps or models: a landscape in motion and alive. In this, it is congruent with much similar, if human-focussed, phenomenological research relating to the bodily experience of various environments (see earlier discussion). Moving whilst body-thinking martens, squirrels and boar inflected the experience so as to facilitate a form of embodied empathy of mobility. Running, specifically, afforded a degree of bodily recognition of the effort involved in modelling assumptions: something, at least, of what is assumed when modellers set parameters for the 'distance travelled' by an organism in their multiple simulations. Something of the anxiety, the effort, the sweat, the uncertainty. Something of the emotion, beyond the assumed dictats of economic rationalities, and evolutionary costs and benefits. Ill-fitting shoes, perhaps, but still worth trying on for a day.

If there is a punch-line to this experiment, it is this: running connectivity forces a recognition of the emotional geographies of moving through habitats. Whilst running 'attuned' to non-human mammals does not facilitate direct knowledge of their emotional experience of mobility, it does serve to suggest that such emotional geographies exist and thus require more than is permitted through reduction into a permeability quotient. 'Arable fields: 0.1', or a 10% probability of either attempted or successful traversal, says nothing of the emotional effort, the fear, or perhaps the elation[8] of such an experience.

[8] Bentham was definitely onto something in his focus on primary, negative emotions like suffering and fear. A careful, critical anthropomorphism seems on more certain ground when interpreting negative emotional states. For example, I am more certain when suggesting Hester is scared, than in imputing what I recognize in humans as emotional states like happiness. That is not to say that I think Hester is never happy; simply to suggest that the emotion of fear is perhaps more similar across species than that of happiness. To put this in

4.3 Some reflections on attunement and hybridity

In a recent paper, Latimer (2013) claims to have identified some problematic 'totalizing' tendencies in contemporary accounts of hybridity. Her concern is the obfuscation of nonhuman difference through the combination of human and non-human in philosophies of co-becoming; an approach that she identifies in Haraway's (2008) influential account of companion species and similarly informed work (see, for instance, Bekoff's (2002) mode of ethology; and Kohn's (2007) more-than-human anthropology). Latimer's contributions form part of a broader set of concerns regarding the extent of posthumanism in recent geography and cognate fields; and they are of significance to the argument outlined here. Such work suggests that in their efforts to decentre the human subject, some posthuman scholars have overlooked the importance of non-human difference (Lulka, 2009), non-human heterogeneity (Bear & Eden, 2011), and 'animals' wildness' (Collard, 2014); and there have also been calls on similar grounds for reclaiming or retaining a vestigial humanism (Thrift, 2008), albeit a re-conceptualised one (Simonsen, 2012). Indeed, Simonsen's compelling re-reading of Merleau-Ponty sketches the outlines of a corporeal and practice-oriented critical phenomenology in which the "*significance of experience*" is "*an openness towards the other (human or non-human)*"; as she explains, *"it is an understanding of others that, on the one hand, does not reduce them to the same, nor, on the other hand, sees their alterity as so radical that it precludes all mutual understanding*" (2012:23, emphasis in original). Such an approach informs and shares much common ground with the notion of attunement outlined here.

The theoretical challenge centres on how to reconcile an account of constitutive and relational becoming with an abiding recognition of inter-species (and inter-subjective) difference. Latimer's proposal is the notion of "*alongsideness*" as a form of "*intermittent and partial connection*" (2013:77)

terms of Wittgenstein's ubiquitous lion, of whom we are often asked whether, if the lion could speak, we could understand what it might say – I am suggesting that when it comes to fear, we could probably get the gist of it.

though which she hopes to foreground both the *connection* and *difference* between humans and animals. 'Being alongside' is conceived as a state of relations between kinds rather than a process of 'being with' (see discussion in Bingham, 2006:492). Thus, she points to the ways in which "*being alongside can involve co-operating with one another, even working together, but not with the same materials and not necessarily to the same ends*" (Latimer, 2013:80). Such a description seems to capture something significant about, for example, Hester and I surveying together; yet it also misses the ways in which attuning to each other not only meaningfully conjoins us, but also changes us both in the process.

Here, I want to suggest that the attention to nonhuman difference outlined above can strengthen, rather than undermine, notions of hybridity. In different ways, I became attuned to the mobilities of boars and squirrels and martens through watching videos, talking to 'experts', walking with Hester and running in woodlands. These various activities are perhaps better thought not in terms of *partial connections* and *partial divisions*, as Latimer suggests; but instead as generative processes in which connections and differences are not held to be mutually exclusive. Despite the critique, Haraway's account remains compelling here, pointing as it does not towards the totalized unity that Latimer quite rightly fears, but instead towards, "becoming *with* across species divides" (Bear & Eden, 2011:336, emphasis in original).

4.4 From movement to mobility (and back again)

The maps and models of traditional biogeography are cartographic and mathematical (re)presentations of movements, both historical and possible. They combine, condense, and afford analysis of different species, through different habitats, across temporal and spatial scales. My account of these traditional forms of representation may read too critically: that is not the intention. Maps and models are often excellent tools for communication. As such, they travel well, through the

hands and eyes and circuits of policymakers and practitioners alike. My aim here is thus more affirmative – to suggest ways in which alternative biogeographies can add to, rather than take away from, these models and maps, through generating accounts of mammal mobilities in addition to their movements.

However, whilst the representational practices of traditional approaches are assumed in the logics of their conduct, in that the end-map or end-model is the goal to which data collection and analysis proceeds, such clear lines of communication do not exist for alternative biogeographers. In these latter approaches, there is no presumed representational objective. And whilst alternative biogeographers make great efforts to listen more attentively to nonhumans, this leads to significant problems when it comes to imparting any knowledges thus (co)produced. The question, as Hinchliffe *et al* (2005) amongst others have noted, becomes: how to move from listening towards (re)presentation, without simply 'speaking for' the nonhuman? Indeed, if the initial aim was to bring back some vitality to biogeography, through exploring mammal mobilities rather than simply movements, what form of representation can communicate this liveliness without reproducing the sterility of traditional approaches?

For some, creative and experimental forms of writing are one route towards a more lively presentation (Wylie, 2010); indeed, this chapter attempts a similar move. Yet language has its limits in (re)presenting experience – an insight forcefully promoted within some non-representational theories; Harrison (2007) makes a compelling argument along these lines regarding the inadequacy of language for re-presenting pain. Furthermore, language remains resolutely human; instead, and as Buller (drawing on Derrida) remarks, *'what is required are approaches to understanding animals that do not rely upon wholly representative accounts … but find other ways of letting animals "speak"'* (2014:3). Engagements with the (more-than) humanities can be helpful here, and a series of artistic, expressive and creative interventions have been made in recent years by geo-artistic collaborations.

What such projects often share is their commitment to exploring the nonhuman in more curious, less hierarchical ways: going some way to move towards affording listening, rather than speaking.

4.5 Conclusions

> *"We … need to teach ourselves to know some of the realities of the world using methods unusual to or unknown in social science … Perhaps we will need to know them through the hungers, tastes, discomforts, or pains of our bodies. These would be forms of knowing as embodiment. Perhaps we will need to know them through 'private' emotions that open us to worlds of sensibilities, passions, intuitions, fears and betrayals. These would be forms of knowing as emotionality or apprehension".*
>
> John Law (2004:2-3)

In this chapter I narrated a series of encounters with, and attempts to represent, woodland mammal connectivity. It began by analysing the ways in which traditional biogeography utilises cartographic techniques to record and predict mammal movements. I suggested that such approaches rely on understandings of connectivity that go beyond movement, taking account of the affectual and emotional aspects of mammal mobilities; but argued that such mobilities are sterilised in the final accounts, maps or models. Animals are thus transformed into rational actors, driven inexorably by the calculus of costs and benefits. It then turned to alternative biogeographies so as to construct an account in which such mobilities might be re-invigorated. Despret's concept of embodied empathy was utilised to develop the concept of attunement, and this was applied to the study of marten, squirrel and boar mobilities through a series of 'experiments'. The first involved traditional informational and observation techniques, engaging with guide-books, videos and expert witnesses; the second, a series of tracking exercises with Hester the springer spaniel; and the third, an attempt to attune through reflexive woodland running. These experiments were far from being unqualified successes. They each had significant shortcomings, in both application and design. Yet together, they created a series of hints about woodland mammal mobilities that, at the very least, serve to justify the distinction between movement and mobility made herein, and certainly point to the need to make mobilities, rather than simply movements, more visible in geographic accounts. Specifically,

these experiments demonstrated that **animal mobilities are embodied (first experiments), sensed (second experiments) and felt (third experiments)** in ways that, whilst never fully accessible to humans, still necessitate attention and illumination. Yet as I noted in the final section, representing such mobilities is by no means a simple task.

This chapter thus contributes to existing literatures in two main ways. First, it adds to a growing corpus of work in animal geography that attempts to illuminate the lived experience of animals, specifically through developing the conceptual distinction between animal movements and animal mobilities. It thus responds to the inversion within biological science of the traditional human/animal, rational/irrational double binary, by arguing that the 'rational actor' paradigm is inadequate for both humans *and* animals. Second, through combining post-phenomenological research techniques with Despret's conceptual framework of inter-species empathy, it contributes to an emerging literature on the methodological possibilities of various modes of attunement in more-than-human geographic research.

Due to the inherent methodological difficulties involved in generating materials about nonhuman mobilities, the bulk of this chapter has focussed on the various ways in which humans and nonhumans might 'connect' through exercises in attunement, variously conceived. In the next chapter, I am concerned with a similar question, alternatively conceived: the connection, as contemporary government policy puts it, between 'people' and 'nature'.

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INTERACTING

Forestry Commission (England) Website

"The Forestry Commission advise visitors to the Forest of Dean to be aware of the possible presence of feral wild boar. If you see boar, stop, call your dog to heel and be prepared to retreat if the boar does not move off. It is unwise to approach a boar, especially if it has set itself in a defensive posture accompanied by snorts and foot shuffling as this is suggestive the animal may be readying itself to charge. We also strongly advise you to keep your dog under control – which means if you know it is unlikely to respond to your commands when walking in the woods, please keep it on a lead.

Feral wild boar are highly intelligent animals and readily learn new behaviours. The boar do not keep to tight territories, and instead roam over large areas to constantly search out food. They may stay in a particular area for a few days or even a week or so when they find a plentiful food supply, before moving on again. Please do not feed the boar! Feral wild boar can become a nuisance at the Forest's many picnic sites and cafes as they find a ready source of food. Initially the food may have been given to them by picnickers, but as the behaviour is learnt and the boar become bolder there have been instances of boar helping themselves to visitors picnics and lunches. The same applies in the Forest villages. Feeding of the boar in the communities encourages boar into the built up areas where they then cause a nuisance."

www.forestry.gov.uk/forestry/infd-9fyfc5

Forestry Commission England. Accessed 05.02.15

5. (Re)connecting people and nature

> ***"Recommendation 7. Responsible authorities should take greater steps to reconnect people to nature …"***
> (from Lawton *et al* (2010:76) *Making Space for Nature: A review of England's Wildlife Sites and Ecological Network*, more commonly known as 'The Lawton Report')
>
> ***"Chapter 4: Reconnecting people and nature.***
> ***Our ambition is to strengthen the connections between people and nature"***
> (from HM Government (2011:48) *The Natural Choice: securing the value of nature*)

"Re-connecting People and Nature" is a prominent discourse in contemporary Britain. It is found in abundance in policy documents, multimedia compositions, and wildlife conservation literatures. As a mode of argument and an attitude towards action, it is held to represent the 'problem' and simultaneously to propose the 'solution' to issues of environmental degradation *and* human wellbeing. As such, it finds easy purchase in governmentalities that seek identifiable, actionable and preferably inexpensive answers to seemingly intractable policy issues. Re-connecting people and nature, it seems, is win-win.

Yet for many geographers, appeals to "re-connect people and nature" no doubt set all sorts of alarm bells ringing. What is this 'nature' that policymakers are talking about? Who are these homogenously disconnected 'people'? And in what senses can these two categories, 'the people' and 'nature', be held separate, let alone need re-connecting? As Lesley Head (2007) memorably asked of the IPCC, haven't they read Latour?

In this chapter, I suggest a more sympathetic reading of the 're-connection' discourse, one that emphasizes the ways in which connections are actively made between all manner of more-than-human actors in the enactment of wildlife conservation. I do so through a detailed account of the

socionatural connective practices enacted in a conservation project for pine martens, in Wales. My aims are threefold: first, to consider the 'people' this project seeks to connect; second, to describe the modes of (re)connection; and third, to reflect on the socionatures that are thus assembled.

I draw on relational geographies, post-actor network approaches to the assembly of publics, and understandings of 'affect' developed within non-representational theories, to narrate an account of **more-than-human political connectivity**: the active and deliberate composition of more-than-human 'performative publics' (Eden & Bear, 2012) through affective means and prior to explicit controversies, by conservation workers in the course of their work. This concept thus adds to existing literatures on the assembly of publics by: (i) illuminating the activities through which nascent publics can be connected prior to, or in the absence of, explicit controversy; and (ii) the affective means through which such (more-than-human) connections are made - in this case through cultivating **atmospheres of curiosity**.

The 're-connection' policy discourse can thus be re-thought in light of material and affective practices that emphasize not separation, but instead the ways in which particular connections are performed. In so doing, I do not intend to understate the danger posed by the discursive separation of 'people' and 'nature' in policy, but instead to suggest an alternative reading of socionatural connectivity as performed in practice. However, such an affirmative reading of socionatural affective encounters has its shortcomings; and I discuss these through further reflections on nature reserves, and the more-than-human politics of squirrels and boar.

5.1 Re-connecting people and nature

Published in June 2011, *The Natural Choice* is a UK white paper that set out the (then newly-formed) coalition government's approach to environmental policy in broad terms (HMG, 2011). After making the case for reform, the report has four substantive chapters that consider: (i) environmental protection, (ii) the 'green economy', (iii) the need to 'reconnect people and nature', and (iv) the international policy context; note that the first three address the triple pillars of sustainability now ubiquitous in UK policy (Russel, 2007). The chapter on 'reconnecting' thus concerns the 'social' dimensions of environmental policy, and is framed in terms of an identifiable, lamentable, and apparently addressable separation of 'people' from 'nature'.

The argument given *for re-connection* in *The Natural Choice* rests on a mixture of utilitarian and ecological concerns. Connecting with nature is good for humans, it suggests, because "*Connecting with nature helps children learn, and improves people's health and wellbeing".* It notes that "*Some 54% of the adult population visit the natural environment every week"*, which raises some interesting/intractable questions about where the rest are to be found. Yet, the authors lament, "*evidence points to an increasing disconnection. Our society,"* we are told in no uncertain terms, *"is bearing the costs"* (2011:45).

Connecting with Nature is not just good for the human side of this equation; whilst "*Nature benefits humans … This is also true in reverse"* (2011:45). If humans are (re)connected with Nature, they suggest, then these humans will do more to protect it. A quote from the conservation luminary Sir David Attenborough, colourful and bold, hammers the point home: "*No one will protect what they do not first care about".* It thus seems that re-connecting people and nature is, in the binary terms of this policy-logic, good for people and good for nature.

Whilst elevating 're-connection' to a previously unachieved prominence in official policy, *The Natural Choice* is by no means the originator of the concept in UK political discourse; indeed, it is possible to trace a variety of such manifestations. Concerns about children growing up in urban, indoor environments have coalesced in conversations about a possible 'nature deficit disorder' affecting children (Louv, 2005)[9], and the public health benefits of 'contact with nature' have been increasingly recognised by health professionals and compiled in government reports (e.g. *Healthy Lives, Healthy People,* HMG 2010*)*. Similarly, conservation journals and literature have often emphasized the linkages between people interacting with nonhuman life, the development of 'biophilia', and subsequent environmental behaviours (Wilson, 1984; Pyle, 2003). Furthermore, conservation organisations have long recognised the need to promote particular visions of connection with the 'natural world' so as to bolster public support for their activities (Adams, 2004; J.Lorimer, 2007). The rationalities of 're-connecting' thus tap into present concerns about obesity, allergy and ill health in humans, whilst also seeking to bolster both support for and (often voluntary) action to protect the natural environment.

5.2 Connecting people, connecting publics, composing atmospheres

Calls to 're-connect people and nature' rest on an idea of human society as somehow separated from the natural world and in need of re-connection. In so doing, they draw on a rich history of Romantic environmentalisms, and traditions of 'wilderness' reification, both of which serve to construct such a separate, pre-existent, and purified realm of 'Nature', valued for its unsullied distinction to that of the human (Nash, 1967; Cronon, 1996; Castree 2005a). They also draw on an entrenched rural/urban discursive dualism in which countryfolk are envisioned as enacting a "*deep connectivity*" with the natural world (e.g. Marvin, 2003:58), whilst urban dwellers are somehow detached (Eden & Holloway, 2013). Separating 'nature' and 'culture' in this way is symptomatic of a dualistic ontology

[9] Indeed, the notion of such a 'disorder' has gained significant traction in popular media and societal discourse.

that Latour suggests is the hallmark of modernity (Latour, 1993), and that mainstream contemporary human geography rejects out of hand (Wynne, 1994; Bingham & Hinchliffe, 2008; see chapter two). The problems are well rehearsed: critics point to both its inaccuracy as a description of *what is*; and to the pernicious effects that adopting dualistic ontologies can engender in practice (Eden, 2001; Castree, 2005a). In emphasizing a need to *re-connect*, the 're-connection' discourse actually reinforces this conceptual separation of 'nature' and 'society'. Thus, whilst the advocates of 're-connection' seem to mourn the separation of humanity from the natural world, they categorically affirm the same separation in the terms of their analysis.

Holding 'people' and 'nature' as separate also affords the establishment of unreflexive categorisations of both: the undifferentiated 'people', and an objectively known 'Nature'. Both require re-thinking. The grounds for challenging claims made about 'Nature' go beyond the contemporary public mistrust of science (Wynne, 1994; see also Callon *et al*, 2009), to question not only the accuracy but also the status of scientific (and cultural) claims to truth (Latour, 2011). Thus, 'Nature' as an objective source of guidance within policy has been critiqued through demonstrating the term's constructive genesis (Cronon, 1996; Latour, 1999; Eden, 2001) and misplaced determinacy (Hinchliffe, 2001); and also through recognition of the scale of human impacts on environments (J.Lorimer, 2012). But, this is not simply a rehearsal of Hume's rejection of deriving *ought* from *is*; going beyond the obvious problem of basing normative action in the claim that something is 'natural', it raises epistemological as well as ontological questions: not only 'what is this 'Nature' that policy suggests we re-connect to?', but also 'according to whom, and on what basis are such claims made?' (J.Lorimer, 2012). Drawing together much recent work in this vein, Bingham & Hinchliffe (2008:83) explain, "*Nature ... no longer offers a stable category to which objects can be intuitively allocated … It is neither a source of smooth facts which seem to speak for themselves, nor an unchanging ground on which one might rely. Nature does not form a rallying site where an agreeable collective might be formed …"*.

Similarly, a significant body of work exists that interrogates simplistic notions of 'the people'. In particular, much attention has focussed on developing more sophisticated accounts of how heterogeneous 'people' become (seemingly undifferentiated) 'publics' in politics and policy (Staeheli & Mitchell, 2007). "*The public*", Staeheli notes, "*is conceptualized in many different ways, but generally is that group of people recognized as being legitimate participants in political discussion, deliberation, and governing*" (2010:70). Thus, attention has turned to questioning how such groups cohere (Staeheli & Mitchell, 2009; R.Ellis *et al*, 2010). For example, an influential collection of research within science & technology studies (STS) and cognate fields begins by rejecting the assumption of a homogenous, pre-formed and universal 'public' (synonymous with 'the people'). Such work, by Latour, Callon and the philosopher Stengers amongst others, has focused attention on the role of environmental controversies as 'generative events' (Callon *et* al, 2009; Whatmore 2009:588; Lane *et al* 2011; Whatmore, 2013). Here, amorphous and heterogeneous people are drawn together into newly-formed publics in particular ways by material concerns-as-events. Thus, focussing on specific events affords the tracing of how multiple connections between actors and things are enacted in specific environmental-political-controversies (Latour, 2005).

On these logics, (and in common with many theories of deliberative democracy) it is controversy that assembles people (and more) into politicized publics (see Marres, 2007). In tracing the development of such controversies, it is possible to describe how they were actively composed. The language of composition is explicated in Latour's (2010) '*Compositionist Manifesto'*, in which he uses the notion to steer a path between universalism and relativism, retaining the 'common world' of the former and the 'heterogeneity' of the latter. Composition, he suggests, "*underlines that things have to be put together … while retaining their heterogeneity*"; and it "*draws attention … toward the crucial difference between what is <u>well</u> or <u>badly</u> composed*" (pp.473-4; emphasis in original).

However, the controversy addressed in the 're-connection' policy discourse is less easy to specify than those identified in much of the existing work on environmental publics; there are no groups of readily identifiable people as in the cases of those affected by the siting of nuclear facilities or the route of a TGV (as discussed in Callon *et al*, 2009). When (and where) the 'disconnection' discourse leads to campaigns for access to green space (e.g. on the grounds of public health), there are perhaps identifiable constituencies of 'environmental injustice' who may be rallied to particular causes (see Boone *et al*, 2009 for a North American example). Yet applied to wildlife conservation, the (human) subjects of the controversy seem doomed to be marked by their ignorance, since the logic that implies their disconnection from 'nature' also blinds them from its necessity (and thus its need for protection). But that does not make them, or the situation, apolitical.

Marres (2007) traces the similarities and points of departure between the public assembly theories of the pragmatist Dewey (in which publics are assembled by the "*harmful consequences*" of actions that concern them (p.768)), and STS theories that focus on "*the 'attachments' that people mobilize (and that mobilize people)*" (p.759), but that often also require "*active articulation*" to assemble publics (p.768; see also Whatmore and Landström, 2011). My intention here is to extend the latter formulation, and thus shift the emphasis in ideas about 'the assembly of publics' beyond evident sites of contest and discord. That is, to illuminate the ways in which attachments are made and articulations activated in the early stages of 'public' assembly; not just pre-public, but pre-controversy.

Thus, re-thinking 'the people' in policies of socionatural re-connection might proceed by paying close attention to how specific (heterogeneous) people (and more besides) are assembled through the connective (compositional) practices of those engaged with more-than-human worlds (Whatmore & Landström, 2011). This suggests that a re-thinking of 'politics' is also required, one that goes beyond the contests and controversies that are the visible tip of the political iceberg, and engages with the

unseen, submerged roots that govern lives beneath. This shift towards a micro-politics of practice is, of course, a familiar move in many feminist, post-structural and non-representational accounts. As an example of what it might imply, Eden & Bear (2012) have recently emphasized not the official 'talk', but the everyday actions of anglers that serve to perform environmental management in aquatic environments; their focus is thus on a performative, habitual and material politics, rather than (or in addition to) the attention-grabbing spaces of discursive friction. Their analysis distinguishes between ideas of 'the general' and 'specialised' publics, to introduce the further notion of 'performative' publics which, "*are not defined by address … but through embodied practice in situ in the environment*" (p.1205); the influence of non-representational theories is clear in this performative understanding, where publics are assembled not through symbolic affiliations but 'enacted' through practice (see Anderson & Harrison, 2010). Similarly, Mason (2013) has drawn on Eden & Bear's work to suggest that publics can be 'exercised' through modes of enchantment rather than controversy. The following analysis adopts this focus on the affective practices through which publics are drawn into being.

In particular, I aim to describe how publics can be enacted through affective composition. 'Composition', following Latour (see above) relates to the careful putting together of lives and things; it is a relational understanding of social life that allows room for liberty and the unexpected. 'Affect' is a more slippery term, both ubiquitous and oftentimes vague in contemporary geography and cognate fields. Yet it is crucial to understanding conservation practice; as J.Lorimer (2007:911) suggests, "*Affect provides the vital motivating force that impels people to get involved in conservation".* Here, to re-iterate from chapter two, I follow McCormack's notion of affect as, "*a field of pre-personal intensities"*, with the related categories of *"feeling as that intensity registered in sensing bodies; and emotion as the socio-cultural expression of that felt intensity"* (2008:414). Affect can thus be understood, as Latimer & Miele neatly explain, "*in terms of 'attachment' on the one hand and being 'moved' on the other";* it is, they continue, "*both embodied and relational"* (2013:8).

In the analysis that follows, my aim is to foreground the role of affect understood in such terms, and its affirmative manipulation in generating attachments and thus connecting people (and more than people); and thus potentially generating conservation publics through what Thrift (2008:220) has described as, "*the affective realm of political feeling"*. In particular, I suggest that conservationists work to compose the **affective atmospheres** that enable such attachments to be made. These atmospheres are simultaneously 'material and ethereal' (McCormack, 2008), 'definite and indefinite', (Anderson, 2009:77); and are shaped by flavours of air and textures of collective mood (e.g. Bissell, 2010) but are not reducible to either, or to merely both. As Stewart (2011:452) explains, *"An atmosphere is not an inert context but a force field in which people find themselves. It is not an effect of other forces but a lived affect – a capacity to affect and be affected that pushes a present into a composition, an expressivity, the sense of potentiality and event. It is an attunement of the senses, of labors, and imaginaries to potential ways of living in or living through things".*

Stewart's description (above) links the concept of 'atmospheres' to the notion of 'attunement' that was encountered in chapter four. Attunement can thus be understood both as a conscious methodological approach through which people might open themselves to the alterity of more-than-human perspectives (see chapter four), but also as a disposition (cognitive and pre-cognitive) through which an affective atmosphere might be both experienced and generated. That is, attunements are multi-directional. Ash (2013:35), though an analysis of how humans attune to the affective atmospheres in video games, draws on Heidegger's understanding of attunement to argue along similar lines, suggesting: "*Attunements are not just feelings or emotional states that begin or exist within a pre-constituted subject, but work as atmospheres outside and between individual human bodies*"; as he goes on to suggest, "*humans become attuned to situations in particular ways: they pick up the 'vibe' of a room through the shared moods within that situation, for example*". Thus, an actor might be less or more attuned to an atmosphere; by implication (and as outlined in chapter

four) might take steps to become more attuned; and thereby (as I will suggest in this chapter) might also alter that atmosphere to particular ends.

Affective atmospheres are both composed and contingent. Indeed, Shaw (2014:2014), drawing on the notion of assemblage as developed (somewhat similarly) by Deleuze & Guattari, and by Latour, conceptualises such affective atmospheres as a kind of "*placed assemblage*", through which he seeks to foreground the various arrangements of material practices that cohere to generate located atmospheres. Such atmospheres can be manipulated towards particular ends, as shown by work on topics as diverse as air conditioning systems (Healy, 2012), the selection of cabin crew (Lin, 2015), or Shaw's own focus on urban nights (2014). Herein, I use the notion of affective atmospheres to point towards the ways in which conservationists work to generate particular affective attachments through a variety of socio-material techniques and strategies, so as to generate such a *"force field"* (in Stewart's terms); and in turn how this can provide a putative gestation point for assembling more-than-human publics.

In particular, I work with the notion of 'curiosity'. J.Lorimer (2012:252) has written of curiosity as an 'ethos', utilised as an affective technique by filmmakers to generate and draw on a, "*sympathetic but uncertain feel for the life of other beings*" within an audience. In the next section I consider the enactment of more-than-human political connectivity in a particular wildlife conservation situation, wherein conservationists actively work to create affective atmospheres of curiosity. The account is based on several months of participant observation/observant participation with a pine marten conservation project in Wales run by the Vincent Wildlife Trust. This project was selected due to its landscape-scale activities, where concerns about ecological and structural connectivity are significant, complicated, and challenging (see chapter six). However, as even the project's official title - *'People and Pine Martens in Wales'* - makes clear, connectivity for pine martens involves more than trees, stepping stones and cover corridors. My aim is to foreground the active composition of

connections between people, pine martens, and more besides; and in so doing, develop an alternative account of socionatural connectivity to the discourse of 're-connection' encountered above.

5.3 Re-connecting people and pine martens

(Re)collections of fieldwork:

It all started with a poster. The word is out: sightings are desired, required. The word is spread through a variety of activities, some more of which we'll encounter below, but this tale starts with a poster, and a phone call. Or perhaps it starts with a creature: small, furry, about the size of a cat. It wasn't a cat though. *What colour was it?* Brown-ish. Maybe with a white belly? At least, I think so, I saw a flash of white. I only saw it for a moment, it was crossing a track in front of me. *Did it have a white ring around its face?* No, I don't think so. *(Probably not a polecat then). Far away?* Maybe twenty metres, something like that. Look, I don't know if it was a pine marten, but if it wasn't, I don't know what it was. *Do you have much experience tracking mammals?* Well, I know a weasel when I see one, and this was much bigger[10].

Upriver from Aberystwyth, to the east of Cwm Rhaidol, and fringing the edge of the Cambrian mountains is a block of Forestry Commission land. There is a parking area for visitors with room for a handful of cars. A noticeboard details several possible walking routes; warns visitors against the dangers of vehicle crime; and attracts the inquisitive eye with talk of UFOs. Yet this is not a site for Roswell enthusiasts; the UFOs in question are "Unidentified Furry Objects". There is a picture of a furry creature in a tree, an explanation that it is a pine marten, and a request to report any sightings. A phone number and e-mail address are included.

[10] These sections are not direct quotations but aggregated from many untranscribed conversations during months of observant participating. They are collections of recollections.

Pine marten conservationists rely on unconnected people to provide leads in their occupancy investigation; (unconnected?). Some are drawn in by the posters; others through the communicative activities of project officers across a variety of familiar channels. These include both direct engagement through giving talks to local groups, running stands at shows, and distributing leaflets and posters; and also indirect outreach through the active courting of media contacts. Days spent taking journalists into the woods to experience the project first-hand are translated into newspaper and magazine articles (local and national), even television exposure that feeds further coverage. Importantly, the tenor of these communications is not catastrophist. Rather than playing to familiar tropes of 'crisis conservation' (Soule, 1985), these engagements work according to logics of curiosity; endangerment and extinction risk is still part of the story, but it is not the central narrative. '*Have you seen a marten?*' the conservationists ask; '*Did you know they live amongst us?*' The word travels. People respond, call, visit, volunteer. Moving mammals and publicity posters generate phone calls; a few each month, some more credible than others. Credible? *We use this form, ask a series of questions, then we can give the sighting a score, like a credibility score. A good sighting would be from someone with experience of identifying mammals, like a forester or ecologist or gamekeeper. How close were they? How long did they see it for? Did they get a photo even?*

The concern with locating martens derives from the need to delineate occupancy in the practice of wildlife conservation; a practice that, after all, tends to be spatially focussed (Adams *et al*, 2013). Statically positioned protected areas have been established across the world to protect either particular habitats, specific species that live in those habitats, or more often both (Brockington *et al*, 2008). Conservationists in Wales, however, struggle to map pine martens; as chapter six explains, these creatures are difficult to '*make present*' (Hinchliffe, 2008). Thinly spread (if, indeed, extant), pine martens continue to evade professional surveyors who are thus reliant on unconfirmed sightings by 'non-experts' in putting together potential distribution maps of the species (Birks & Messenger, 2010). If they were widespread and easily recognisable, this technique would be less

problematic. However, at present, the locations of any currently active marten populations in Wales are not known with certainty.

"Sent 07.28: Tim? I'll pick you up at 8. Exciting news!" Today's plan had been to scope out a nature reserve in Snowdonia. Dave had been in touch with the reserve manager, and she was keen for us to install some den-boxes. But then came the phone calls, and the plan changed. Two sightings, quite credible, had come in overnight. They were both nearby. There are more posters nearby too, but we weren't trying to establish abundance; simply occupancy. We wanted to find out where in Wales pine martens live; to confirm inhabitation as a step towards conserving the species. And if these sightings were real, they might live near here.

Occupancy maps based on possible sightings by non-experts are useful evidence in conservation science, but they do not carry the certainty implied by unambiguous photographs or video recordings. Fortunately, the increasing availability and affordability of motion-detecting cameras is changing the practice of wildlife surveying in contemporary Britain. Cameras can be left for weeks at a time, allowing a single surveyor to be in many places at once, awake, and recording. High definition footage can be compelling evidence of species occupancy, abundance, and even behaviour. Yet these cameras are still expensive kit from the perspective of small species conservation projects. The project with which I worked covered the length and breadth of Wales, and had at its disposal no more than a dozen camera-traps. Most had been loaned: some from interested individuals, others from a television production company on the understanding that they would broadcast any footage of any pine martens thus captured.

So now we had a new plan for the day. First, Dave plotted the new sightings on the OS map; pencil and paper - the GIS could wait. Then we visited the areas, surveying for any sign of martens. In practical terms, this meant searching for scat. In places where martens are more abundant, they

often defecate on tracks and forest trails, seeming to prefer slightly raised areas like hummocks or tree stumps. In Wales, the lack of confirmed marten scat made such assumptions tentative, but surveying on paths had the benefit of focussing our attention on a visible transect. It also made the going easier than it would have been otherwise, as the understory was growing thick in the midsummer, and the valley sides were steep. Dave found a few scats that he thought worth bagging, tagging and sending to the lab for DNA analysis, and then we turned our attention to setting up some camera traps. These were baited with peanut butter, fish or valerian; and once activated, we left the woods to knock on a few doors and ask people about wildlife they might have encountered. Then, to the local café to see if they would let us leave some leaflets about the project. We stopped for some cake whilst there, and chatted with the owners about other pine marten ecologists who had visited them over the years; we weren't the first on this hunt (see Birks & Messenger, 2010). Conversations in the field and the cafe facilitated more attachments; more performers with eyes alive to the martens amidst.

Figure 5a: Setting camera traps for pine martens

A week later, we collected the cameras from their various positions, uploaded the memory cards to Dave's laptop, and sat on the rim of the car boot trawling through the footage. We didn't have time to go through it all, but we couldn't wait to have a peek. We were both excited. This moment, every time, was magic. The stress, frustration and disappointment of months of camera trapping with no success all disappeared for the brief duration of this weekly ritual of hope. Time slowed. *Fox cubs! Wow, check this out! That's a badger, definitely a badger. What's that? There? Oh, it's a fox I think, look at the way it walks.* What about the camera by the cave? *Here we go. Oh no. Sheep.* We always filmed a lot of sheep.

Conservation practice is not all dis-passionate science; as J.Lorimer (2008b) notes, affective emotional engagement underlies the field activities and motivates the involvement of scientists and laypeople alike. The film footage captured over many months included badgers, foxes, yellow-necked mice, lots of (grey) squirrels, the occasional deer, bait-stealing Labrador retrievers, a ferret being walked on a string, and some very persistent sheep. It didn't confirm the presence of pine martens; but Dave would put the best bits would onto the web for wildlife enthusiasts to watch and enjoy – and attune (see chapter four). The cameras are high definition, but these are not the polished advertisement films of the big conservation NGOs; instead, the badly-lit, half-captured images exude an unfeigned authenticity. Together with the project web page, the monthly update, and the more frequent Facebook blog, these moving images were (are) important parts of the communication strategy. These media do not simply operate in a linear direction; conservationists here are not simply spreading the word, but engaging in conversations, developing connections, composing a community of concern. Video clips and stories from the field generate an emotional and affectual response, in and from those watching, reading, writing (see J.Lorimer, 2010b). Attachments are made through wonder rather than controversy. This nurturing of community is a deliberate action taken by pine marten conservationists to inform and enthuse others; and when necessary to generate assistance.

A dozen cameras, but many more eyes and noses. Traditional, low cost, human-reliant survey techniques enabled the project both to widen the search area, and to widen the network of searchers: both were explicit goals in their own right. Drawn in through the word, the poster, the picture, the film, or the chance vital and visceral encounter, volunteers proliferate. This is not unusual; volunteer naturalists have a significant role in the history of wildlife surveying in the UK, and their involvement became particularly pronounced during the recent era of Biodiversity Action Plans (Ellis & Waterton, 2004, 2005). The active assembly of these human volunteers is, in utilitarian terms, essential to the success of the pine marten project; yet it is also constitutive of the enactment of a particular mode of living with (nonhuman) life. The survey techniques are uncomplicated and easily taught to volunteers; evidence of presence has fewer requirements than evidence for abundance. Eyes are used to locate promising looking scat: "*They are usually 8-10cm long and 1.2cm thick, sausage-shaped, generally twisted and pointed",* says the field guide (Bang *et al,* 2001). In practice, though, it isn't always possible to identify scat by shape and size alone. Noses are also enrolled to assess likely origin: fox scat has a musty, unpleasant smell, whereas pine marten excrement is often sweet-smelling. *Lift it on a stick, have a sniff, watch your face though!* If the scat looks good and smells sweet, surveyors use a clean ice-cream stick to manoeuvre it into a plastic bag and make a quick note of the location. With practice the eyes become sharpened and the nose alert; new modes of walking emerge, attuned to the possible paths of martens rather than the distant horizon. People 'learn to be affected', as Hinchliffe *et* al (2005:648) described the similar processes of tracking water voles (following Latour).

From forest track to plastic bag, the onward journey of promising poo is informative in tracing the connections being performed here. First to the freezer, to try and retain some freshness; then across the Irish Sea to the lab in Waterford, where the scat is screened for DNA. Genetic verification is the gold standard, proof beyond even a well-lit photo or the tell-tale marten movement in a film. The

hope is that the lab will provide definitive answers, but often the translation of organic matter into excel data simply codifies uncertainty; the tests are frequently inconclusive, because of the effects of sample degradation. DNA techniques work well with fresh material, but fresh scat is hard to find with searchers spread across a vast region. At the end of 2013, there had been a continuing drought of confirmed pine marten DNA in suspected scats from Wales, amongst the many definite negatives and inconclusive possibles. The project continues to send plastic bags of poo to the lab. Finding genetic proof would have significant purchase in a policy environment known for its emphasis on the measurable (Bowker, 2000; Turnhout *et al*, 2014). Yet the continuing uncertainty regarding the status of martens tells us something about the public that conservationists are attempting to compose: people are not being assembled by the uncovering of a controversy through pre-constructed science, but instead are drawn into the practice of that science by a curiosity about the other lives around them.

Figure 5b: Supermarket stall, stuffed marten

Returning to the forests, the emails full of negative and inconclusive findings encourage Dave to make further connections. We take to the supermarkets (those that part-sponsor the project), with a taxidermied pine marten in tow, to talk with anyone drawn in by our professional-looking stall, stuffed mustelid, and clipboard-toting smiles. People come close; ask what it is; and stroke the dead marten's fur. *Can I touch it? It's so soft!* We discuss pine martens, their plight, the potential to augment their population in the future (see chapters six and seven); we listen to the occasional person less than thrilled by chicken-killing, pheasant-eating carnivores loose in the landscape – and we *do* listen; we chat about the local area, about valued places and remembered faces. I listen as Dave listens, and I realise that this stall is not about pedagogy. He is not trying to tell people what he thinks they should know; he is responding to their interest about the elusive nonhumans in their midst. The taxidermied marten works to affectively stimulate this wonder[11].

In the most promising places where habitat, sightings, and facilitative land management objectives coalesce, volunteers help professional conservationists to install den-boxes. The lack of old trees in many Welsh forests means a commensurate lack of gnarly holes for pine martens to live in, and den-boxes – a home fashioned from plywood and hoisted into a tree – are the conservationists' jury-rigged solution (see chapter six). These boxes are constructed according to a detailed plan, and yet every one seems to have its own idiosyncrasies depending on where it was made and by whom. A dozen boxes put together by the craft class at a local secondary school each incorporated some form of innovation; the boxes made by a joinery firm were more uniform, but still seemed to differ in weight; the few I made personally seemed to evolve as I became more skilled at shaping wood, cutting to measure, and following guidelines[12]. The project needed permission from multiple

[11] An existing literature within animal and historical geography examines the representative roles, and practices of production, of taxidermy specimens (see Patchett 2008 & references therein); often with an attention to the ways in which these processes deliberately perform and produce affective encounters (dis-placed, and out-of-time).

[12] Ingold (2011) has some interesting insights on re-thinking the sawing of wood, and the modes of skill implicated in this practice.

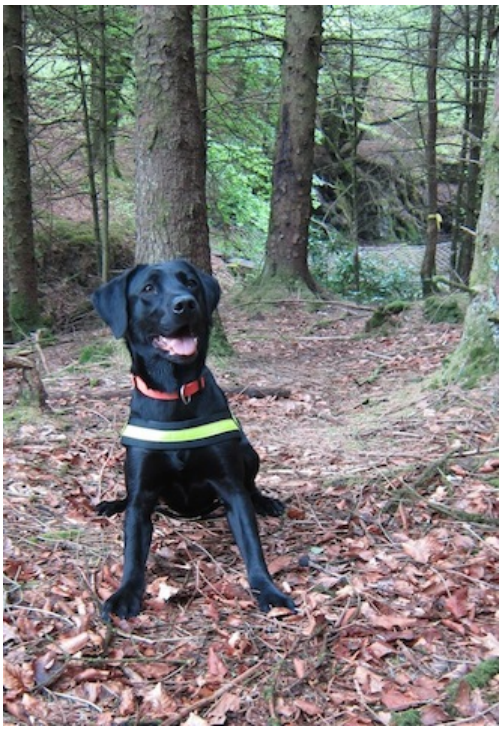
landowners – public, private and charity - to install these boxes across the landscape; more connections were made, fostered, worked.

Figure 5c Den-boxes: shared design, many versions

Later, taking some of these boxes into a forest with several volunteers, we discuss the difference between watching martens on youtube, and walking in (perhaps) their woods. People mention how they feel more 'connected' out in the forest. They know my research is about connectivity, and I worry about bias, but there is something in their conversation that I cannot ignore: the visceral connectivity that is afforded by the vitality and materiality of place. And I remember that the (professional) conservationists have actively worked to bring people to these places, they have deliberately facilitated this affectual encounter. There is a danger here of slipping towards the tropes of wilderness that Cronon so convincingly dismantled (1996); that is not my aim. Instead, I suggest that whilst surveying for scat helps the pine marten project get 'data', and installing den-boxes helps martens find a place to rest (see chapter six), these activities also act to compose, in Latour's terms, a conservation public in a very particular, materially-affective way.

The project also enlists the help of Luna, one of the UK's only pine-marten-specialist scat detection dog and her handler, Louise Wilson[13]. There are noses, and there are noses; canine olfactory capabilities are as famous as they are superior to the human. Luna has been taught to lead her handler towards pine marten scat, but to ignore those of other species. With the right type of nose, this can prove particularly accurate. Scat surveying with dogs is livelier, more accurate, and more fun than without; for us, at least. Sitting on a tree stump, Luna and I share an apple; I get the pips. As a professional working Labrador, she is more patient than my own adolescent and often unruly spaniel (see chapter four). Luna's handler and Dave muse about the relative merits of dogs versus DNA sampling: they wonder how Luna would have indicated on all those promising scats that were returned from the lab as digits in the 'could not determine' column of an excel spreadsheet – *would she have been so ambivalent*? *With the promise of a game of ball when the work was done?*

Figure 5d: Luna, a professional pine marten sniffer-dog



[13] Many surveyors utilize the assistance of their dogs when surveying for martens, but Luna is the only professional dog that I know of working in this way; although there may well be more.

5.4 Cultivating atmospheres of curiosity, connecting publics

Hinchliffe (2008:95), in defining a particular notion of 'care' in conservation practice, utilises the notion of curiosity to suggest an "*openness"* and "*attention to difference"* through which a particular mode of conservation can be encouraged: *"a process of gathering together that is not too tight and can thereby work to confirm rather than assimilate others"*. Indeed, Foucault took a similar tack, writing that curiosity, *"expresses the care one takes for what exists and could exist"* (1981:327 quoted in Phillips, 2014:505). The gathering assembled by pine marten conservationists is enabled through such a careful composition of an atmosphere of curiosity. Various practices work to encourage and draw on this atmosphere: placing posters, posting videos, talking, listening, visiting, surveying, attuning. Many of these practices draw on pre-existing cultural understandings of, and behavioural histories with, particular forms of 'wild-life': cultural geographies of wildlife conservation are an important context in which these new relations are made (see Hinchliffe, 2007); and these histories of practice inflect and shape the possibilities of action for conservationists. It is through such activities that a particular public begins to be composed – through the cultivation of a nascent set of affective connections.

This 'pre-controversy' collective is neither solely a human endeavour, nor limited to uniquely human participants. Indeed, it is tempting to re-think the notion of 'publics', as well as 'collectives', in more-than-human terms. There is a long tradition within environmental ethics that argues for a widening of political inclusion as well as ethical consideration to nonhumans (DesJardins, 2001) that has informed similar discussions in geography (Hinchliffe *et al* 2005; Hobson, 2007), and with which I have much sympathy. Yet the problems in such a move are also well rehearsed: who to include, and how to represent nonhumans in political processes. Here, pine martens are implicated in the affective composition of a conservation public; they are *actors in this politics*, akin to the bears traced by Dempsey (2010) in the more controversy-laden contexts of British Columbian environmental

policy; yet not as *political subjects* in their own right. Similarly, the places suspected of harbouring pine martens have an affectual force that is resolutely a multi-species and material achievement, but that remains outside of traditional political participation: river valleys of oak and rowan and bilberry; mountain fringes populated by spruce sentinels in their unyielding lines; woods of light and dark, steep and shallow, sleepy and alive. Agency in these places exudes from both the lively and the inert, making attachments; they are 'affective environments' (Whatmore, 2013) generating affective atmospheres (McCormack, 2008; Stewart, 2011), implicated in the composition of the performative public, but silent in traditional considerations of the political. Indeed, as chapter four has already suggested, listening to rather than speaking for nonhumans is no simple task.

Here, I remain focussed on the connective practices through which publics are composed. The tune I hope to amplify relates to how particular sets of (hybrid) relations are composed through the making of heterogeneous attachments by conservationists. Dave and his colleagues are not simply part of a collective; not passive nodes in a relational network. Instead, they actively engage – more than most – in composing this collective of people, places, pine martens, posters and poo. As Latour puts it, *"[t]here is no group without some kind of recruiting officer*" (2005:32). Their efforts deliberately foster affective atmospheres of curiosity about the possible lives within the midst of human living, sometimes aided through the facilitation of affective encounters with the 'beastly places' (Philo & Wilbert, 2000) of pine martens (wherever these may be). Connecting - with laypublics and labs, hacks and handlers – is what the conservationists described here spend much of their working time attempting to achieve. The result is, in Eden & Bear's (2012:1205) terms, a 'performative public' drawn together through the heterogeneous, 'behind the scenes' actions of those involved; but one that remains mutable, indeterminate, and transitory. This public is not assembled through a logic of controversy, but by contrast through affective affiliations.

Callon has made a useful distinction between 'public education', 'public debate', and the 'coproduction of knowledge' (see Lane *et al*, 2011:1619). The connective practices outlined above are more than outreach on the traditional 'deficit model' of public understanding (Irwin & Wynne, 1996), long associated with conservation groups that aim to educate an ignorant public; and they are more than the opening of conservation practices to debate – although both of these modes of engagement are in evidence. They are more, also, than the marketing activities of big international conservation groups, manipulating media to attract funding and prestige (Igoe *et al*, 2010). Instead, the conservation practices outlined here act more akin to Callon's third mode of public engagement. That is, they facilitate a form of connecting on more equal terms through a suggestion of wonder, an emotional reach, a mode of attunement, an opportunity for bodily and visceral engagement, and an invitation to participate in a co-production of knowledge-practices and worlds.

Moreover, through drawing together diverse more-than-human assemblages, new knowledges are created through joint experience, new places through erecting den-boxes, and new spaces through developing modes of living with nonhuman life. The conservationist thus operates as facilitator rather than gatekeeper: making introductions rather than policing entry; opening up possibilities rather than closing down interpretations; generating potential connections and collective politics. I refer to these enactments of attachment and connection as a particular composition of **more-than-human political connectivity.** This term is thus intended to describe a form of politicized socionatural connectivity, in which various relations and attachments are made, often (but not necessarily) towards particular ends. The emphasis on enactment also foregrounds the material, embodied, affective and emotional registers through which these connections are forged, maintained, and renewed.

5.5 Re-thinking re-connection: reserves

> "*In the case of conservation, protected areas are in most cases explicitly exclusionary, conceived and managed as places without people*"
> (Adams *et al*, 2013:2-3, emphasis in original)

(Re)collections of sandwiches and tree stumps: *I lived an enjoyable early-summer Friday in mid Wales working with a reserve manager from Natural Resources Wales. We were installing den-boxes for pine martens into a nature reserve designated for a different complement of species; there was room for martens to live here too. Over a packed lunch eaten at the side of a rough forest trail, he told me about the importance reserve managers attach to presenting the nature reserves 'well' so that 'the public' can engage with them. The little things matter here: stiles and signs, paths and parking. He had even stretched to smearing mud and dung over the sides of a newly installed cattle trough, so that it didn't look 'out of place'. The weekend followed, and I took the opportunity to visit Ynys-hir, one of the RSPB's flagship nature reserves and a wonderful place (see below), where the woodlands of west Wales meet the saltmarsh and the sea. Coincidentally, when I visited it was also playing host to the BBC's Springwatch nature programme, their fleet of trailer trucks hidden discretely in a side area not open to all. Navigating my way through the greeters and their cheerful suggestion that I join the millions of RSPB members, I paid five pounds and was handed a ticket and some information sheets about the wildlife currently in residence. At the top of the pile was a list of likely candidates (not only birds), with boxes to tick if encountered; the logics of curiosity prominent (and encouraged) once again. Flask in hand, I wandered the well-maintained paths, moving in and out of groups of people stopping to look here and there; and enjoyed the sporadic artworks mediating the trail. Later, sitting in a well-appointed hide, I gazed across the treetops and felt settled, inspired, alive. I think that was the point. But then came anxiety.*

Nature reserves in England and Wales are rarely constructed as 'fortresses' to keep people out (see Brockington, 2002), but are instead often places for people to engage with the more-than-human. *"Our nature reserves are wonderful places to get closer to the natural world"*, the RSPB, owners of Ynys-hir, suggest (RSPB, 2014). The Wildlife Trusts, a group of 47 local trusts managing reserves across the UK, make a similar claim: *"Our work helps to connect people with the natural world and ensure that local communities have access to wild places on their doorstep"* (TWT, 2014). Natural England, the public body that manages a network of National Nature Reserves (NNRs), state that, *"Almost all NNRs are accessible and provide great opportunities for people to experience nature"* (Natural England, 2014). These examples are representative of the framing of the role of reserves as places for both 'people' and 'nature' in England and Wales. Reserves are thus envisioned and (materially as well as culturally) produced places of staged encounter between humans and (many) natures. As such, there are important political-ecological questions to ask about the forms of nature thus produced and preferred: what kinds, where, by and for whom[14]. My concern here, however, is to reflect once again on the modes of connection facilitated by such reserves.

Thinking in/about nature reserves unsettles the reading developed in my earlier account of the enactment of more-than-human political connectivity in pine marten conservation. On the one hand, reserves rely on material encounter. They facilitate (and stage) an immersive experience with nonhuman life (see Whatmore, 2002:15) that may allow forms of attunement and learning – and in fact deliberately aim at doing exactly this. Affects of curiosity and wonder are abundant, stimulated through staged encounter, tick lists and interpretive materials. Material-ethereal affective atmospheres are shaped and folded towards particular ends; affective environments are engaged in a performance of material politics (Whatmore, 2013). What is more, through bringing together a whole range of human and non-human actors in networks of affect, emotion, and co-operative

[14] Garland (2008:62) has argued that wildlife conservation in Africa can be critiqued not simply as a form of postcolonialism, but instead as a "*particular kind of capitalist production*"; although not my direct concern in this chapter, English and Welsh nature reserves might be read productively (in both senses) through such a lens.

action, many reserves and the people managing them seem to operate according to the logics of more-than-human political connectivity outlined in the situations of pine marten conservation considered above.

However, nature reserves also seem to share a damning similarity with the critique of 're-connection': in bounding particular places, they appear to perpetuate both the idea, and the material arrangement, of a separation of 'people' and 'nature'. Thus, people come from human places to visit 'nature' in natural places (usually outside of urban areas, cementing the distinction); or they don't even visit, but consume these versions of 'nature' through television (including *Springwatch*) and film. Rather than a politics of "*conviviality*", described by Hinchliffe and Whatmore (2006:134) as a disposition, "*that is serious about the heterogeneous company and messy business of living together*", nature reserves instead seem to enact a politics of segregation. By this logic nature reserves can never really allow people to 'connect' with 'the natural world'; their very existence serves to materially produce the separation. Humans become visitors to, not inhabitants of, a 'natural' world. This is, of course, by no means a new critique.

Yet as compelling as this argument seems, for me the critique of nature reserves perpetuating the separation of the human and the non-human is also something of a dead end – at least as far as England and Wales are concerned. It makes an important point about the production of non-human places (and the various biases in their locations, inhabitants, and exclusions), but these productions could also be read differently – and indeed perhaps have to be in the Anthropocene. I would therefore like to attempt a more generous reading. Accepting that there are no 'untouched lands', 'virgin rainforests', or 'pristine wildernesses', labelling the contemporary period as the Anthropocene acts to highlight the ubiquitous impacts of human societies within the bio-geographies of Earth (J.Lorimer, 2012; see discussion in earlier chapters). This understanding leaves little space for purified nature reserves, but has plenty of room for the necessarily hybrid ecologies practiced within and

beyond the borders of protective designations. Reserves, increasingly, are envisaged, managed, and enacted not as islands but as networked places of encounter (see chapter seven); and they do not separate the nonhuman from the human but work to actively draw them together (connecting, rather than re-connecting). Latour's distinction between 'critique' and 'composition' can be usefully applied here. Critique, suggests Latour, "*did a wonderful job of debunking prejudices, enlightening nations, and prodding minds",* but ultimately fails because it relies on discovering "*a true world of realities lying behind a veil of appearances"* (2010:474-5). Composition, by contrast, seeks to (re)build. Nature reserves can be composed badly, as when they act to incise, to demarcate and to disconnect; but they can also be composed well. Of course, to do so may require a softening of the borders; it may also require re-thinking locations, to offset the bias towards 'remote' places, and the bias against urban ecologies (Hinchliffe *et* al, 2005; Hinchliffe & Whatmore, 2006; J.Lorimer, 2008b; Francis *et al*, 2012; Eden & Holloway, 2013). However, focussing attention on the ways in which reserves act to compose more-than-human political connectivity might also allow room for a more sympathetic reading of the wider 're-connection' discourse.

In the account of pine martens sketched earlier, the material affectivities of many objects, practices, and 'animal places' were suggested to play an important role in generating attachments that, in turn, may aid the assembly of a conservation public. There is an obvious resonance here between 'affective attachments' to animal places, and 're-connections with nature', albeit that the former dispenses with the dichotomous freight of the latter[15]. Both formulations focus on the socionatural connectivity that is fostered between lives and things, and through which collectives can be (contingently) composed. Yet my aim is not to argue the toss about which is more semantically effective. Instead, I wish to draw out the implications of this resonance: **that nature reserves have a surprising amount in common with a stuffed pine marten wandering the aisles of a city**

[15] There is also a degree of resonance with the 'biophilia' hypothesis (Wilson, 1984), which suggests that humans have an innate desire to affiliate with some forms of nonhuman life; although such ideas about biophilia often display a problematic tendency towards biological determinism, whereas notions of 'affective attachments' differ in their socio-materiality and contingency.

supermarket. The taxidermied marten encountered earlier was not presented primarily as an object of controversy but as a curiosity; the message was not one of crisis and death, but of possible lives amidst. It was an invitation to encounter the local environment differently. Likewise, nature reserves in England and Wales are increasingly envisaged as places to encounter interesting lives, rather than as arks to articulate a shared harm (although that is not to say the latter message is not present; my argument relates to emphasis, not absolutes). Places and their inhabitants (often non-urban, often separate from human settlement, but not necessarily so), are enrolled by conservationists in a performance that seeks to generate connections with the people who inhabit or visit them. In both cases, that of the pine martens, and for nature reserves as places of encounter, the connections made are visceral, formed through encounter, and compose publics through material affiliation. In practice, there is not so much difference between 'affective composition' and 're-connecting with nature' as an attention solely to discourse might imply. 'Re-connecting' does not have to imply reification of a separate and sublime 'Nature'; it can rest on a relational and material foundation.

5.6 Re-thinking re-connection: the limitations of curiosity

The account of pine marten conservation offered here suggests that affective encounters with conservationists, media, inert objects, nonhumans and/or the 'animal places' they inhabit (and humans share) can facilitate the assembly of performative publics. Not all, *but some people* are moved through atmospheres of curiosity, or visceral encounter. Indeed, whilst many more walked through the supermarket tills than those who stopped to inspect the taxidermied marten, and whilst the posters only drew in a handful of those exposed, a particular public was/is composed. The (differentially) affective experiences that support this composition can be encouraged, promoted, and facilitated by conservationists. In a sense, such actions work by promoting what Hinchliffe and Whatmore (2006) have described as the "*politics of conviviality"* (see earlier; also Hinchliffe *et al*, 2005; Karvonen & Yocom, 2011). The publics that result will be heterogeneous and contingently

composed rather than universal. But they will be composed through the logics of affective encounter as operating in woodlands and supermarkets, out walking and online.

However, the politics of curiosity has important limits, and below I foreground two of the most pertinent. The first relates to concerns about the ethics of affective manipulation; the second, to affective events that inspire not curiosity, or 'enchantment' (Bennett, 2001), but fear, anger, or even casual indifference. I will deal with the first summarily, and the second through a longer reflection on situations relating to grey squirrels and wild/feral boar.

First, there is a 'politics of affect' (Anderson, 2012) that needs to be considered. The preceding analysis has (deliberately) attempted an affirmative reading of the affectual strategies of conservationists. I have focussed on how particular techniques are, and can be, utilised so as to further the goals of conserving life, rather than critically examining the goals themselves. Yet there are also, as I have recognised, significant grounds for critique when it comes to conservation through nature reserves: where, how, and with what they are composed. Much existing work on affect, by contrast to that offered here, is more critical in character and is explicitly concerned with its manipulation; for example, in the ways that neoliberal modes of governance are enacted and enforced through emotional and affective strategies (Whitehead *et al,* 2011; Anderson, 2012). As Thrift (2004a:69) explains, "*it is quite clear that there are enormous emotional costs and benefits for individuals or groups in being shaped by particular institutions in particular ways. However, it is often quite difficult to show what is at stake for the individual or groups in submitting to such institutions and embracing certain affective styles that render them deferential, obedient or humble – or independent, aggressive and arrogant".* Indeed, a similar concern with bodily politics infuses neo-Foucauldian analyses of the creation of environmental citizens through 'technologies of the self' (Rutherford, 2007). Such a critical reading of affect could be turned towards the ways in which strategies to 're-connect people and nature' enact and influence affective encounters with

nonhumans in particular ways. The preponderance of nature reserves in out-of-the-way, remote and/or rural locations is an example: performing encounters predominantly in such places seems to reinforce a separation of the nonhuman (see earlier discussion). Yet such a deconstructive tack provides little in the way of resources to think things differently. Considering the affirmative possibilities of affective encounters, by contrast, foregrounds the ways in which this might be done.

However, and second, the affirmative tenor implied in such enactments is itself problematic. What happens when curiosity and encounter lead to negative affects: not affiliation, but fear, horror, or disgust (Ginn, 2014)? What resources are offered by affirmative accounts in situations of human-wildlife conflict (Barua, 2014a), or environmental controversy (Whatmore, 2013)? Indeed, similar charges have been laid at the door of much recent work in animal geography. Curiosity has limits. Such considerations are an important reminder of the contingent and limited scope of this form of affective strategy; and that it has seemingly little to say about biophobias, awkward or even fatal encounters (J.Lorimer, 2012; Ginn, 2014; see also Clark, 2011). Below, I reflect on these limitations through outlining some of the more-than-human political connectivities evident in situations involving grey squirrels and wild/feral boar.

Grey squirrels

In chapter six, I will describe some of the forms of human-political connection through which red squirrel conservation is performed in the north of England. In particular, I will stress the importance of action by, and co-operation between, volunteers, local groups, regional and national conservation organisations, government agencies, foresters, landowners, land managers and various funding bodies. I will also detail how red squirrel conservation is enacted in practice in England and Wales, and how the primary conservation action relates to the culling of grey squirrels. The type of affective encounters through which these conservation publics are assembled thus differs markedly to those

recounted with respect to pine martens. Whilst surveying for red squirrels appears to operate through similar modes of curiosity and affective attachment, the practice of trapping and killing greys generates very different affects. Culling greys in areas where reds also persist has to be selective, so at-a-distance control through poisoned bait is not an option; instead, despatch is up close and personal; usually involving a trap, a hessian sack, and a final act with either firearm or fisherman's priest. Such actions are very far from naïve enchantment, or active curiosity (see Ginn, 2014). They are, instead, confident in their dis-affirmation of particular types of life; not 'open', as demanded by logics of curiosity, but 'closed' through an atmosphere of repudiation.

Atmospheres of 'repudiation' that cohere through practices of grey squirrel control are as important as those of 'curiosity' within red squirrel conservation, but they are of a markedly different kind. Grey squirrel control practices rest on logics of invasion and nativity wherein forms of life are judged according to their spatio-temporal histories of location (see chapter six); and such logics are enforced through actions, often violent and deadly, that facilitate particular forms of categorical attunement. Earlier in this chapter I have presented a detailed account of how atmospheres of 'curiosity' are facilitated by conservationists, so as to elucidate the processes through which such atmospheres are carefully composed. Such an account can also be constructed of the ways in which atmospheres of 'repudiation' are enacted through a coming-together of specific and deliberate material and discursive practices, albeit of a distinctly dis-affirmative hue. Such an account might also begin with posters, but in this case rather than opening a space for curiosity, posters about grey squirrels tend to be steeped in unsettling affects such as anxieties, warnings, and threats. Whereas atmospheres of 'curiosity' are deliberately facilitated and shaped by conservationists to make spaces for more-than-human lives, atmospheres of 'repudiation', by contrast, are deliberately shaped and enacted to forcibly limit their extent – for particular organisms, categorised as species. Curating these different atmospheres is purportedly targeted at the same ends (species conservation), but as I will suggest in chapters six and seven, they enact very different forms of biopolitics.

Facilitating affectual encounters with grey squirrels thus does not lead inexorably to the generation of protective attachments; quite the opposite, in these situations. As Yusoff (2012) suggests, attachments made through "violence" require attention alongside more affirmative modes of relation. Thus, more-than-human political connectivity is still being enacted through the active creation of attachments (affirmative and violent), and conservationists of various types still work hard to create, strengthen and build on such socio-material and affective connections. However, that these actions often rely on and enact different modes of socionatural connectivity than those outlined above is important to recognise.

Wild/feral boar

The politics of wild/feral boar in England is explicitly controversial. Identifiable, heterogeneous and conflicting publics have been assembled through a proliferation of generative events. On one side, resistance to the return of boar to the English countryside has been amplified by invasions of gardens and golf courses; the ravaging of aesthetically-pleasing bluebell-beds; and the (sometimes fatal) savaging of dogs. Boars have also recently been implicated in causing fatal traffic accidents. On the other side, the control of boar through fatal culling (high powered rifles in this case) in areas such as the Forest of Dean has met with opposition from individuals and groups for whom such actions are objectionable on one or a number of related grounds (animal welfare, rights, views on woodland ecology). And more complex positions proliferate: for example, hunters who are pleased with the arrival of a new quarry, but whose activities might be integrated within the apparatus of the cull. Simple or singular affirmative logics of affectual attachment can neither describe nor explain fully the complexities of these situations. Reactions to boar are diverse, and generative of an often fractious more-than-human politics.

Divergent modes of more-than-human political connectivity

I will consider the situations of squirrels and boars in more detail in later chapters, but this brief summary of the more-than-human politics involved is indicative of the different ways in which socionatural and political connectivity can be configured. Affectual more-than-human encounters are not always affirmative. Atmospheres of repudiation, fear and death connect publics differently to atmospheres of curiosity; and they are enacted through very different forms of power relation and spatial practice, as later chapters will demonstrate. However, I suggest that the concept of **more-than-human political connectivity** is useful for reflecting on all of these divergent contexts. It affords a focus on: (i) the various more-than-human attachments through which particular groups are assembled into (perhaps conflicting) publics; and (ii) and draws attention to the affectual relations through which diverse forms of politics are enacted. Thus, whilst conservation practices engendering curiosity or repudiation are enacted through (and reproduce) different forms of affectual atmosphere, they are both implicated in the generation of more-than-human political connections (albeit differently composed). In both cases, these affectual attachments can precede and be generative of the formation of publics, although the shift towards controversy as a proliferative and generative event, as highlighted in the theories of public assembly discussed earlier, is likely to occur sooner in the case of repudiation.

Considering the situations of grey squirrels and wild boar forces recognition of the limitations inherent within *naively affirmative* approaches to more-than-human politics. Atmospheres of repudiation, violence, fear and killing do not seem particularly likely to foster a politics of conviviality, for example. Of course, it could be argued that this is a good reason to avoid violence, rather than a reason to abandon conviviality. However, the specificities of wildlife conservation tend to complicate such monochromal readings, particularly when the proliferation of one species threatens the safety or even survival of another. That is not to say that such affirmative approaches do not have a role in

situations where conflict and controversy is explicit and amplified. In fact I would suggest (normatively speaking) that this is exactly where such approaches may have the most to offer (see chapter seven). However, to be relevant in such situations, an affirmative mode of more-than human connective politics needs to be based in, and work through, detailed knowledge of existing discursive-material attachments. As Ginn (2014) has recently argued, this may require an ethics derived through practices of detachment as much as those of relations (see also Candea, 2010).

5.7 Conclusions

In this chapter I have reflected on the discourse of "re-connecting people and nature" that is both widespread and influential in contemporary UK conservation policy. It is an easy notion to criticize. In theoretical terms, the very attempt to 're-connect' makes such a move impossible; the internal contradiction is all too apparent. However, I have also cautioned against the ease of such a critique. A more sympathetic reading of 're-connection' is possible which, through focussing on a particular affirmative enactment of what I have termed **more-than-human political connectivity,** emphasizes the deliberate strengthening of visceral, materially affective relations through the careful composition of affective atmospheres of curiosity. Following pine marten conservationists as they work, I have demonstrated the centrality of such connective practices within a particular mode of wildlife conservation: how (some, particular) people are drawn together and the multi-species collectives thus composed, not through a politics of controversy, but through a politics of affective attachment. Considering the affective encounters facilitated through nature reserves allowed me to challenge, but ultimately to affirm, this reading of affirmative affective composition; but considering the situations of grey squirrels and wild boar forced recognition of the limitations of naively affirmative approaches to multi-species politics.

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SPACE

Interview with an ecologist.

August 2013, Forest of Dean, England. Abridged.

"*last summer we had quite a large bachelor group, between 8 and 10 young males. They'd been dispersed out of quite late litters. Males are chucked out of the sounders, sounders are matriarchal, they're female. With very young at hoof, soon as they get to about between 7 and 9 months old, young males get ousted and they tend to band together. They made themselves a bit of a nuisance at Beechenhurst, and I'm talking things like going in there, broad daylight, trying to get into the play area, trying to get into the café. I had reports of people turning around and saying "Beechenhurst was no longer Beechenhurst but 'Peppa Pig World'" … for some reason, and I don't know why, Beechenhurst is loved by boar for foraging. The grassland there was just being hammered, and it was unusual because normally boar will go, they'll use a resource, move away, go to somewhere else, use the resource there, move away, and so its episodic. For some reason, and I don't know why, Beechenhurst seemed to be boar central for food …*

So it was decided that Beechenhurst would be fenced off, but not just fenced off with ordinary stock fencing. This is top end, proven record wild boar fencing. As far as we know it is the only time it's been used in the UK. It's got no sliplock so it's locked. The grids at the bottom are closer together than those at the top. It is also dug into the ground and folded out 20cm so basically the boar have got to dig right under that and they won't do that. And then it's folded back over so its like rabbit fencing. The grids are so small so that the boar can't get their snouts in to lift it up which is what they've done at the campsite …

The policy is if a boar is found inside that fence-line it's shot …"

6. Places, mobility and biopolitics

In this chapter I compare how the **connectivity multiple** is composed differently in situations of red squirrel and pine marten conservation in England and Wales. It builds on the consideration of **ecological connectivity** and animal mobilities presented in chapter four, and the discussion of **socionatural** (including political) **connectivity** in chapter five, by combining these and additionally incorporating considerations of the spatial practices of **territorial connectivity** enacted in conservation practice. The aim is to demonstrate: (i) how connectivity is enacted as a multiple; but also (ii) how this multiple can be composed in very different ways. I do this through comparing the spatial practices, techniques of management, and modes of biopolitics enacted in two contrasting conservation situations, relating to pine martens and woodland squirrels.

The analysis draws on, and in turn contributes to, three bodies of geographic/sociological theory concerned with: (i) mobility; (ii) places; and (iii) biopolitics (notably at the intersection with biosecurity literatures). I utilise the concept of animal mobility developed in chapter four to account for the ways in which nonhuman agencies enact particular forms of ecological and territorial connectivity. Additionally, I utilise geographic theories about place-making to analyse a series of spatial practices by conservation actors, attempting to facilitate, prescribe or curtail the mobilities of particular animals. And finally, I engage with established and contemporary work on biopolitics and biosecurity in order to think through the various ways in which these spatial practices promote the flourishing of particular kinds of life.

I begin by exploring the ways in which pine marten conservationists promote ecological connectivity through the (co)production of **potential places**. Following recent engagements with Foucault's work, I suggest that this is a form of affirmative biopolitics directed at the population of martens through interventions in their 'milieu'. Second, I consider how both territorial and ecological dis-connectivity

is enacted in practices of red squirrel conservation through the (attempted) enforcement of **prescriptive places**. In this case, I trace how disciplinary techniques that target the mobilities of individuals are combined with modes of (bio)security that manage the circulations of various populations (of squirrels and viruses). In contrast to the biopolitics of pine marten conservation, this regime is difficult to conceptualise in affirmative terms, but considering these difficulties points towards recognising the fraught ethical quandaries imposed through the logics of conservation practice. Last, speculation about a particular possible future, for both squirrels and martens, suggests how nonhuman enactments of territory (through mobility) can be re-thought as the making of **animal places.** Yet even this move has its biopolitics, as both species are effectively enrolled into an apparatus of 'ecosystem management' by human action/inaction. Furthermore, acting through proxies does not, I suggest, sidestep ethical imperatives.

This chapter thus contributes to existing debates about biopolitical practices in wildlife conservation in two important ways. First, it illuminates how the spatial practices of conservation actors (including animal mobilities and place-making activities) enact particular multi-species modes of biopolitics; and through so doing, facilitates reflection on the ethical difficulties in identifying affirmative paths. Second, it foregrounds the importance of how 'the connectivity multiple' is composed to understanding these situations: i.e. considering how mobilities, territorial practices, and forms of human/nonhuman relations cohere in particular situations and events. In chapter seven, I will build further on this account of 'composing the connectivity multiple' in order to interrogate wider trends in conservation practice in England and Wales.

6.1 Places, mobilities and biopolitics

Place-making

Considerations about connectivity in conservation theory have shifted attention from a focus on particular places (nature reserves, protected areas, particular habitats and sites) towards the connections between places; and this shift forces a re-thinking of the ways that such places have been produced through conservation practices. 'Place', as a concept, has a thick and many timbered genealogy in a geographic discipline for which it is a central concept. In a series of influential interventions, it has been theorized in humanistic, phenomenological, feminist, political and cultural traditions, amongst others (Cresswell, 2004). In this chapter, however, I aim to focus in particular on three sets of ideas about places: (i) as relational achievements; (ii) by contrast, as discrete and bounded; and (iii) somewhat differently, as more-than-human. I utilise these different understandings to foreground different modes by which places are imagined and enacted in conservation practices.

The first draws on processural philosophies (Bergson, Whitehead, Deleuze), Massey's (1991) sense of relational and de-centred places, and related post-structural and non-representational work (Thrift, 2008), so as to conceptualize places as a set of possibilities rather than a final achievement. Here places are understood as open rather than closed, fluid rather than fixed, made through relations rather than of essences (Pierce *et al*, 2011), and not in 'counterposition' to space (Massey, 2005:183). This processural understanding is used to develop a notion of 'potential places' within the section relating to pine marten conservation. The second is Cresswell's (1996; 2004) elucidation of the ways in which constructions of places facilitate judgments that people and things can be 'in place' and 'out of place', the power relations involved in these constructions, and the subsequent derivation of moral geographies. In Cresswell's terms, places are more bounded and fixed, albeit

'transgressions' do occur – and it is through these transgressions that the boundaries become clear. This understanding of places has frequently been adopted and articulated in the field of animal geographies (for instance, Philo & Wilbert, 2000). I will bring this concept of bounded places into conversation with more recent work on biosecurity (Braun, 2013) and non-native and/or invasive species (Warren, 2007; Fall, 2013; Gibbs *et al*, 2015) in order to trace the ways in which squirrel conservationists attempt to enact 'prescriptive places'.

The third is a post-humanist take on places, in which more-than-human agencies are explicitly recognised in understandings of how places are enacted. Places are more than simply locations; indeed, Jones (2008) suggests that places are made through acts of 'affective territorialisation'. To transform locations into places it thus requires (at the very least) both an appreciation of context, and the inscription of meaning (Agnew, 1987). For many variants of humanism, 'meaning' remains the preserve of humans, as that which separates 'us' from whatever else. Yet as Ingold suggests, it is 'absurd' to think that "*non-human animals inhabit meaningless worlds*" (2011:64); indeed, similar positions can be found in traditions of ethology and philosophies of non-human perception that emphasize the possibilities of non-human lifeworlds (H.Lorimer, 2010). Notions of non-human places have thus become more widely discussed and accepted in geographical theory in recent years, particularly through the wide-ranging sub-discipline of animal geographies (Wolch & Emel, 1998; Urbanik, 2012); albeit exploring these 'beastly places' (Philo & Wilbert, 2000) poses distinct epistemological challenges (Buller, 2014; Hodgetts & Lorimer, 2014). Thus, within the chapter, I also develop the notion of 'animal places', conceptualised as those formed through animal acts of affective territorialisation.

Whilst theories about places have a long pedigree within human geographic theory, and remain central to the discipline, contemporary theorists with material and more-than-human sensibilities point to two ongoing encumbrances. First, as noted above the concept of 'place' retains the shadow

of humanism; and to some posthumanist scholars, this legacy is problematic. Second, theories about places – even processural theories – tend to privilege the located knots of relations known as 'places' rather than re-balancing the analysis towards the various more-than-human relations through which they are made. For some, an alternative language of territories and flows is preferable (Clark *et al*, 2008). However, my reasons for holding onto the notion of places, despite the problems involved, are also twofold (and intertwined). First, it helpfully captures something of what conservationists actually do in practice: they attempt to make 'places', understood in such terms. Second, it also holds onto something of the sense in which these places are enacted through (more-than-human) meaningful experience. Both are important in the following account; both also point, following Woodward *et al's* (2012) work on '*site ontology*', to the ways in which the co-production of such places is generative of (bio)political possibilities.

Mobilities

In chapter two I introduced the notion of nonhuman mobilities through bringing contemporary literature on (human) mobilities into conversation with the sub-discipline of animal geographies. For the most part mobilities scholarship has been limited to human-focussed geographies; yet extending the concept of mobilities to more-than-human actors serves two important purposes. First, it draws attention to the ways that 'animal mobilities' are affected by, enabled through and constrained by human actions (Lulka, 2004; Creswell, 2014); for example, Barua's (2014a) recent work on the intersections between elephant wanderings, rural agriculture, and clandestine alcohol distillery in India could be read through a mobilities lens. Second, and perhaps more importantly, it enables the conception of animal movements in terms that go beyond simply movement: as lived, affectual, and relational animal activities (as demonstrated in chapter four). It is a concept that thus works towards developing what Lulka (2009) has described as a 'thicker' form of hybridity, in which the relational

ontology of animals is understood in less anthropocentric terms. Not all animal mobilities involve humans.

For Adey (2009), mobilities are inherently relational; for Massey (2005), the same could be said for places; and the same also holds for connectivity of various kinds. But these three (groups of) concepts are not mere synonyms for forms of relation. 'Mobilities' relate to the ascription of meaning to, and experience of, movement; the concept of 'places' is used in a variety of ways to conceptualise the ascription of meaning to, and experience of, what might be termed congealments of these mobilities – what Ingold has described as "*knots"* of lines (2011:149). Territorial connectivity thus refers to spatial practices seeking to shape pathways for mobilities between specified places; ecological connectivity refers instead either to enactments of mobility, or supportive actions by conservationists that aim at affording such mobilities. In the situations that follow, animal mobilities thus combine with contrasting human attempts at conservation place-making to enact particular forms of dis/connectivity.

Biopolitics

The concept of biopolitics is, according to Rutherford & Rutherford in a recent pair of essays, both currently fashionable and increasingly difficult to define (2013a,b). They suggest that perhaps the most accessible definition of the term's meaning in a Foucauldian sense is offered by Gordon, who defines biopolitics as: "*the conduct of living and the living*" (1991; cited in Rutherford & Rutherford, 2013:414). Foucault's concern is with the ways in which particular governmental practices make life itself governable – and 'biopolitics' relates specifically to actions aimed at the level of populations rather than individuals (Foucault *et al*, 2009, 2010; Holloway et al, 2009); the benefit (herein) of Gordon's definition is it does not limit these populations to the category 'human'. But Foucault is not the only game in town; and in the first of these papers, Rutherford & Rutherford trace the

development of biopolitical thinking through the work of five major figures: Foucault (governmentality through populations), Hardt and Negri (how authority produces life), Agamben (who distinguishes between 'bare life' and 'full life'), and Esposito (biopolitics as immunization) (2013a) (see also review in Hinchliffe & Bingham, 2008). More names could be added to this list (see below).

In the fields of animal and more-than-human geographies, the notion of biopolitics has been extended beyond its original anthropocentric ambit, and deployed to critically consider a range of governance practices through which particular nonhuman lives are shaped and spaced; these include regimes of biodiversity conservation (Buller, 2008; Lorimer and Driessen, 2011; Hennessy, 2013; Srinivasan, 2014; Biermann & Mansfield, 2014; Braverman, 2014), animal health (Enticott, 2008) and livestock breeding (Holloway et al, 2009), zoonotic diseases and biosecurity practices (Hinchliffe & Bingham, 2008; Hinchliffe & Lavau, 2013), human-wildlife conflict (Collard, 2012), and dog control and care (Srinivasan, 2013). Such work has engaged with several of the various strands of biopolitical thought; as Lorimer & Driessen note, the "*biopolitical turn … has expanded from a Foucauldian interest in the ways in which life is spaced, to a vital materialist concern for the lively potentials of nonhuman forms and processes to make places and unsettle such orders*" (2011:2). Indeed, these authors turn to the work of both Esposito and Haraway in their attempt to trace a more affirmative biopolitics of 'living with' nonhuman life. And in their second paper, Rutherford & Rutherford point to both Haraway's work on companion species, and Hannah's re-working of biopolitics (in part based on incorporating Wilson's (1984) notion of 'biophilia'), as further possible theoretical resources for developing a more affirmative tack in biopolitical theory and practice. In a similar affirmative vein, Hinchliffe & Ward (2014) consider the promise, but also limitations, of adopting Esposito's notion of immunity in order to move beyond geographies of biosecurity that rest on practices of spatial segregation and the prevention of 'incursion'.

The term 'biosecurity' relates to a particular subset of more-than-human biopolitics, specifically the pre-emptive processes, practices and institutions that are designed to prevent or ameliorate a particular set of lively disturbances and thus, "*secure valued forms of life from biological risks"* (Braun, 2013:45). Regimes of biosecurity have been developed at the various intersections of: human and animal health regimes (Lakoff, 2008; Hinchliffe & Bingham, 2008); food production and virology (Enticott, 2008; Enticott & Franklin, 2009; Donaldson, 2008; Enticott *et al,* 2012*;* Hinchliffe & Ward, 2014); international trade, horticulture and plant disease (Maye *et* al, 2012; Potter, 2013); international relations and terrorism (Rappert & Lentzos, 2013); invasion ecologies and biodiversity conservation (Barker, 2008; see also Barker *et al*, 2013). The disturbances they seek to control thus include pathogens that threaten human and/or animal health, the infected bodies that transmit them, and invasive species that challenge existing 'native' ecologies. These heterogeneous bio-securities (Braun, 2013) share: a concern with the endangerment of life through a proliferation of unwelcome, entangled lives; a focus on demarcating space; and the assignment of particular forms of life to specific areas (Barker *et al,* 2013). Boundaries and barriers become the operational tools in preventing the movement of prescribed life; biosecurity thus operates through a spatially inflected mode of biopolitics (Hinchliffe *et al*, 2013). In short, connectivity – for some species of life - becomes undesirable.

Within wildlife conservation, biosecurity concerns and responses emerge in two main contexts: (i) the spatial spread of diseases threatening endangered species; and (ii) invasive 'alien' species that threaten 'native' ecologies. The latter often gets greater emphasis, and theories of invasion ecology have been widely adopted within conservation biology and cognate disciplines. There is some disagreement around the exact definitions of both 'invasive' and 'alien', and the important differences between the two (Warren, 2007), but as Fall (2013:170) notes, "*invasiveness generally refers to the behaviour of an organism, while alienness (and, conversely nativeness) refers to its belonging in a certain place"*. The assignment of place and value to forms of life is, of course, far from

being an objective act (Davis *et al*, 2011); and attending to the politics at work in the biology of invasive species has enabled the articulation of powerful critiques of the notions of 'natives', 'aliens', 'invaders', and the uncomfortable discursive echoes they engender (Warren, 2007; see review of the debates in Fall, 2013; see also Robbins & Moore, 2013; Gibbs *et al*, 2015). Despite these concerns, the logics of invasion and nativity continue to grow in influence in policy internationally (Outhwaite 2013); and the management of 'invasive alien species' as a mode of biosecurity control is well documented, manifested through practices of monitoring, containment, and where possible, eradication.

In this chapter, I engage (for the most part) directly with Foucault's work on biopolitics enacted on and through populations, because (by analogy at least) it illuminates some of the key processes involved in governance and management practices relating to squirrels and martens. Specifically, I draw on Foucault's understanding of the milieu as a site of intervention, and on his distinction between techniques of 'discipline' (that work on individual bodies) and 'security' (that operate through populations; see later sections). I also point towards some of the limitations of affirmative modes of biopolitics in the context of the ethically-charged practices of 'making die to let live' enacted in wildlife conservation in England and Wales.

6.2 Potential places, and 'living with'

> Fieldwork stories (2013).
>
> *"Nearly there!" shouted Pete, grinning at us from the top of the ladder. He tied the washing line holding the den box to the tree, and cut off the loose ends.*
>
> *This was the second box of the day, and it had been hard work. We were deep inside a nature reserve, a steep-sided deciduous woodland in the Cambrian mountains of Wales. Amongst*

other things, this area contained an important assemblage of lichens, and we were under orders not to disturb or damage them. Carrying the box, ladder and climbing equipment up the hill-side had been a complicated affair, as our chaperone – the local reserve manager – ensured we kept our hands and feet away from the rarities. Keeping balance on the uneven ascent was not helped by the constant assault of midges, intent on sharing our blood.

"Okay, try it now". I eased the tension on the winch-line, letting the den box settle into place. It was square on the tree, and tightly-mounted. Perfect.

"Happy Rhondda?" Pete asked the reserve manager.

"Yes. But be careful on the way down!"

Pine martens, carnivorous cat-sized mustelid relatives of stoats, weasels and polecats, are thought to be very rare in England and Wales, stemming from a history of habitat loss, hunting for fur, and particularly persecution by gamekeepers (Harris and Yalden, 2008). Indeed, since the 1990s there has been some debate as to whether there are any 'viable' populations remaining in the two countries at all (Birks & Messenger, 2010). Significant efforts by a procession of ecologists in England and Wales have failed to establish the precise locations of any extant populations. Instead, conservation professionals are forced to rely on lay knowledges. 'Sightings' reported to conservation organisations are assessed according to a strict protocol in order to quantify the likelihood of their accuracy (see chapter five); the unfamiliarity of pine martens to most people in England and Wales means cryptic sightings are the norm. The possible and probable sightings have been collated to produce potential distribution maps (Birks & Messenger, 2010); few unequivocal records exist (bodies, photographs, etc.), and these may be evidence of captive escapees or unofficial translocations, rather than persisting populations. Once assembled, the sighting-maps suggest that possible pine marten refugia

in Wales are located somewhere in the Cambrian mountains, with three areas of possible concentration towards the north, middle, and south of the range. Connectivity, conservationists suggest in both conversation and written reports, is crucial if these pine martens are going to survive; isolated populations face the universal threats of in-breeding depression and stochastic extinction.

Conservation action is complicated when species presence is uncertain, places cannot be specified, and locations become vague (J.Lorimer, 2008; Nygren & Jokinen, 2013). Steve Hinchliffe (2008) has written of how conservation in practice (compared with theory) often revolves around the 'making present' of elusive and rare creatures. Considering water voles and black redstarts in urban Birmingham, he notes that, "*their presence in the city is far from being self-evident"* (p.89); yet establishing presence/absence is crucial in such cases, since various legal protections only apply within inhabited areas. Given the difficulty and expense involved, Hinchliffe explains that conservationists and developers have developed a mode of working that adopts a logic of 'likely presence'. Similar problems of 'making present' apply within pine marten conservation. There is not at present an identifiable nature reserve, woodland, or mixed habitat in either England or Wales where enthusiasts can focus their attention in the knowledge that pine martens are present. Thus, instead of presence, the raison d'etre of static, place-based approaches to conservation, the humans involved are forced to consider the possibilities and potentials of presence; and the challenges of apparent absence.

A traditional, widespread, and often successful approach to producing presence in conservation has been the production of conservation-places (Adams, 2004; see also J.Lorimer, 2008b). This form of place-making can confirm likely presences as well as establish new inhabitations. It can involve the creation of structures for nesting or denning (akin to place as 'home'); or it could relate to wider habitat construction (place as 'locale'). Indeed, species-focussed home and habitat-creation schemes

are an old favourite in the conservationist's toolkit, at a variety of scales from bird boxes in residential gardens to huge tracts of managed land.

Place-making seems of a similar hue in pine marten conservation; yet also involves an important difference. It revolves around the installation of den-boxes throughout the landscape. These boxes are reminiscent of those for large birds such as owls (albeit with different entrance designs and size specifications), constructed from sheets of marine-grade plywood and hoisted into suitable trees to provide denning sites for any pine martens that might be in the vicinity. Den-boxes are required because of the history of commercial timber extraction in the Welsh uplands that has left many areas bereft of old, gnarly trees – the sort that develop holes and crevices through long-lived histories, and in which martens prefer to make their homes (safe from goshawk above, and foxes below). Pine martens in Scotland have taken to inhabiting den-boxes in the absence of alternatives, which also has the coincidental benefit of making the species easier to survey (when in residence in a box, martens tend to defecate on the roof; and some boxes even have cameras installed). However, the aim with the boxes in Wales is not to attract the martens into a specific area; nor is it to install them only in areas of confirmed marten presence, as such detailed locational knowledge is lacking. Instead, through installing many such boxes throughout western Wales, conservationists hope to produce *a range of possible places* for martens – and thus also facilitate the movement of organisms through this range.

Figure 6a: Installing a den box.

The installation of den boxes is a key part of the conservation strategy for the species. In the final (2007) version of the 'Species Action Plan' (SAP) for pine martens, produced under the rubrics of the old UK Biodiversity Action Plan (UK BAP), the strategy was made explicit. Action 1 in this plan aimed to: *"Promote strategic re-afforestation to increase general woodland cover to >25% and improve connectivity in regions where pine martens occur in England and Wales"*; and Action 2 continued thus: *"Within woodland, increase above-ground den site availability through retention of standing old and damaged trees (long term action) and through provision of den boxes (short term)."* (JNCC 2007:4). Further actions relate to the need for further socio-ecological research. The UK BAP regime has now been superseded by a policy framework in which responsibility has been devolved to the constituent nations, and where more emphasis is placed at the level of ecosystems than species (JNCC & DEFRA, 2012; see chapter seven); however, even under the new approach, priority species are still identified, and the historical SAPs continue to guide action to some extent. The conservation groups working with pine martens in England and Wales have thus followed a similar course in recent years; although more radical action, including re-stocking populations with trans-located

individuals, is under active discussion (see section 6.4).

Whilst afforestation is a territorial connectivity strategy, den-boxes work through ecological logics; and it is the latter that are the main focus for contemporary conservationists working on the species. In terms of practical action, installing den-boxes is a more cost-effective, achievable, and affordable way to facilitate species inhabitation and movement compared with the scale of tree-planting suggested by the woodland cover/connectivity targets. Large-scale afforestation, though desirable for many species, runs into many significant challenges in application; s*trategic* afforestation (targeted action for facilitating pine-marten-specific connectivity) shares many of these challenges, and some of its own: the areas where pine martens *might be present* are vast (complicating the location of strategic action); land tenure is often fragmented amongst many different owners (complicating efforts to link forested areas); land use is tied into byzantine structures of farming subsidy and forestry grants (complicating land use incentives); the areas managed for conservation have multiple purposes (including favouring particular species or habitat types over others); and the resources (financial and otherwise) specifically for action on behalf of the pine marten are sparse. In a complex relational web of power and influence over land use planning and management, pine martens and pine marten conservationists have limited options. By contrast, den-boxes are (relatively) cheap and (relatively) easy to install.

Over fifty of these boxes have now been positioned throughout west Wales, from the Tywi in the south to Snowdonia in the north (as of end 2013, with more planned). They have been erected by a combination of professional conservationists and volunteers; in commercial plantations, private woodlands, in Forestry Commission estates and in nature reserves; in areas where pine martens are suspected to reside as well as the areas in-between. Landscape ecological models can help here in identifying favourable locations, but in practice the boxes are positioned through more ad hoc criteria including access to and amenability of the relevant landowner, ground-truthed assessments

of habitat suitability, and existing interpersonal networks. The assumption is that pine martens will be able to navigate the mixed habitats between these boxes. Unfortunately, there is little evidence on which to assess landscape permeability in England and Wales for martens, although experience in Scotland suggest they are able to traverse a range of habitat types if fragmentation does not reach a 'threshold' level (Caryl, *et al* 2012); as a conservationist working with martens across the UK explained to me: *"Contiguous woodland would be the ideal but where that's not possible then they could get by in fragmented forests or hedgerows or they will cross open areas if they need to"* (interview in Scotland, 2013).

The biopolitics of potential places

Providing den boxes in (expert designated) 'suitable' habitat addresses absence through (co)producing places; yet in departure from traditional modes of place-production found in 'protected area' conservation, it does so in a non-prescriptive manner. The aim is not to demarcate particular sites; rather, it is to improve the possibilities and permeability of a huge area that stretches more than a hundred miles from north to south. After all, conservationists do not know exactly where martens reside, and therefore don't know which boxes are more or less likely to be used. It is thus about increasing potential rather than prescription. To make this distinction clear: whereas prescriptive modes of place-making serve to define and demarcate inhabitation (this organism, at these co-ordinates), modes of (co)producing potential places instead seek to open up possibilities (for living, moving, inhabiting).

In practice, the humble den box becomes the conservationist's tool of ecological connectivity; promoting the movement of martens through providing a spatial spread of favourable denning spots – throughout the landscape, in nature reserves and commercial plantations alike. Not planting trees, but creating places to live – and enough of them, spatially positioned, to facilitate a connected

population. This enactment of ecological connectivity thus relies on a form of territorialisation, but one that operates at the scale of the den box rather than the wider landscape. Den boxes are not linked through structural territorialities, but instead are generative of ecological movements (and mobilities).

If the installation of a den-box is understood as the making of a 'potential' place, then it is only through inhabitation that such potential can be fulfilled. It is at this point in the story that human agency recedes somewhat, as it is through animal mobilities that potential is realised. However, of the boxes installed in Wales, none as yet has been confirmed as inhabited. These more-than-human places are thus best understood not in terms of bounded specificities but possibilities. These possibilities cannot be fully comprehended through spatial co-ordinates; 'beastly places', to borrow Philo & Wilbert's (2000) term, are meaning-full inasmuch as they are both lived and becoming. Following Massey, such places might thus be thought of as, *'an ever-shifting constellation of trajectories*' (2005:151), where the agency of conservationists can combine with the mobilities of martens and more besides.

There is, therefore, a particular form of biopolitics being enacted here. Indeed, the distinction made by Foucault, in the 1977-78 lectures at the Collège de France (*Security, Territory, Population*; Foucault *et al*, 2009) between 'discipline' and 'security' as modes of power is particularly relevant. Discipline, he suggests, "*structures a space and addresses the essential problem of a hierarchical and functional distribution of elements",* whilst security, "*will try to plan a milieu in terms of events or series of events or possible elements …. It refers to the temporal and the uncertain, which have to be inserted within a given space"* (ibid, 20). Following these logics, traditional protected area-style approaches to conservation can be conceived as operating through apparatuses of discipline, since their mode of operation is exactly this form of spatial structuring and imposition of various (often taxonomic) hierarchies. Indeed, within the boundaries of protected areas, organisms are required to

enact particular "*performances*". By contrast, the creation of potential den-sites for martens throughout a mixed landscape operates, instead, through techniques of security – and specifically the composition of a particular *milieu*. Foucault continues to explain that, *"the milieu appears as a field of intervention in which … one tries to affect, precisely, a population. I mean a multiplicity of individuals who are and fundamentally and essentially only exist biologically bound to the materiality within which they live"* (ibid, 21). The *milieu,* for Foucault, is thus something upon which governmental action can intervene; it can be regulated, *"which involved not so much establishing limits and frontiers, or fixing locations, as, above all and essentially, making possible, guaranteeing and ensuring circulations: the circulation of people, merchandise, and air, etcetera"* (ibid, 29). Whereas Foucault was tracing a historical shift in the governmental practices that occurred in Europe several centuries ago, these concepts do much by analogy to excavate the conceptual distinctions operating in contemporary modes of conservation practice. The spatial practices of pine marten conservationists, operating according to a biopolitics in which martens are figured as a population, can thus be understood as operating through techniques of (bio)security that seek to manipulate the *marten milieu* so as to shape possibilities for mobility and inhabitation; the 'circulations' in question being mobile martens.

The particularly striking facet of the marten situation is that such techniques of security – in this context – facilitate an *affirmative biopolitics*, wherein the co-production of potential places works to facilitate the lives and mobilities of martens collectively and individually. Following Haraway (2008), this is a biopolitics of *'living with*', enacted deliberately through specific practices (see also Lorimer & Dreissen, 2011). Of course, for Foucault, the identification of apparatuses of security as a mode of governmentality was the first step towards building his critique of liberal government through both the 1977-78, and 1978-79 lecture series (and elsewhere). The point to make here, then, is that techniques of security can be composed in affirmative ways; particularly when they operate through facilitating proliferative possibilities.

The (co)production of potential places by conservationists is by no means unique to pine marten conservation, but instead represents a well established series of practices within both traditional and emerging modes of wildlife conservation (see chapter seven). The emphasis on movement contrasts strongly with formulations that equate places with rest (and space with movement), as in Tuan's influential notion of topophilia. Instead, the co-production of potential places is, following Massey, de-centred and processural; it is, following Deleuze, not achieved but constantly becoming; it emphasizes not fixity but mobility. It stands in stark contrast to the form of places generated through the dis-connective practices of squirrel biosecurity that I will now move on to consider.

6.3 Prescriptive places, letting live and making die

Whereas the practices of pine marten conservationists open up space for connectivity, much of the work carried out in aid of red squirrels in England and Wales explicitly aims to close connectivity down. My aim in this section is to foreground an influential mode of territorial practice, which stands in stark contrast to those promoting the facilitation of animal mobilities. If the simple point is that connectivity is not always a good thing, the more interesting analysis relates to the ways in which various structural and functional connectivities are actively governed and the bio-political practices of territorialisation this involves.

Figure 6b: A baited squirrel trap

Fieldwork stories (2013).

"Over here!" called Susan, in tones of hushed urgency. "We've got one".

One, in this context, was a red squirrel, lured by corn kernels and hazelnuts into a well-hidden trap. Roger and I hurried over from our side of the forest track to have a look. Susan proceeded to cajole the squirrel into a measuring device (somewhat reminiscent of a bird feeder) so that it could be scanned, measured and weighed. If this squirrel had been encountered before, it would have been fitted with a PIT (Passive Integrated Transponder) tag: a sub-skin microchip that can be read by a hand-held scanner. It turned out that this squirrel was indeed a repeat visitor – the week before, it had been munching hazelnuts on the other side of the ravine; quite a traverse, we all remarked, from there to here. Susan was efficient, completing the necessary audit as quickly as possible so as to minimise any distress to the animal. Soon it was loose again, scampering a few metres across the forest floor to the nearest lodgepole pine before taking off into the upper canopy. I found myself reflecting on the thought that if the squirrel in this trap had been grey, not red, its fate would have been very different. It is illegal to release

grey squirrels in the UK, and that includes those caught whilst surveying. In practice, whilst this red was handled with care and quickly released, the greys are usually culled.

Territorial dis-connectivity, biosecurity, and squirrel conservation

In red squirrel conservation in England and Wales, the twin modes of biosecurity as controlling either disease or invasive species are combined. The situation is usually presented by conservationists and enthusiasts, thus: the native red squirrel, *Sciurus vulgaris*, is threatened with local extinction by the spread of the invasive grey squirrel *Sciurus carolinensis*. The larger greys outcompete the native reds (Gurnell *et al,* 2004), but more important is their role as a vector of disease, and in particular the squirrel poxvirus. This virus has very little impact on the greys carrying it, but devastates populations of reds, with mortality usually occurring within around 14 days of transmission (Rushton *et al,* 2006). As a result, it is thought that red squirrels have been wiped out from large areas of England and Wales through an advancing wave of disease, and the lively colonists following in its wake. Total eradication of the greys, often a preferred management option where invasive species are concerned (Barker *et al,* 2013), does not appear feasible throughout all of England and Wales (interviews). Greys are too widespread, the resources necessary for eradication are not available, and there are significant questions over the level of public support a full-scale cull would have particularly in urban areas (see Dandy *et al* 2012 for a wider view on levels of support for animal culling in the UK). Thus, whilst a century ago red squirrels were widespread across Wales and England, the contemporary situation is very different with current populations limited to a few islands, a few small areas in mid-Wales, and a larger area in the north of England, centred on blocks of coniferous forest in Cumbria and Northumberland. Given the situation, connectivity is held to be a bad thing; indeed, conservation action largely involves efforts to prevent (possibly infected) grey squirrels from reaching the few areas where red squirrels remain.

In the north of England conservationists seek to protect red squirrels through controlling functional, rather than structural, connectivity. Northern reds tend to be found in or near upland conifer plantations, but not necessarily because these are prime habitat for the species. Instead, it is thought that the larger greys struggle to invade resource-poor coniferous woodlands (particularly those dominated by tree species like sitka spruce), whereas low-density populations of the smaller reds can subsist, leaving these reds unaffected by incoming competition or disease (interviews). Controlling connectivity does not, in this case, imply implementing spatial habitat disconnection; there is no action to make the woodlands of the north of England more isolated, or more fragmented; such an approach would be detrimental for the movement of many species besides grey squirrels. Instead, functional connectivity is controlled at a species-level. In the mixed and deciduous woodlands between the conifer islands, greys are held back through an extensive extirpation programme. The aim is to create virtual barriers through enacting trapping zones that reduce the landscape permeability to as near as zero as practically possible.

Enacting functional disconnectivity is only possible through the prior enactment of a particular mode of socionatural connectivity; one which assembles a collective of actors willing to support, fund or carry out culling of the greys. As noted in the previous chapter, the affective atmospheres through which such a collective is drawn together cannot be explained simply through logics of curiosity; instead, this is a biopolitics starkly marked by practices of separation, segregation and killing to let live. Until recently the control work was conducted almost exclusively by a loose alliance of voluntary conservation groups. Initially formed several decades ago, the impetus behind such groups has been spatially diverse. Groups vary in size from a few people to some with hundreds of members and paid staff; and they differ in resourcing, efficacy and longevity. Those involved point to the importance of meaningful community involvement to sustained success. Kate, a professional conservationist, described the legacy of this volunteer-led action, thus:

> *"I think it has to be said that if it wasn't for volunteers and communities taking up the fight for red squirrels, the red squirrel wouldn't be in England at all, it would have gone some time ago, and an example – if you look at Cumbria as a county, the people in Cumbria actually identified this risk of losing a species which added considerably to their lives and to their tourism business, about 20 years ago, and they took the view that they were going to do something. And, you know, government … have swept in on the coat tails of these volunteers … just over the north of England, I'm looking at Cumbria and Northumberland, just as two counties, they've probably got about 1500 volunteers up here, and Cumbria is already showing the fantastic results of that early intervention by people who took it upon themselves not to wait around for government or wait around for grants, to get out there and save the animals. And there are massive good news stories coming out of places around the Lake District where reds are just quite commonplace now, and no grey squirrels."* (Interview in England, 2013)

In recent years this locally-focussed, widespread and voluntary action has become increasingly co-ordinated at a regional scale, driven by the realisation that controlling squirrel movements locally can be undermined by a lack of action in neighbouring areas. As a result, in 2008/9, a volunteer-led umbrella organisation named Northern Red Squirrels (NRS) was formed to help the various local groups co-ordinate their activities, and through which to communicate more effectively with government agencies and funding bodies. The impact has been notable; local groups now have a voice, and national bodies include them in the conversation; institutional connectivity matters too.

The work of these volunteer groups has been further bolstered since early 2012 by the establishment of Red Squirrels Northern England (RSNE), a new and well-funded regional body with professional conservation staff. RSNE was set up by a coalition of government agencies and NGOs including the Forestry Commission, Natural England, the Wildlife Trusts and national squirrel group the Red Squirrel Survival Trust (RSST); it receives funding from a range of sources including the waste company Biffa (through their landfill tax award scheme) and the Heritage Lottery Fund; and it works closely (and publicly) with the various volunteer groups brought together through Northern Red Squirrels. RSNE's aim is to protect red squirrels through preventing the ingress of greys; as they put it:

> *"Red Squirrels Northern England's mission is to maintain red squirrel range in England, through grey squirrel control, sound science and partnership. It builds on a long history and mature conservation community fighting for persistence of red squirrels in the northern English landscape against all the odds. This initiative, in contrast to previous programmes, invests in a single conservation tool, grey squirrel control, and focuses hard on organising community participation in this activity and the measurement of its impact."* (RSNE 2012 Summary Report, p.3).

RSNE thus employs a number of 'rangers' (15 at the end of 2012) whose primary role is grey squirrel control. The conservation strategy centres on the defence of 17 key 'strongholds' (comprising a core reserve and a buffer zone) where red squirrel populations still exist, and the prevention of grey squirrels from reaching these areas through a programme of trapping both inside and in the adjacent buffer zones. The strongholds are located in (largely commercial) conifer plantations around 200ha in size (RSNE, 2014), and were designated by the Forestry Commission in conjunction with the UK Red Squirrel Group (another umbrella group, this time drawing together involved agencies and experts). In practical terms, this reserve-style designation simply means that government funding is available in these areas for grey squirrel control. Although there is no obligation on land managers to apply for or implement control activities, commercial foresters tend to utilise the scheme as grey squirrels can cause extensive and expensive damage to plantations. Indeed, some government-sponsored estimates of the financial impact of grey squirrel damage on UK forestry put the figure at over £6 million each year (Williams *et al*, 2010).

Figure 6c: Grey squirrel. Unwelcome?

The stronghold strategy is not universally popular. As one professional conservationist explained: "*I suppose there's an assumption … that, well, these are the bits that we'll make sure we'll defend, and the rest of it doesn't matter as much, that's kind of, I think, the sort of message it gives. And a lot of people are living outside of those areas, and they still actually have red squirrels because of the work they're doing"* (interview in England, 2013). Some of the local volunteer groups argue that it makes more sense to adopt a landscape-scale approach, defending not just reserves but also the connections between them. Doing so, they suggest, would aid the genetic diversity and resilience of red squirrel populations through facilitating movement, a point they make when applying for funding (to various bodies) to carry out grey squirrel control in areas outside of reserves (interviews). Here more functional understandings of connectivity theory are thus enrolled to justify action beyond the strongholds, in the places to which various volunteer groups are attached. The regional RSNE celebrates this landscape-scale action by volunteer groups, but its own control practices remain largely focussed on the reserves.

Red squirrel conservation in the north of England thus unites a loose alliance of foresters, locally-based volunteer-led movements, and a (for now) well-funded regional body in a series of dis-connective practices. The various groups seek to prevent the incursion of greys, and to retain and defend purified places in which reds (and timber crops) can survive. They are all engaged in a series of territorial practices that explicitly attempt to close down ecological connectivity for grey squirrels. Whilst some groups' actions seek to promote red squirrel movement, this is largely an issue of scale: the difference concerns whether to prescribe small reserves or wider landscapes as places for reds. The predominant regional strategy is thus bounded and prescriptive; with 'transgressions' (to use Cresswell's term) by greys actively policed. It entails a constant battle, in which the agency of red and grey squirrels alike must be contended with – for, as much as grey squirrels may attempt to transgress red areas and 'strongholds', so the red inhabitants of these areas may venture outside and thus come into contact with pox-transmitting greys. Both greys and reds can be 'out of place'; disease outbreaks occur on both sides of the human-demarcated borders.

In Wales, the problem of two-way border transgression – by reds and greys – is starkly evident for conservationists working on Anglesey. This island is separated from the mainland by the Menai Strait (a narrow but forbidding sea channel), and connected through two (road and rail) bridges (see Figure 6d). Anglesey is often cited as a key victory for red squirrel conservation, in which a remnant population of reds numbering in the tens and surrounded by greys has been brought back from the brink. The conservation work was designed, implemented and supported by a dedicated alliance of local people, both professional conservationists and volunteers. Grey squirrel populations on the island were progressively reduced through an (often ad hoc) evolving, multi-year programme of culling; with the corollary that the prevalence of squirrel pox virus was also reduced in those that remained (interviews). The remaining reds were augmented with the addition of captive-bred squirrels, and the island now supports one of the strongest and best-defended populations of red squirrels anywhere in Wales or England. Both structural and functional connectivity is limited by the

island's geography; squirrels can swim, but the Menai is a fearsome stretch of water. Even on an island, however, the threat of the poxvirus remains despite the removal of diseased greys. Whilst incoming grey squirrels are usually caught in traps when they attempt to cross onto the island and summarily 'despatched' (killed), any captured reds are released. These reds may have crossed and re-crossed the bridges, moving freely from island to mainland and back again. In so doing, they may bring an unwanted viral passenger with them on their return. Thus, these borders, despite the best efforts of those who police them, are never bio-secure: grey squirrels can be stopped in their tracks, but viruses are more elusive immigrants. As 'Rob', one of the project's leading figures, explained as we walked through Anglesey's woodlands:

> "*I'd never imagined that red squirrels would run across bridges the way they are. So the long term for the project, the buffer on the outside will fill up with red squirrels – there's got to be a red squirrel conservation project on the mainland, which as a big dividend also protects Anglesey from reinvasion, like a sponge on that side soaking up greys … I think we can forget about Anglesey as an island. We need to think about it as a relatively defendable peninsula, okay? So we've got one population. 'Island' and 'mainland' – we need to remove those terms, we are talking about one population"* (Interview in Wales, 2013).

Figure 6d: One of Anglesey's bridges

Both territorial and ecological dis/connectivity are thus enacted on behalf of red squirrels. Defending red squirrels on Anglesey makes geographic sense because the border – porous though it remains – is at least short. There are two bridges to defend, and a relatively small stretch of coast within swimming distance of the mainland; most of the border is protected by the wilds of the Irish Sea. By contrast, red squirrel conservation in the north of England is beset by spatial challenges; here the various strongholds, given their fragmentation, have a long area of border to protect relative to their internal area. This border-to-area problematic is one that has long taxed bio-geographers concerned with optimal reserve design. Some of those involved think that to be viable long-term, red squirrels need to be protected in areas that are less exposed to invasion by greys (interviews). This might mean islands like Anglesey, or shifting scales from reserves to landscapes in the north of England; but it could also be in mainland areas that mimic the properties of islands - with (relatively) short exposed borders and long inaccessible coastlines. In Cornwall, for example, a local group is trying to remove greys from the peninsulas of the county's south-west (West Penwith and The Lizard), so as to re-introduce red squirrels into an area that is perhaps more defensible – practically and economically – than some of the areas in which they continue to hold on. Such re-introduction projects are not without their critics, with others preferring to focus attention on areas where reds can still be found (interviews).

Biopolitics and topological connectivity

Despite differing priorities, the various red squirrel projects in Wales and England share a mode of dis-connective conservation practice that centres on securing life through controlling movement, implemented as the demarcation and assignment of species populations to particular (prescriptive) places, and the policing of borders with deadly force. Acts of territorialisation that enforce prescriptive places thus serve to prohibit (rather than facilitate) ecological connectivity. The various projects also share a common difficulty in containing the movement of viruses rather than squirrels;

the latter are easier to track, locate and capture than the former. Turning to the viral scale opens possible alternative futures in red squirrel conservation that may enable different forms of dis-connective practice. Some of these involve vaccines, others the use of immunocontraceptives on greys, but with research years from completion all of these remain opaque for the present (interviews). Other futures are hinted at by the possible emergence of immunity to the pox virus in red squirrels, but evidence for a widespread immunological shift is lacking. For the present, squirrel conservation appears locked into a particular groove of disciplinary control through prescribing places.

Bruce Braun, amongst others, has usefully engaged with Foucault's conceptualisation of biopolitics to explore the ways in which certain modes of biosecurity seek to govern the lives and deaths of various species, considered, constructed and performed as populations (Braun, 2013; see also Holloway *et* al, 2009; Collard, 2012; Rutherford & Rutherford, 2013ab; Srinivasan, 2013). As Braun notes, (2013:46) *"biosecurities can be seen to invest in life through making cuts into the fabric of life as a whole, whereby those forms of life deserving of protection are separated from those that can be sacrificed".* There is such a biosecurity at work in squirrel conservation, where the populations of red squirrels are secured through policing the vitality of greys and the viral pathogens that accompany them. Yet unlike the mode of security operating through the marten milieu (see earlier), red squirrel conservation seems to be practiced through techniques of discipline as well as security: attempts at structuring space (through reserves, islands and peninsulas), requiring particular individual performances (not transgressing boundaries) and imposing hierarchies (through selective culling of greys to protect reds).

Squirrel conservation operates according to the familiar biopolitical logics and spatial imaginaries of nativeness and invasion (see, for example, Barker, 2008). Red squirrels, constructed and understood as a 'native' population, are valued over the 'invasive' (and economically damaging) grey. Rhetorical

tactics reify the native; vilify the invader. Individuals are thus subsumed into concerns about the survival of specific populations in England and Wales (albeit disciplined through individual bodies). In continental Europe the red squirrel is not currently endangered; indeed, they continue to flourish in many countries[16]. It thus matters to those involved in conservation activities that the species is at risk of extinction *in England and Wales*, despite their abundance overseas. Populations of squirrels are thus actively governed to promote their located presence in places of historical inhabitation. Ideas of nation and/or locality are important here; red squirrels are viewed as 'in place', greys as 'out of place', on a national scale. Adrian, a conservation volunteer, explained that action for red squirrels is important for him because, *"… the thought that a species could be extinct in our lifetime in our country is quite frightening. I mean, we're all terrified about rhinos and everything else, and we're turning a blind eye to what's going on right in our back garden really";* Linda, in a different part of the country, echoed this view: "*when I look at the big picture and I say 'why am I doing this?', the answer is I don't want one more British mammal to go extinct when there is something I can do about it"* (interviews in England, 2013). Such sentiments are widespread. The mode of biosecurity through which squirrels are governed is thus imbricated with charged notions of space and place: secure places ('strongholds', islands), borderlands, and the infected spaces beyond. Squirrels are assigned to particular places on the basis of their identified species and shared histories.

However, despite the efforts of those involved to prescribe places for squirrels, there is a tension between imaginaries of purified space/place (where native ecologies flourish free from the impact of invasive competitors and disease) and the materialities of porous borders (where red and grey squirrels, and much else besides, repeatedly transgress). As Hinchliffe *et al* (2013) have recently suggested, biosecurity in practice is more concerned with 'borderlands' than 'borderlines'; spatial ideas about segregation are thus better re-imagined as 'topologies of infected life'. This reading of connectivity moves way from the iron-grid of 'extended' space, and instead emphasizes, "*a*

[16] Some ecologists fear this may change with the spread of grey squirrels already established in areas of Italy (Bertolino & Genovesi, 2003)

topological landscape of embeddings and disembeddings, where disease registers its presence through the density of its intra-actions" (2013:538). Barker (2008:1600) makes a similar point with respect to biosecurity practices and invasive species in New Zealand, engaging with Mol & Law's work to imagine, "*boundaries that are blurred, that move around, that fold".* Red squirrel conservation is perhaps better understood in such topological terms. In practice, actions are not limited to securing the barriers of reserves. Biosecurity is achieved (if at all) through preventing functional connectivity in the wider landscape for invasive greys. It is lands, not lines, which are policed for transgressions; but the achievement is never final, never complete. As Ingold suggests, "*in modern western societies, the environment has been engineered, or 'built', to conform to expectations of closure, but … life always, and inevitably, breaks through the bounds of the objective forms in which we have sought to contain it"* (2011:115). Buller makes a similar point about the liveliness of wolves in the French Alps; wolves, he notes, "*will not confine themselves to the spaces in which humans may seek to secure them … a (misguided) focus on bounded space recalls once again that sense of belief not only in nature's containment and separation but also in its fixity and stability and in the homogeneity of ascribed categorizations"* (2008:1593). Thus, whilst the intention in red squirrel conservation might be to prescribe places through disciplinary acts of territorialisation, in practice it is topological spaces of security that are enacted through a variety of more-than-human agencies.

Squirrel conservationists are thus faced with the same problem that Foucault diagnosed as underlying the historical shift from sovereign rule towards governing through apparatuses of security: *"the problem of circulation"* (Foucault *et al*, 2009:64). As he suggests, therein, "*we see the emergence of a completely different problem that is no longer that of fixing and demarcating the territory, but of allowing circulations to take place, of controlling them, sifting the good and the bad, ensuring that things are always in movement, constantly moving around, continually going from one point to another, but in such a way that the inherent dangers of this circulation are canceled out"* (sic,

2009:65). Managing circulations is fundamental to practices of biosecurity (Hinchliffe & Lavau, 2013); indeed, Hinchliffe and Ward (2014) make a similar point in relation to biosecurity practices in agriculture. Through tracing immunological practices in pig farming, they demonstrate how 'making safe pigs' involves material enfoldings, such as immersion in microbe-rich mud, that seem to defy the logics of spatial separation that permeate biosecurities imagined through discourses of hygiene. The techniques required to manage squirrel 'circulations' thus include aspects of both discipline and security; as the squirrel milieu is planned and managed through techniques of trapping and selective culling that operate across the borders and boundaries of disciplinary spaces, and on populations as well as individuals. Indeed, Foucault recognised that the modes of power identified in his genealogy of government (i.e. sovereign, discipline, and security; see Rutherford & Rutherford 2013b) often co-existed in particular contexts.

It is thus difficult to trace an affirmative biopolitics in squirrel conservation, operating as it does through the practice of imposing death on some woodland mammals (disciplined as individuals) in order to facilitate the lives of others (securitised as a population). Yet this is problematic because, for the people involved, culling greys is seen as an ethical necessity: necessary to protect red squirrels from extinction in the UK (interviews). Indeed, for those involved – who include, as demonstrated above, significant numbers of volunteers and professionals drawn together in practical networks of conservation action - *not acting* to protect red squirrels would be morally objectionable. An affirmative biopolitics of 'living with' that allowed for the continuing flourishing of grey squirrels, according to such logics, would not be affirmative for long when considering the position of reds. The conservation public assembled here through a more-than-human politics of concern is thus committed to making difficult decisions about the 'sacrifices' (to re-iterate Braun's terminology) that need to be made in order to protect particular kinds of life.

6.4 Animal places, systemic biopolitics

Earlier, I described how pine marten conservationists in Wales enact ecological connectivity through creating 'potential' places. However, given the very small number of martens thought to remain, more radical action might be needed to safeguard the species. Augmenting the remaining population with trans-located pine martens (possibly from the resurgent Scottish population) has been periodically suggested in recent decades, and lately has been gaining more support amongst conservationists (interviews). 'Reinforcing' the existing population (VWT, 2014), plays to a different discursive register, legal and otherwise, than the idea of a species reintroduction; and the contemporary (albeit elusive) presence of pine martens matters here. Facilitating recovery is a more traditional, less controversial, mode of conservation compared to ideas about 're-wilding' (Lorimer and Driessen, 2011; see chapter seven); but there are still issues to consider. These include: the possible impacts of higher pine marten populations on prey species, both wild-living (mammals and songbirds) and captive (especially chickens and game birds); the contemporary habitat suitability for martens (questions remain given their apparent failure to recover despite legal protection); and the impact on existing population genetics. As a result, a recent project has assessed the socio-ecological feasibility of such an augmentation in Wales and/or England, as a prelude to possible imminent action in this regard (VWT 2014).

This is where the stories of squirrels and martens meet. Ecological research conducted in Ireland has begun to offer scientific support for the idea (locally, and more widely, held) that the presence of pine martens in an area can drive out grey squirrels, and also thus allow red squirrel populations to recover or re-colonize (Sheehy and Lawton, 2014). The precise ecological mechanisms are yet to be fully demonstrated, but the decline of grey squirrels is suspected to be due to a mixture of direct predation by martens, and resulting predator avoidance behaviour by the greys. As such, local support for augmenting the Welsh marten population is also increasing amongst some forestry

operators, for whom the damage inflicted on plantations by grey squirrels can be a significant economic cost (interviews). Some conservationists speculate that the recovery of red squirrels in Ireland is perhaps due to their smaller size and lower densities (interviews); and the implication is that augmenting pine marten populations *might* be beneficial for the conservation of red squirrels. However, there are significant caveats regarding the applicability of the Irish research to the Welsh or English contexts, not the least of which relates to differences in forest composition, and significant divergence of opinion surrounds the idea of utilising martens to control greys. Memories are long in conservation, and the introduction of predators to control invasive species has a controversial track record; albeit the difference in this case is that the predator is already part of the region's historic ecology. Therefore, the current feasibility study to reinforce pine marten populations is not actively justified in terms of squirrel conservation or control; martens are considered on their own terms; yet there is hope amongst some red squirrel enthusiasts and some foresters (far from mutually exclusive categories) about what an augmentation of pine martens might augur.

Without seeking to predict the ecological outcomes of a re-stocking, it is clear that such a move might have significant implications for the way that conservation places and the connectivity multiple are enacted. There is a possible ecological future in which grey squirrels are dis-placed by incoming martens, and re-placed by reds. Ecological and territorial connectivity (and disconnectivity) would thus be enacted through animal mobilities and place-making activities, as martens and squirrels make, unmake, and re-make territories. Indeed, the ways in which martens fulfil the 'potential' of den-boxes through mobility and inhabitation (section 6.2), and the ways in which squirrels transgress the human-drawn borders of cartographic reserves (section 6.3), can be theorized along similar lines. Of course, the concept of territory has a long ethological pedigree (Raffestin & Butler, 2012:124); as Metzger has recently argued, understanding territories as more-than-human achievements leads, "*to the insight that the phenomenon of place is in no way exclusive to human existence"* (2014b:1002). These are animal places that are created through animal mobilities; similar to Massey's notion of

places as "*collection[s]"* of simultaneous (and heterogeneous) "*stories-so-far*" (2005:130); and to Ingold's suggestion that, "*Places … are like knots, and the threads from which they are tied are lines of wayfaring"* (2011:149); but that the stories and lines thus gathered are, for the most part, nonhuman.

Ingold's approach to places is helpful in conceptualising these animal places; he writes *"Places are formed through movement, when a movement along turns into a movement around … Such a movement around is place-binding, but it is not place-bound. There could be no places were it not for the comings and goings of human beings and other organisms to and from them, from and to places elsewhere. Places, then, do not so much exist as occur"* (2008:1808, emphasis in original). Animal places thus cohere through multiple mobilities; it is these mobilities that shape the *milieu*. To put this in terms of Mol & Law's influential spatial imaginaries, these mobilities perform particular kinds of space: not fixed regions (like squirrel conservation strongholds), nor networks (like den boxes or culling practices), but fluid spaces where identities shift and mix and contingently congeal (Mol & Law, 1994).

The conservation practice of place-making can thus be more fully imagined as a multi-species (co)production of fluid places in which these places are understood as more-than-human achievements. Of course, re-thinking places in these terms is also a political move that creates space for, and resonates with, alternative forms of inter-species politics. For example, Lulka's (2004) Deleuzian theory of wildlife emphasizes nonhuman indeterminacy and movement, instead of the fixed identities and locations demarcated by much human (conservation) action. Whilst Lulka is thus wary of attempts to prescribe space for nonhuman animals, and of the essentialist ontologies of animal 'being' enacted within wildlife conservation, he locates animal 'becoming' in the processes and lived experiences of movement (i.e. similar to the concept of animal mobility as used herein). Indeed, Lulka's more recent work on 'thick hybridity' is particularly relevant here, wherein he makes

the case for understanding nonhuman interactions in ways that do not rely on a 'residual humanism'; he writes of, "*trying to achieve … an expansion of hybridity in the world, but one that is not reliant upon human hands",* wherein*, "[i]n a real sense … nonhumans are setting the stage for action"* (2009:388). Animal places cohere through such thick nonhuman hybridities.

The re-stocking scenario thus appears to point towards an additional mode of affirmative biopolitics. Unlike the facilitation of martens through den-boxes, which I have conceptualised as an enactment of Haraway's "*biopolitics of living with*" (Haraway, 2008; described in Lorimer & Driessen, 2011:3), the augmentation of martens in Wales can perhaps also be imagined as enacting a form of animal biopolitics of immunity. Conceptualised through Hinchliffe & Ward's (2014) affirmative reading of Esposito's concern with immunity, this understanding of the possibilities of augmentation would point towards the ways in which various animal mobilities and territorialisations could fold spaces of inhabitation. As these authors explain in relation to the immunological biopolitics of pig farming, "*Biological difference still matters and should not be eradicated through exclusion, nor, at the other extreme, denied through unconditional hospitality. Rather there is a continuously changing world, a borderlands of folded relations, within which health is made and re-made. And, here, it is the memory of immunity that seems key"* (2014:143). Yet it is important to remember that in the context of red squirrels, it is the potential presence of martens rather than antibodies through which 'immunity' to grey squirrels - and thus the pox virus - (metaphorically) operates.

However, the risk with a 'thick' notion of place-making assumed in this animal biopolitics, is that it collapses back towards tropes of wilderness (as in Cronon, 1996), and thus obscures the human biopolitical practices of wildlife management that continue to exert influence over such situations. Whilst the possible displacing of grey squirrels that *might* accompany a marten re-stocking in Wales could be seen simply in terms of animal mobilities, doing so obscures the very real modes of (more-than) human politics that would be implicated in shaping this *milieu*. These modes include, first, the

biopolitics of nativity and invasion relating to both squirrel and marten populations. If support for marten augmentation comes, in part, from red squirrel conservation constituencies, then the ethical challenges relating to culling are not fully displaced through replacing traps and sacks with pine marten proxies; action-at-a-distance remains morally considerable; yet neither is this precisely the same ethical dilemma – the entrance of martens changes the relevant relations. Second, this biopolitics also includes another form of political rationality that focuses on system processes rather than species populations. In this latter ontology of wildlife management, policy objectives relate to ecosystemic functions rather than to the health or status of particular species populations; I will cover this ground in more detail in chapter seven, but the point to make here is that some of the support for marten augmentation comes not from a concern for either martens or squirrels as species, but from targeting particular ecological processes as desirable system properties (for example, the flourishing of plantation forestry).

6.5 Conclusions

> *"Envisioning space as always-already territorialized, just as much as envisioning it purely as a space of flows, misunderstands the ever-changing ways in which flows and territories are conditions of each other. It is the practices and relations which construct them both that demand address."* Massey (2005:99)

In this chapter, I have explored two somewhat contradictory enactments of connectivity in conservation, and outlined a third possible future. By so doing, it has been possible to conceptualise the ways in which the connectivity multiple has been (or could be) enacted in various ways, through the confluence of biopolitical management, animal mobilities and multi-species place-making activities (see Figure 6e).

Figure 6e: The biopolitics of connectivity multiples

Situation	Spatial Practices of Dis/Connectivity	Technique of wildlife management	Modes of biopolitics
Pine marten conservation	Human: co-producing potential places (den boxes) Woodland mammal: mobility, place-making	'Security' (Intervening in milieu)	Affirmative: Facilitating life ('living with')
Red squirrel conservation	Human: prescribing places (culling) Woodland mammal: mobility, place-making	'Discipline' (imposing individual boundaries & behaviours) and 'Security' (managing population circulations)	Not affirmative: Imposing death (Nativity and invasion)
Both pine marten and red squirrel conservation	Human: co-producing potential places (marten translocations) Woodland mammal: mobility, place-making	'Security' (Intervening in milieu)	Ambiguous: - Living with - Immunity - Nativity/ invasion - Systemic

In practice, squirrel conservation revolves around enactments of territorial and ecological dis-connection that seek to prescribe places, at a variety of scales for reds, greys, and their selectively fatal viral companions. The form of prescriptive place-making at work aims at closing down possibilities for living. Creating, monitoring and enforcing bio-secure borders is a defensive action; it is about digging in, and repelling change through disciplinary techniques. Yet as such, it is perhaps better understood as a process rather than as a state of affairs. As one conservationist explained to me: *"the joke is you kill one squirrel, and three turn up to the funeral".* Some joke; tragicomedy. Biosecurity is never achieved; it is, rather, continuously attempted. Transgressive squirrels of both species that move beyond prescribed places serve to periodically challenge its efficacy, as do the viruses they transport. Thus, even as prescription is attempted, a more enfolded performance of

more-than-human place-making is enacted, influenced also through topological techniques of (bio)security. By contrast, pine marten conservation seeks to facilitate rather than prevent connectivity, opening up landscapes rather than closing them down. The installation of den-boxes on a regional scale, akin to bird boxes or garden bee houses, seeks to co-produce a network of potential places for living rather than to prescribe and police specified locations. Yet here also, it takes animal mobility to turn potential into inhabitation. Considering one possible future for squirrels and martens alike allowed for additional conceptual reflection. (Re)introducing organisms to a region works according to a different logic of conservation place-making, particularly if there are hopes for specific types of interspecies interaction.

Given the scale of human impacts captured by the Anthropocene logics discussed in chapter two, the idea that places can be prescribed and borders secured to the 'outside' might be considered naïve. Humans have, it is suggested, through changing the pathways of ecological connection through the world, facilitated the co-production of widespread species movement, resulting in 'novel' ecologies (Hobbs *et al*, 2006) and 'fluid bio-geographies' (J.Lorimer, 2008a). The magnitude of contemporary ecological interconnection, at a variety of spatial and temporal scales, perhaps implies the prioritisation of approaches to conservation that work with rather than against this connectivity. As a result, some ecologists and conservationists are proposing the adoption of management principles based in species function, rather than on an outdated native/invasive dichotomy (Davis *et al,* 2011). Prescribing places, on this reading, is like trying to swim against the flood-tide. Yet fluidity poses its own problems, which are also well rehearsed: opening up, rather than closing down, facilitates the spread of invasive species that threaten biodiversity (Lodge & Shrader-Frechette, 2003), and perhaps presage a 'homogocene' (Didham *et al,* 2005) where locally adapted diversities are overrun by ravaging global monotonies and pathogenic ecologies.

Exploring contradictory connectivity practices, both facilitative and preventative, forces consideration of these debates about native/invasive, open/closed space and prescribed/potential place. Yet there is no simple answer to resolve these questions; there are only choices: between the illusion of control and the (ir)responsibility of inaction; between which forms of life to favour in the cuts we choose to make or avoid; between the places we attempt to prescribe, those we help to make amenable, and those where we choose to step back, that remain inaccessible, or of which we are ignorant. The choices are biopolitical: they revolve around the ways in which lives are valued. Conservation, and the wider field of environmental ethics, still has much work to do in addressing these choices.

This chapter contributes to such work by providing a conceptual framework for analysing the spatial practices through which conservationists enact the connectivity multiple (i.e. enacting connective spaces, mobilities, & socionatural relations). First, it contrasts human actions that attempt to produce prescriptive places, with those instead aimed at encouraging potential inhabitations; and complicates both through asserting the agency of nonhuman actors in making animal places through various forms of mobility. Different actors play particular roles, and exert different forms of power (e.g. mobility, culling, installing boxes), but animal places are always in some sense a coproduction. Second, it foregrounds the importance of considering the biopolitics that inform, shape and are enacted through these spatial practices. The biopolitics of nativity and invasion enacted in red squirrel conservation operate according to different logics of 'living with' to that found in pine marten conservation; and thus the mode of socionatural connectivity imagined and performed differs also. Third, and most importantly, this chapter thus stresses the importance of attending to how connectivity is enacted as a multiple: how spatial practices to demarcate or connect particular areas, and facilitate or inhibit movement, are inextricably linked to how socionatural connections are performed in practice (i.e. how humans relate to, intervene with, and live in 'natures'). But its findings also caution against simplistic reifications of particular modes of biopolitics in the complex

and ethically charged contexts of conservation practice; specificities matter. In the next chapter, I turn to the wider import of this connectivity multiple.[17]

[17] In this chapter, all interviewee names have been changed to respect and preserve participants' anonymity.

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Natural England Website

Managing wild boar

Wild boar are a former native species. They became re-established in the UK as a result of escapes and unlawful, deliberate releases. While some welcome them as a reintroduced species, they can cause significant damage to agricultural and other environmental interests.

Defra's Feral Wild Boar Action Plan, published in 2008, states that primary responsibility for wild boar management lies with local communities and individual landowners. However, advice and guidance is available from Natural England and the Deer Initiative.

There are no specific legal restrictions governing how wild boar can be controlled, but they are given general protection against cruelty in certain circumstances by the Animal Welfare Act 2006 and the Wild Mammals (Protection) Act 1996.

www.gov.uk/wild-mammals-management-and-control-options#managing-wild-boar. Natural England. First published: 11.09. 2012. Last updated: 04.07.2013

Accessed 05.02.15

7. Scale, policy objectives and governance practices

In this penultimate chapter I consider the connectivity multiple within the wider context of conservation policy. My argument is not simply that connectivity is enacted in multiple ways, but instead that attention to *how this multiple is composed* provides the grounds for re-thinking the possibilities of human-environment relations in practices of wildlife conservation.

I begin by narrating a recent history of conservation policy in England and Wales, before drawing together academic work about contemporary developments (national and international), noting the emergence of three key trends: (i) a **shift in the scale of conservation action**, from 'small', 'single-site' or 'habitat'-based activities, and towards those at a 'large' or 'landscape'-scale[18]; (ii) a **shift from species to ecological processes** in the identified objectives of conservation policies and practices; and (iii) a **shift towards neoliberal modes of governance** in the management of wildlife and biodiversity. Briefly reviewing each of these trends, and their contemporary influence in England and Wales, I then consider how connectivity is enacted in this policy context. Through a close reading of contemporary policy documents, supported by a series of interviews with governmental and NGO policymakers, I demonstrate how the three contemporary shifts in policy both shape, and are enabled through, a particular composition of the connectivity multiple. Finally, I engage with recent discussions of 'rewilding' to outline an alternative composition, here termed **'revitalizing conservation'**; informed by the previous chapters, and through which a re-thinking of connectivity can challenge contemporary 'binary' spatial practices in conservation.

The analysis rests on a detailed exposition of the ways in which connectivity has been discursively enacted in English and Welsh conservation policy in recent years. The term 'policy' herein refers

[18] Such terms are of course relative, but the scare quotes here identify them as 'actor's categories' (the actors in these cases being both conservationists and academics, again not mutually exclusive categories).

primarily to governmental legislation, regulations, codified approaches to the management of particular functions, discussion documents and the like, that together advocate and enact particular regimes of practice; but also encompasses similar codified and practiced regimes performed by non-governmental actors with relevant governance roles (particularly, in this case, conservation NGOs). In analysing policy discursively, I am drawing on a tradition of work in more-than-human geography that foregrounds material nonhuman agency, but that also takes account of the role of discourse in performing particular configurations of more-than-human relations (Whatmore, 2002; Srinivasan, 2013). Discourse isn't everything, and no doubt was over-emphasized in social science during the 'cultural turn'; but it does matter, even in hybrid (Whatmore, 2002) and non-representational (Thrift, 2008) approaches. As Turnhout *et* al (2014:594) explain about scientific discourse in particular, "*Its epistemic authority makes us see the world in a specific way that makes possible specific ways of acting upon it while silencing others"*. Thus, Biermann & Mansfield, following Foucault, suggest attending to practices of "*truth-telling"*, by which they refer to, "*the ways in which particular ideas about nature are designated normal, natural and true through the circulation of scientific discourses"* (2014:258). Specifically, I follow Adger *et* al's (2001:685) definition of discourse as a "*truth system",* containing, "*a corpus of expressions in which we can find homogeneity in message as well as in expressive means"* (they were writing within a political ecology tradition, but the technique travels). Through a detailed description of how scientific ideas about structural and functional connectivity have been incorporated in policy, I aim to show that concepts of connectivity have been developed in particular ways (through ideas about 'ecological networks' and/or 'ecosystems'), thus enacting an 'ontological politics' (Mol, 1999; Law, 2004) that has consequences (the facilitation of particular modes of conservation practice).

Identifying how the connectivity multiple is enacted in context is important for three key reasons. First, doing so affords a greater understanding of the spatial practices (territorial, ecological, and socionatural) through which contemporary shifts in conservation policy are occurring. Second,

analysing these shifts through the lens of the connectivity multiple identifies how they cohere to constitute a particular regime of conservation: how these trends are, importantly, interwoven. And third, recognising the co-constitutive roles of various spatial imaginaries and practices aids the identification of possible sites of resistance. Put differently, attending to how the connectivity multiple is composed (following Latour, 2010) enables consideration of how it might be composed differently. It thus illuminates how attending to the spatial practices of conservation might provide grounds for either affirming or intervening upon shifts towards particular types of landscape-scale action, processural and systemic policy logics, and/or neoliberal modes of governance – as well as the alternative possibilities of "revitalizing" as a mode of conservation action.

7.1 Contemporary trends in conservation policy in England and Wales

Context: the decline of the 'biodiversity' regime

The key historical event in the emergence of the 'biodiversity' policy discourse is usually cited as the 'Earth Summit' held in Rio de Janeiro in 1992, and the ensuing Convention on Biological Diversity (Gaston & Spicer, 2004). Internationally, the theory of biological diversity had huge influence, informing and re-configuring nature conservation activities across the world (Jeffries, 2006). In the UK, and subsequently in the constituent nations post-devolution, biodiversity came to operate as an organizing concept in conservation policies (J.Lorimer, 2006). Codified first in the UK's 1994 overarching Biodiversity Action Plan (BAP), similar finer-scaled plans for species and habitats came to dominate the formulation and application of policy (Ellis & Waterton, 2004; J.Lorimer, 2006). Biological diversity was theoretically measured in terms of genetic, species and habitat diversity (Gaston & Spicer, 2004); but in practice most weight was given to the species level, with habitats not far behind. As plans were written for each species and habitat of concern, Species Action Plans (SAPs) and Habitat Action Plans (HAPs) proliferated.

Unfortunately, it has become increasingly apparent that the 'biodiversity' regime, as enacted through unit-based plans, has failed. This failure is twofold. First, as accepted at the Nagoya Biodiversity Summit, the target of halting global biodiversity loss by 2010 has not been reached (Butchart *et al*, 2010). Second, the utilisation of 'biodiversity' as an organizing concept has proven problematic. Although in theory it offers a 'panoptic' view (J.Lorimer, 2006), in practice it is doomed to the same fate as all such panopticisms. As Philo explains, Foucault's re-thinking of Bentham's Panopticon explicitly recognizes that panopticism in practice, "*is, has been and cannot be anything other than full of holes. In practice, it can never fully work …"* (2012:500, emphasis in original). Organizing action around the protection of species in a biogeography with many threatened species led to an unworkable expansion in the bureaucracies of conservation policy: too many species, too many action plans; too much for even the panoptic eye to see. If each species had similar requirements, this may have been surmountable; likewise if the list of threatened species had been short enough. Yet with the official recognition, additional protection, and authority that SAPs brought to conservation action, the lists continued to grow. They became unmanageable (interviews).

Reform ensued. The 'UK Post-2010 Biodiversity Framework' (JNCC & DEFRA, 2012) is more of a high-level approach than the previous BAP, and the practice of creating plans for every priority species has been abandoned. Indeed, England's *Biodiversity 2020: a strategy for England's wildlife and ecosystem services* makes not a single mention of Biodiversity Action Plans; they are consigned to an archival role (DEFRA, 2011). Instead, the emphasis is on "*an integrated large-scale approach to conservation*", increasingly concerned with ecological processes rather than individual species, and delivered through neoliberal modes of governance (HMG 2011:1). Similar emphases are also evident in Welsh policies. Below, I consider each of these trends in turn.

(i) The shift towards 'large' or 'landscape-scale' conservation

There has been a marked trend in conservation policy, in recent decades and in many jurisdictions, towards 'large scale' management (Adams *et al*, 2013)**.** Of course, there is a long history of action at 'landscape' or 'large-scales'; some of the earliest nature reserves and natural parks designated in Africa and North America encompassed vast areas of multiple habitats (Nash, 1967; Runte, 1987; Adams, 2004). Furthermore, in theoretical terms, there have long been calls for working at larger scales (e.g. Sale, 1984), recently buttressed by the emerging literature on connectivity (Jongman & Pungetti, 2004; Worboys *et al*, 2010). What is new about the recent trend is the widespread recognition, in both policy and practice, of the need for a persistent direction of travel; reminiscent of the European Union's motto "*Ever Closer Union*", the mantra of contemporary conservation often seems to be "*Ever Larger Action"*; albeit that the notion of 'large scale' is relative to the extent of existing action, which differs markedly within and between countries.

In England and Wales, the shift towards larger scale action is both evident and marked by its context; unlike the vast nature reserves found in many parts of the world, conservation in England and Wales has traditionally been limited to small, often individual, frequently isolated sites (Adams *et al*, 2013). In part, this reflects a system of land tenure in which the state tends not to own large sites (in terms of international comparison), in which land holdings are frequently fragmented, and wherein agricultural uses often predominate (MacEwen & MacEwen, 1987). The challenge posed by the inadequate size of, and connectivity between, reserves has been recognised (Lawton *et al*, 2010); and addressed through a range of policies and practices. At governmental level, this is reflected in a number of initiatives to encourage larger-scale, and often co-operative, working. The English 2011 white paper *The Natural Choice* thus promotes and facilitates 'large-scale conservation', both through discursive encouragement, and through targeted funding (HMG, 2011). An example of the latter was the creation of 'Nature Improvement Areas', whereby grants were made available to

facilitate land management cooperation across specific landscapes for conservation purposes. Welsh environmental policy has seen a similar trend towards integrated and large-scale management (see, for example, the 2013 white paper *Towards the Sustainable Management of Wales' Natural Resources*). Such governmental initiatives follow the paths laid out by the large conservation organisations, that have been pressing for large-scale activity since at least the turn of the century; for example, through the Wildlife Trust's *Living Landscapes* programme, and the RSPB's *Futurescapes* (TWT, 2015; RSPB, 2015).

Indeed, there has been a marked and measurable shift towards large-scale action in UK conservation practice over the past fifteen years; Adams *et al* (2013:1) have described these new modes of large-scale working, "*as a form of re-territorialisation, a reframing and extension of conservation's spatial claims"*; and these authors have done much to quantify and detail the magnitude and geographies of such changes, and the governance practices through which they have been enacted. The large conservation areas assembled in their recent study of UK conservation, *"covered nearly 6 million ha, equivalent to about one third of the total land area in the UK*" (ibid:7). Joined-up working involves cooperation between conservation managers running contiguous, adjacent, or neighbouring reserves towards shared goals; it can involve cooperative modes of finance; and it necessarily involves running sites not as individual 'islands', but as part of a larger landscape (interviews). As one NGO conservation practitioner explained, such cooperation necessitates, "*a series of conversations and relationships over a long period that bring about the change in land management in these bigger areas … we can't just go in and share our vision from a nature conservation point of view; you've got to go in there a develop a shared vision with them and say, you know, you live here, you work here, what do you want to see happening?"* (interview in England, 2012).

The connectivity practices enacted in situations of pine marten and red squirrel conservation documented in earlier chapters fit into, and are part of, this wider trend towards large- or landscape-

scale action. Installing den boxes throughout the Welsh uplands, in nature reserves of varying types and ownership as well as in silvicultural areas, relies on such a large-scale, cooperative and cross-border approach. In different ways, restricting the movement of invasive grey squirrels also requires large-scale action across multiple sites, thus relying on similar forms of cooperation between various conservation actors, landowners and land managers. This is perhaps unsurprising, given that concerns about connectivity *presume* more-than-local action by necessity. And differently again, the situation of wild/feral boar is explicitly a large-scale concern; boar are not limited to individual sites, and their capacities for dispersal over tens if not hundreds of miles necessitates a large-scale approach.

(ii) The shift in objectives from species to ecological processes

The second major shift occurring in contemporary conservation policy-practice relates to the changing emphases given to the stated objectives of conservation action; specifically: away from species, and towards ecological processes (Pressey *et al*, 2007; Bennett *et al*, 2009). The reasons for this shift are many and complex, but four particularly influential issues and developments are worth noting. First, the species concept is riven with internal incoherencies; species are increasingly understood as less pure and more plastic than hitherto imagined (see Biermann & Mansfield, 2014:266 and references therein). Second, as narrated above, the species approach to conservation had failed on its own terms; too many species with specific requirements led to an unmanageable bureaucratic complexity when conservation action was organized primarily along species-lines (interviews). Instead, policymakers have increasingly sought higher-level conservation objectives that deliver benefits for multiple species, but that do not require the same level of micro-management in application (interviews). The shift towards organizing action around the protection of key ecological processes has been framed in such terms. Third, the focus on ecological processes is more easily translatable into the utilitarian and anthropocentric language of economic benefits. Whilst significant

work in governmental, academic, and third-sector organisations has sought to demonstrate the economics of both 'ecosystems and biodiversity' (TEEB, 2008), the economic benefits of systems and their constituent processes have proved an easier sell in policy circles. Flood protection seems of more obvious benefit to humankind than floral diversity in water meadows; carbon sequestration more politically important than conserving rare lichens; but in both cases, the resulting conservation action may be remarkably similar. Thus the language of biodiversity has been increasingly replaced in governmental discourse by the language of 'ecosystem services', to which I will return in the next section. And finally, focussing on ecological processes rather than individual species has also been encouraged and supported by a shift towards more holistic and dynamic understandings of complex systems within ecology (Pickett *et al*, 1997).

For some commentators, species and process approaches are viewed as "*complementary*" rather than "*competitive and mutually exclusive*" (see Callicott *et al,* 1999:22). But enacting conservation policies through logics of processes rather than species has consequences; most obviously for species that are subsequently treated as means rather than ends (with all that implies), but also in terms of the wider practices thus enacted. As Turnhout *et al* (2014:594) explain through their Foucauldian notion of 'measurementality', "*only what is counted counts".* Instead of species abundance and distributions, a focus on processes foregrounds objectives based on systemic concepts such as the notion of 'resilience' (which has become increasingly influential in environmental management in recent years; see Turner, 2013). The challenges of prioritising species in conservation action is thus replaced by a new problem: prioritising processes – which ones count?

It is not immediately apparent what the shift towards processes implies for the enactment of connectivity in conservation practice. Ecological connectivity (defined as the mobilities of organisms) can be conceived functionally as a process in itself (mobility), or as a systemic property that enables functions to occur (e.g. pollination or predation facilitated through mobility). Furthermore, ecological

connectivity remains species-specific; and thus straddles and complicates this supposed demarcation between 'species' and 'process' ontologies. Structural connectivity of various forms is also required for particular processes to occur; in this case, connectivity is more clearly a systemic property rather than a function in itself, but is similarly both species-specific and process-enabling. Somewhat differently, organising policy in terms of processes in part derives from, and in part supports, particular modes of socionatural connectivity (specifically, an anthropocentric utilitarian approach to environmental management); it is to these latter concerns that I now turn.

(iii) The shift towards neoliberal modes of governance

The third significant shift in contemporary conservation policy-practice concerns the modes of governance through which conservation is enacted. Specifically, a trend towards neoliberal forms of governance has been identified and documented as occurring within environmental activities across many jurisdictions (Castree, 2008b), and particularly in the UK (Felli & Castree, 2012); and likewise specifically in practices of wildlife conservation (Brockington & Duffy, 2010; Igoe *et al*, 2010; Büscher *et al*, 2012). Neoliberalism is a broad term (Bakker, 2010); as Castree (2009:1788) notes, "*There has never been (nor will be) a single, homogenous, globally integrated thing called 'neoliberalism', though the last thirty years have certainly seen various local, national, and international experiments in laissez faire political economy worldwide"*; but his typologies of neoliberal governance practices are informative, and include: privatisation, marketization, deregulation (to shrink the state), reregulation (to support marketization), the use of market proxies, the encouragement of non-state actors, and the creation of 'self-sufficiency' (2008a:142; 2010:1728). Thus, neoliberalism usually refers to governance arrangements that have the following characteristics: (i) a significant shift in competencies from state to non-state actors; (ii) the introduction or increased use of market-based financial instruments and logics through which to enact policies; and (iii) a shift in the role of state regulation towards supporting the first two aims. Yet UK wildlife conservation is marked by a long

history of action by non-state actors which pre-dates such neoliberal trends, particularly involving volunteers and local groups as part of a strong tradition of (often amateur) natural history, (Evans, 1997; Adams, 2004; Ellis & Waterton, 2004, 2005). What the neoliberal critique refers to specifically, then, is both an additional hollowing out of governmental competencies that forces compensatory, additional action from non-state actors (often larger, professionalized NGOs), and the creation of a policy architecture that seeks to enact conservation policies through the rubrics of market economics.

In wildlife conservation, the shift towards neoliberalism has become particularly evident in the emerging policy rationality of 'ecosystem services'. The notion of ecosystem services has emerged from relative obscurity within environmental economics, becoming an influential concept in policy in the past 10-15 years – and has attracted sustained academic critique (Barnaud & Antona, 2014). It incorporates and facilitates the securitization of ecosystems in terms of the 'services' they provide and the 'inputs' on which these services depend, and to which payments can be attached (McAfee & Shapiro, 2010). Tracing its development from academic journals to huge, international-agency sponsored empirical exercises in data gathering and synthesis, Dempsey & Robertson (2012) have recently made a coherent case for understanding the multiplicity of the 'ecosystem services' concept; it is not, they suggest, always constructed, understood or enacted through logics of neoliberalism; instead, they suggest that sometimes, "*policies and practices around the ecosystem concept deviate considerably from the neoliberal doctrine"* (p.758). Indeed, Roth & Dressler (2012) usefully distinguish 'market-orientated' conservation governance from 'neoliberal' conservation, arguing that the former does not always imply the latter, and pointing to the long history of entwinement of conservation and capitalism that long pre-figures the rise of neoliberalism (although see also Brockington *et al*, 2008). Yet in the case of wildlife conservation policy in England and Wales, I suggest that the claim holds: therein, 'ecosystem services' is framed very much in terms of the broader neoliberal project and persuasion of the 2010-15 coalition government (see section 7.2).

The management of environments through policies and practices deriving from ideas about 'ecosystem services' has effects. Aside from the longer-term self-defeating tendencies inherent in capitalist approaches, foregrounded in political economy accounts of neoliberalism (Castree 2008b, 2010b) and thus also in practices of 'selling nature to save it' (McAfee, 1999), there are also nearer-term textures and inclinations of note. As Asdal & Marres similarly observe with respect to carbon accounting, "*in empirical practice it takes a lot of work to establish relations between environmental entities and social practices or assemblages – and this recognition obliges us to trace by analytical and empirical means the different aspects of 'tastes' of nature that might be left by the wayside in projects to take 'the environment' into account – for instance, in accounting practices"* (2014:2057). Thus, some processes, objects and organisms are illuminated through the services approach; others are cast into the shade (Turnhout *et al*, 2014). Services goals and biodiversity objectives may not always coincide (Adams, 2014). Furthermore, the method of securitization matters; as Collard (2014:161) notes when discussing the commodification of rescued animals, "*for the animals themselves surely there is a critical difference in the nature of commodification between being an exotic pet commodity and being an ecosystem services commodity or even a 'wilderness' commodity".* Significant issues also arise from conceptualising 'nature' in terms of monetary values that can be traded and exchanged (Robertson, 2012; Robertson & Wainwright, 2013): in practice, such a move *disconnects* all manner of ecological processes and more-than-human affective connections (Pawliczek & Sullivan, 2011; Büscher, *et al,* 2012), and obscures the existence of plural value systems (McAfee & Shapiro, 2010; Kolinjivadi *et al*, 2015). Indeed, conservation practitioners interviewed in the course of this research were quick to point out how the notion of 'ecosystem services' fails to translate to the local, vernacular level at which much conservation is enacted. And finally, conceived through neoliberal logics, policies drawing on ecosystem services enact a particular form of hierarchical, anthropocentric socionatural connectivity: wherein all life is judged according to its utility to humanity. Of course, the preceding 'biodiversity' regime was also infused with all

manner of biases and variegated vision (towards charismatic species, and bounded and isolated locations, for example); the point then is to attend to such forms of partiality.

The trend towards neoliberal modes of governance is evident and significant within wildlife conservation policy-practices in both England and Wales (Adams *et al*, 2013). Successive re-organisations and rationalisations of government bodies concerned with the natural environment at both a UK and an English/Welsh level have led to a significant shift in competencies towards non-state actors; and these conservation organisations are thus playing an increasing role in the organisation and delivery of conservation activities across both countries (interviews). Market-based logics are being used to frame policy objectives (e.g. the prevalence of the 'ecosystem services' discourse in English and Welsh policy), and market-based instruments utilised to deliver policy objectives (e.g. moves to introduce 'biodiversity offsetting'). The first of these – the rise of 'ecosystem services' – is the most pronounced, developed and significant in English and Welsh policy (see HMG, 2011; WG, 2013); and is also increasingly generated through diverse conservation practices 'on the ground' (Wynne-Jones, 2012); albeit that conservationists' supporting such developments may be acting with "cautious pragmatism" rather than through uncritical acceptance of market-based schemes (Sandbrook *et al*, 2013:232).

7.2 Connectivity in conservation policy in England and Wales

In this section, I trace how scientific discourses about structural and functional connectivity have been incorporated in, and circulated through, conservation policies in England and Wales, again drawing on textual analysis and interviews with practitioners. My aim is to demonstrate, first, how the connectivity multiple has been composed (in part) through a particular understanding of scientific discourses and a set of spatial imaginaries; and second, how this composition both enables and is shaped by the three wider trends identified in the previous section. Through so doing, I

identify the connectivity multiple as a key site of intervention for re-thinking contemporary conservation practice; and in section 7.3 I will discuss a particular mode of rewilding as offering possibilities for an alternative composition.

(i) England and 'Ecological Networks'

> *"… there's been a lot of debate in the ecological literature over the years about ecological networks and what format they take, and the general model that you see promoted of core areas, buffers and corridors was actually something that Forman and Godron proposed in the early eighties, just as a 'thought-experiment'. And as so often happens with scientific concepts once they get released into the wild, a bit like genetic organisms I suppose, they are very difficult to control, and policymakers quite often, they miss the subtlety of some of the arguments"*
> (From interview with a scientific policy advisor, England, 2012)

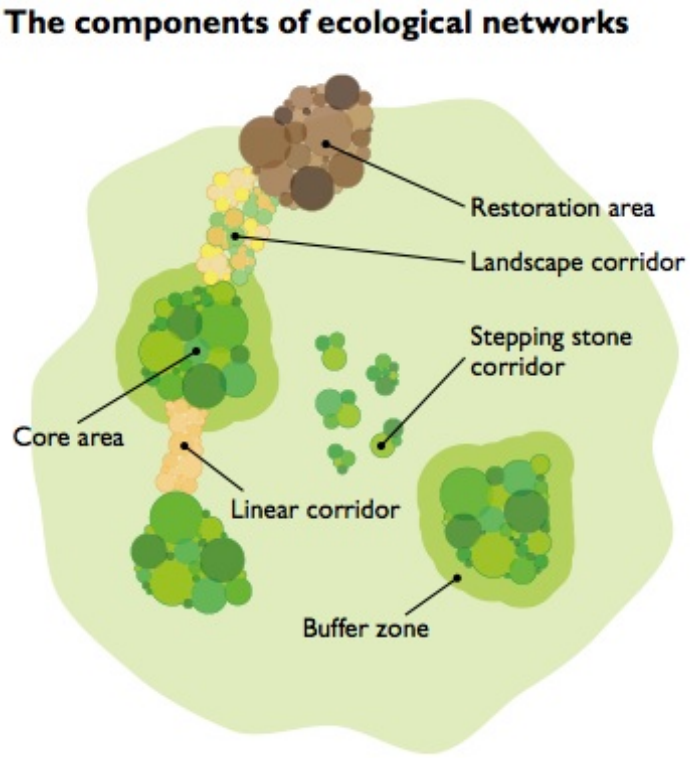
In June 2011, the Conservative/Liberal Democrat coalition government of the United Kingdom presented to parliament the first white paper on the environment since 1990. Entitled '*The Natural Choice: securing the value of nature'*, (HMG, 2011) this document set out the then-new government's approach to environmental policy in England (many policy competencies relating to the environment, and most relating to nature conservation, are devolved to the constituent national assemblies of the UK). The dominant narrative of the document concerns re-framing environmental issues (and wildlife conservation) within the language and logics of economic analysis and neoliberal governance.

Ideas about connectivity are notable in two sections of the report, relating to 'Protecting and Improving the Natural Environment' (ibid:14), and 'Re-connecting People and Nature' respectively (ibid:44; discussed in chapter five). Ideas about connectivity deriving from connectivity science are found in the former, and are expressed predominantly in terms of 'ecological networks'. Thus, the approach to conserving biodiversity is set out, following the earlier *Biodiversity 2020* strategy plan (DEFRA, 2011), as follows: *"Our 2020 mission is to halt overall biodiversity loss, support healthy well-*

functioning ecosystems and ***establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people****"* (HMG 2011:17:2.8, emphasis added).

Ecological networks are conceptualized in *The Natural Choice* as held together through ecological connections, which are presented in both structural and functional terms. The inclusion of an illustration, familiar in a number of government reports, makes this clear (see figure 7.1).

Figure 7a: An exemplar illustration of connectivity in English policy



Reproduced from HMG (2011) The Natural Choice, p.18
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http://www.nationalarchives.gov.uk/doc/open-government-licence/

The emphasis placed on 'ecological networks' in these documents marks a significant shift from the preceding decade. Indeed, England's previous biodiversity strategy *Working with the grain of nature*, published in 2002, makes little to no mention of connectivity despite nascent concerns with working at larger scales and responding to the impacts of climate change; and only refers to 'networks' with regards to obligations under various EU directives[19]. This is perhaps surprising, given the emphasis that 'ecological networks' were already being given in European conservation policy from the mid 1990s onwards (Jongman & Pungetti, 2004).

The emergence of 'ecological networks' in *The Natural Choice* draws on and derives from the previously published report of the Lawton panel, *Making Space for Nature* (Lawton *et al*, 2010). Commissioned by DEFRA under the previous (Labour) administration, this inquiry brought together representatives of government agencies, conservation organisations, land managers and academics; and was tasked with investigating whether England's existing wildlife sites constituted a "*coherent and resilient ecological network*" able to withstand various future challenges, including climate change (ibid: 105). The panel chose to operationalize their task through addressing five research questions: whether the 'network' was representative of England's biodiversity; whether the protected sites were big enough; whether they were adequately protected and managed; whether "*sufficient ecological connections*" existed between the sites; and whether they were accessible and important to people (ibid: vii). Their conclusion echoes the very structure of these questions. *"The essence of what needs to be done …",* Lawton and colleagues inform their taskmasters, *"can be summarized in four words: more, bigger, better, joined."* (ibid: viii, emphasis in original).

The focus on sites before connectivity within the Lawton framework is pre-figured, in part, through the way the report frames 'ecological networks'. In the introduction, the following definition is

[19] The Habitats Directive enabled and facilitated the creation of a Europe-wide collection of wildlife sites designated Special Areas of Conservation (SACs), which together with the Special Protection Areas (SPAs) instigated through the Birds Directive combine to form the 'Natura 2000' network.

offered: "*An ecological network comprises a suite of high quality sites which collectively contain the diversity and area of habitat that are needed to support species and which have ecological connections between them that enable species, or at least their genes, to move"* (ibid: vi; see also p.14). This definition has a dual focus: sites and species; or, alternatively, places and movement. However, for the bulk of the report, it is **sites and places that gain emphasis** and ascendancy[20]. Connectivity is thus positioned as important, but not the primary focus. Indeed, the preferred order of action is explicitly labelled in hierarchical terms within the detail of the report. The authors suggest that, *"… since choices are unavoidable, wider practical considerations suggest that the hierarchy of benefits … runs: Better management of existing sites > Bigger sites > More sites > Enhance connectivity > Create new corridors"* (ibid: 58). As the summary notes, "*Increasing connectivity helps, but first there need to be high quality sites with thriving wildlife populations to connect*" (ibid: viii). Perhaps unsurprisingly, given the format of the panel, these conclusions reflect the status quo in conservation practice in England and Wales – that is, a focus on conservation primarily enacted through the designation of protected areas. As one policy advisor close to the process explained, "*there are tremendous issues in squabbling between conservation agencies, as well as conservation organisations, and a lot of the Lawton conclusions were the product of political manoeuvring as much as they were trying to implement some of the science"* (interview in England, 2012).

Of course, wildlife conservation is affected by a collection of policy domains beyond those focused solely on wildlife. In particular, policies relating to planning, farming, and forestry are explicitly concerned, in part, with the conservation of wildlife. In all three cases, the influence of the ecological network approach is also evident. For example, The *National Planning Policy Framework* (DCLG, 2012), a fundamental reform and simplification of planning policy in England, is imbued with

[20] This echoes how the dualism of AREA / ISOLATION found in the Equilibrium Theory of Island Biogeography was enacted in conservation practice through disproportionate emphasis on the first rather than the second term (see chapters one and two).

considerations of connectivity understood as a network. Local planning authorities are required not only to consider the protection necessary for designated wildlife sites, but also the contribution these sites make towards ecological networks (S113); they are required to develop a strategic approach to creating, protecting, enhancing and managing such networks within local plans (S114); and furthermore they are required to *"identify and map components of local ecological networks"* (S117). The attention paid to connectivity in the current framework thus requires positive, pre-emptive action (mapping and identification) as well as a reactive response to planning applications.

There is, therefore, a very particular understanding of 'network' in use. As Law has noted in his work on regions, networks, and fluid spaces, "*the notion of network – or the creation of objects in network terms – is not spatially neutral, but also implies the production of a particular kind of space"* (2002:94; see also Mol & Law, 1994). Indeed, the use of the 'network' metaphor has been criticised in social theory because of its failure to allow for alterity, i.e. for spaces outside of the network (Hetherington & Law, 2000). The focus on 'places' in these documents is thus informative: 'networks' are understood as collections of (particular, specified, protected) places that may be connected, rather than as relational spaces made through their connections. That is, the emphasis is more on the nodes (places) that are connected, than on the connections that tie them together. Such emphases matter; indeed, the semiotic and material separation of nature from culture seems influential in these imaginaries of non-human places, connected in non-human networks, as a series of somewheres that humans might visit but not inhabit (see chapter five).

Interestingly, the development of the concept of 'ecological networks' in ecological theory is explicitly directed towards moving beyond the forms of spatial demarcation that seem evident in how the concept is being invoked in English policy. Jongman & Pungetti define it thus: "*An ecological network is today recognized as a framework of ecological components, e.g. core areas, corridors and buffer zones, which provides the physical conditions necessary for ecosystems and species to survive*

in a human-dominated landscape" (2004:3). They continue, "*since ecological networks consist of both ecological and human components, the interaction between nature and culture is a priority to consider in both nature conservation and sustainable development*" (2004:5). There is a clear resonance between their notion of ecological networks and Rosenzweig's ideas about 'reconciliation ecology' (see chapter two); and indeed, such resonance is deliberate – ecological networks are imagined as a means by which human and nonhuman life can co-exist. There is thus room within this concept for the development of the connectivity multiple along less binary, spatially demarcated lines. Yet in current policy (and in some readings of this form of ecological theory), the tendency towards imaginaries of purified spaces remains influential. Indeed, connectivity specialists involved in advising policymakers in England and Wales who were interviewed for this research often bemoaned the focus on structural, spatially demarcated networks, suggesting that the nuances of permeability had been "*misinterpreted",* or somehow lost in translation; as one policy advisor put it, *"I think functional notions are generally lost on policymakers and nonspecialists"* (interview in England, 2012).

(ii) Wales and 'the Ecosystem Approach'

The enactment of 'connectivity' in Welsh policy discourse is somewhat, but not significantly, different. In 2006 the Welsh Assembly published its first fully expounded statement on environmental policy in *Environment: Strategy for Wales* (WAG, 2006). A document with wider environmental concerns than the later (English) *The Natural Choice* (HMG, 2011), it makes broad commitments that relate to climate change, resource use, pollution, public access, waste and water management, landscapes and seascapes as well as biodiversity. Ideas about spatial and/or ecological connectivity do not dominate. With discussion of connectivity limited to the specific section on biodiversity, even there connectivity is only mentioned in one of that section's three desired outcomes, thus: "*The wider environment is more favourable to biodiversity through appropriate*

management, reduced habitat fragmentation and increased extent and interconnectivity of habitats" (ibid, 2006:36). A "landscape zone" approach is suggested as the way to address the multiple goals inherent in conserving both biodiversity and historic land- and seascapes, and "delivering" connectivity is one of five goals incorporated in this mode of governance; as the authors note, *"climate change and the imperative to adopt a more dynamic approach to land management means that a purely site based approach will not be appropriate"* (ibid 2006:40). However, this is the extent to which connectivity is emphasized in this wide-ranging strategy. Connectivity is not explored or defined as a concept, and does not even make it into the glossary of key terms alongside more dominant notions like 'ecosystem services'; moreover, the idea of "ecological networks" does not even get a mention. Similarly, in the 2008 version of the *Wales Spatial Plan: Peoples, Places, Futures* (WAG, 2008), a policy in which notions of spatial and ecological connectivity might be expected to be encountered, only 'ecological connectivity' gets a passing mention; and not until page 79.

One possible explanation for this relative underplaying of connectivity in Welsh Government policy relates to the timing of these documents. The few years around 2010 mark a time of significant re-organisation in conservation policy within both Wales and England, with the shift away from the previous regime of Biodiversity Action Plans described earlier. Indeed, although ideas about connectivity are marked by their lack of volume in the years before 2010 in Wales, evidence of the shift towards an approach based on ecosystems, and in particular ecosystem services, are clear in both these documents and other contemporary statements and papers. However, when in 2013 the Welsh Government published a white paper and opened a consultation on the new Environment Bill, ideas about connectivity continued to be largely overlooked. Indeed, in this white paper (*Towards the Sustainable Management of Wales' Natural Resources: Consultation on proposals for an Environment Bill*, WG, 2013*),* there is not a single mention of either 'connectivity' or 'ecological networks' aside from a reference to the Lawton report. Given that the aim of this white paper is to promote and consolidate an integrated approach to environmental management, it is perhaps

surprising, and certainly noteworthy, that ideas concerning structural and functional connectivity appear to play so little explicit role in the shaping of policy.

Yet within the governmental agencies responsible for environmental management of various kinds in Wales, ideas about connectivity have demonstrably had a more notable degree of influence. Connectivity modelling has been developed and utilised in the past 10 years by both the Countryside Council for Wales (CCW) and the Welsh part of the Forestry Commission (both organisations have been incorporated into the integrated agency Natural Resources Wales (NRW) since 2013). Indeed, resources have been allocated to the development of a GIS tool that maps connectivity by habitat type across Wales, based in a least-cost approach and operationalizing connectivity in terms of generic focal species that are 'representative' of particular habitat types (Latham *et al*, 2013; see also chapter four). These maps and models have been designed and prepared for use by policymakers, planners, local government officials and land managers so as to be able to incorporate considerations of connectivity within environmental decision-making in a comparable manner across the country. Their use is increasing as the maps become more widely available (ibid, and interviews); and is comparable to similar trends in England.

In these models, connectivity is explicitly conceptualized in functional/ecological terms, as the movement of species through and between habitats and the wider matrix. As the NRW connectivity tool's creators explain: "[it] *is not simply about physical connectedness and 'joining things up'. To its detriment, connectivity is often thought of in this way, and equated with features such as linear corridors and dormice bridges"*; instead, the authors suggest that it should be interpreted as, "*a broad term,* [that] … *refers to the characteristics of the landscape that affect the movement of organisms and natural processes. It is usually interpreted with respect to species movement, but actually has much wider implications, and is relevant to ecosystem functioning as a whole and its resilience"* (ibid, 2013:3). The last point in the preceding quote, about widening the notion of

connectivity, helps to position both how connectivity is being conceptualized and to explain its relative absence from the contemporary high-level policy documents mentioned earlier. Welsh environmental policy is increasingly (and explicitly) committed to and organized through the '**Ecosystem Approach'**; an idea also significant, but not as discursively dominant, in English policy. Connectivity, in turn, is conceptualized as one of a number of important factors that contribute to this functioning of 'ecosystems': it is thus imagined as a systemic property, rather than a function of particular species.

Within the narrower domain of forestry policy, however, ideas about connectivity are more evidently influential; and therein, the imaginary of 'networks' is once again discursively important. For example, in the 2009 *Woodlands for Wales* forestry strategy (WAG, 2009), concerns about habitat fragmentation and the promotion of habitat "*inter-connectivity*" come to the fore in discussions of biodiversity. The following excerpt from section 6.3, concerning woodland biodiversity in particular, is indicative:

> "*It is important to protect the structure and functioning of woodland habitat networks and, where necessary, to reverse the fragmentation of semi-natural habitats. By improving woodland networks we will make it easier for wildlife populations to reach new habitats and to move in response to a changing climate. There is no 'one-size fits all' approach to reducing the fragmentation of woodlands and improving the connection of woodland with other semi-natural habitats. We recognize that ecological network approaches can open up opportunities for the dispersal not just of desirable species but also of pathogens and problem species such as the grey squirrel. Improving woodland networks will require a strategic approach that is integrated with other land uses and sensitive to local needs"* (WAG, 2009:47)

Here, connectivity is conceptualised in structural *and* functional terms, in a nuanced and complex manner. Connectivity is not simply reified, nor reduced to structural connectedness. Nevertheless, connectivity is still cautiously promoted and objectives are set through which the 'woodland network' is to be improved through more effective management, the creation of more woodland, and/or actions to *"make the intervening spaces more friendly to woodland species"* (ibid, 2009:48).

Specific actions regarding grant aid are identified as levers, and the need for supporting spatial modelling identified – a need later addressed.

The subsequent development of a detailed 'Policy Position' for biodiversity within the woodland strategy (WG, 2011) makes this commitment to connectivity clear. It notes that the previous woodland grant scheme, Better Woodlands for Wales (BWW), which ran until 2010, specifically targeted new woodland creation according to a spatial hierarchy of site preference determined by connectivity logics, operating through the identification of priority zones for woodland creation in 'core' and 'focal networks'. Yet it also notes the scheme was unsuccessful in achieving this goal. BWW has since been replaced by an incentive programme that is part of Glastir, the integrated land management subsidy scheme for farmers and land managers in Wales, which includes a 'Woodlands Element' specifically targeting strategic woodland creation for biodiversity. Wildlife conservation is one of six objectives for the Glastir Woodlands Element, alongside soil, water quality, flood management, protecting historic landscapes and improving access; and biodiversity objectives are explicitly conceptualized in terms of connectivity, thus: "***Bio-diversity*** *– to improve woodland connectivity and enhance structural diversity"* (WG, 2012:3). At first, woodland connectivity has been interpreted in more limited terms than under the BWW scheme, limited to intra-site rather than inter-site scales (WG, 2011). Yet the longer term aim is to utilize Glastir funding to encourage new woodland creation for connectivity at a landscape scale; as the Policy Position document makes clear: "*We will welcome all woodland which meets UK Forestry Standard but will encourage spatial targeting of woodland which contributes to habitat connectivity, both of woodland networks and contributions to semi-natural habitat networks, reducing fragmentation of habitats. These networks will provide species with opportunities for movement in the light of climate changes. We will continue to support research into connectivity and landscape scale biodiversity"* (WG, 2011:41). Within Glastir, the strategic targeting of new woodland creation so as to aid connectivity is being operationalized through the creation of 'Strategic Creation Area maps'.

7.3 Composing the connectivity multiple

The preceding sections have detailed the various ways in which theories about connectivity have been developed through and incorporated within conservation-related policies in England and Wales. In England, the notion of "ecological networks" has gained significant discursive traction in recent years, although the extent to which this emphasizes the status quo of site protection versus a newer focus on connectivity is open to question. In Wales, a discourse centred on the "ecosystems approach" is shown to rely upon spatial imaginaries and practices of connectivity in both structural and ecological terms, but to subsume such concepts (often as taken-for-granted, unstated, and/or under-theorised assumptions) within this broader "systems" narrative and mode of action.

There are, therefore, specific enactments of the connectivity multiple that can be traced, mapped, and mused upon. In England, the notion of 'ecological networks' relies on a binary spatial imaginary that demarcates 'human' from 'natural' space. In Wales, framing the 'ecosystem approach' in terms of ecosystem 'services' and natural 'resources' in turn relies – in part – on an anthropocentric, utilitarian, and (following Massey, 2005) colonial spatial imaginary (i.e. by prioritising human needs, all space becomes human space). Indeed, the anthropocentric territorialisation implied by the ecosystem services discourse is also discursively apparent in England, where it seems to compete with the binary proposition. Crucially, then, in neither discourse in the contemporary policy situation detailed above, is the imaginary of *shared space* given much emphasis (except, notably, in Welsh woodland strategies). I will suggest in section 7.4, however, that it is precisely through sharing space that an alternative enactment of the connectivity multiple might be composed.

The spatial imaginaries apparent in England and Wales are enacted through specific policy-practices, and they have effects. First, framing connectivity in terms of 'ecological networks' that consist of a collection of (interchangeable) sites, as evident in English policy, enables and draws on the same

logics of *site-substitution* that are also essential to the marketization and fungibility of 'nature' under neoliberalism (see J.Lorimer, 2012). There is thus a specific spatial practice – a demarcation of exchangeable 'natural' sites, imagined collectively as a systemic network – that influences and is also shaped by the wider trend toward marketization illuminated in neoliberal critiques of contemporary practice (see earlier). Furthermore, focussing on networks of sites, rather than on the connections between these sites, serves to reinforce the importance and capacities of the site owners/managers. Since in many cases these sites are owned and managed by non-governmental conservation groups, this form of spatial conservation practice also contributes to the shift of governance competencies to non-governmental organisations that is also a hallmark of neoliberalism (Adams *et al,* 2013).

Second, both 'ecological networks' and 'the ecosystem approach' imagine and enact a particular form of ecological connectivity, focussed on affording the mobilities of those species deemed processurally useful to ecosystem health and de-emphasizing others. Again, this is a specific spatial practice. Ecological connectivity is thus enacted in systemic rather than species terms – influenced by, and contributing to, the wider shift from species to processes noted earlier. Organising policy through the mantra of ecosystem services thus also enacts a particular form of socionatural connectivity, with all manner of nonhuman organisms, things and events judged primarily in terms of their utilitarian usefulness to human ends.

Third, both the 'network' and 'ecosystem' approaches clearly rely upon, and are a part of, the move towards 'large-scale' conservation. Both require spatial imaginaries and practices that are not limited to single conservation sites, but imagine and manage such sites as part of a larger 'network' and/or 'system'. Scientific discourses about connectivity are an important justification for such acts of territorialisation; but they do not dictate the precise ways in which such practices will be manifest.

The last point is crucial. Whilst the spatial practices of connectivity in English and Welsh policy are both informed by and part of the wider shift towards larger scale, process-targeting, neoliberal modes of conservation practice, the multiple could be composed differently. To quote the Blow Monkeys (1987), "*It doesn't have to be this way".* Connectivity science, as shown in chapter two, is diverse. More emphasis could be placed on matrix permeabilities than networks of individual sites; more emphasis could be placed on connections between the sites, rather than on the sites themselves (i.e. networks as 'relations' rather than as a 'collection of nodes'). Prioritising connectivity in policy could be done in ways that are not supportive of site fungibility and marketization; that views species and organisms as more than inputs to systemic processes; and that affords larger-scale action without the binary territorialisations implied by the continued prioritisation and designation of nature reserves.

But - and this is also crucial – accepting that the multiple could be composed differently does not establish the wider trends identified earlier (i.e. the shifts towards larger-scale action, processes as objectives, and neoliberal governance) as causal agents in enacting this particular multiple. Indeed, establishing causal priority is difficult if not impossible in such a complex policy environment; the spatial imaginaries of connectivity are, to reiterate, better understood as both informed by, and generative of, these wider shifts. Yet if indeed these spatial imaginaries and practices are implicated in enacting neoliberal modes of conservation (as well as being informed by such practices), then they still emerge as possible sites for resistance. In the following section, I engage with contemporary literatures on rewilding to trace such an alternative path, one that I term "**revitalizing conservation**".

7.4 Connectivity and "revitalizing" as a mode of conservation

In contrast to the ways in which connectivity is imagined in English and Welsh policy, through 'ecological networks' (construed as emphasizing collections of sites rather than the linkages between sites) or the 'ecosystem approach' (emphasizing systemic processes), the mammal connectivity practices documented in earlier chapters, enacted through animal mobilities, and *through* landscapes rather than confined to large(r) reserves, point towards alternative possibilities. These alternatives can be unpacked through attending to 'rewilding' as an emergent mode of conservation action (Rotherham, 2014). Rewilding is relevant here because it enacts the shifts towards larger scale action and system processes in similar yet also very different ways to the status quo of the protected area approach, which as discussed earlier focuses on 'more, bigger, better managed', and latterly perhaps 'joined' reserves. Furthermore, certain forms of rewilding manage these shifts without necessarily relying upon or facilitating neoliberal modes of governance. Specifically, I will draw on the distinction made by Lorimer & Driessen (forthcoming) between 'binary' and 'hybrid' modes of rewilding to trace a form of conservation practice I term "**revitalizing conservation**".

The notion of 'rewilding' is both controversial and contested (Jørgensen, 2014). It roots are often traced back to the manifesto of the "Wildlands Project", a north American large-scale conservation project launched in the 1990s and operating according to a threefold logic of 'cores, corridors and carnivores' (Soulé and Noss, 1998); in a move that widens the field whilst retaining alliterative harmony, these have subsequently been developed in conservation theory as cores, connectivity and 'keystone species' (Sandom *et al*, 2013). Thus, from its beginnings, rewilding has been tied up with ideas about and enactments of structural and functional connectivity.

The initial aim was to restore/protect large tracts of 'wild lands' to facilitate the ecological processes enacted by large predators; in some cases, this would involve re-introducing missing carnivores; and

the return of wolves to Yellowstone is often cited as the classic example of this approach (J.Lorimer *et al*, forthcoming). In more contemporary versions, the keystone processes enacted by previously missing herbivores often gain more emphasis (Sandom *et al,* 2013). The temporal ambiguity implied by the notion of 'missing species' (i.e. missing since when?) was foregrounded by the subsequent controversy (Caro, 2007) around a further development of the idea: Pleistocene re-wilding (Donlan *et al*, 2006). This latter approach advocated an ecological baseline some 10,000 years distant (compared to the pre-Columbian baseline in some previous versions), and thus proposed the assisted migration of African megafauna to North American sites to restore lost ecological processes (seed dispersal, vegetation disturbance, predation etc). Various modes of rewilding, combining megafaunal (re)introductions with laissez-faire management, have thus been enacted in a number of sites of quite different size, from the vast Yellowstone ecosystem in the US, to the parochial scale of the Oostvaardersplassen in the Netherlands (Marris, 2009; Lorimer and Driessen, 2014); and it has influenced similar projects in the UK (notably Ennerdale in England, and Alladale in Scotland; St. John, 2010).

Yet not all re-wilding is the result of such grandiose projects; indeed, the term has a fair degree of plasticity in contemporary usage (Jørgensen, 2014). It may be coincidental, driven by processes of rural land abandonment (Navarro & Pereira, 2012) or game (re)stocking; indeed, Hearn *et al* (2014) trace the conjunction of both in eastern Liguria (Italy), where unplanned afforestation has facilitated the successful spread of boars thought to have been (re)introduced to the area by hunters in the 1960s. Or it may be the result of ecological migration, like the return of wolves to southern France – afforded by changes to land management practices and wildlife legislation, but otherwise unassisted by human agency (Buller, 2008). It may refer to conservation actions that restore ecological processes, through, for example, the re-introductions of herbivorous species to enact particular grazing regimes, or to facilitate seed dispersal; a good example of the latter is the introduction of exotic tortoises in Mauritius to facilitate the spread and germination of hardwood ecologies (Griffiths

et al, 2011; Robbins & Moore, 2013). Or it may simply refer to actions that restore a little more liveliness – or 'wildness' – to particular ecologies (Seddon *et al*, 2014).

The various different forms of re-wilding thus share a commitment to increasing the (relative) scale of conservation action. They also utilise particular species to enact wider systemic processes (seed dispersal; herbivore and meso-predator population regulation; grazing patterns and intensities and related faunal and floral fluctuations); but crucially can do so whilst also retaining a focus on, and valuing of, the species (if not individual organisms) involved. This is not always the case – some forms of rewilding utilise species/individuals to enact particular ecological processes with no particular interest in the flourishing of these organisms/species beyond the process-objective. But, and unlike the systemic ontologies driving the shift towards 'ecological process' objectives in English and Welsh policy, rewilding projects often rest on an explicit concern for both species **and** processes. This might seem a fine nuance; but in practice it is an important one, particularly when species/individuals are *not deemed useful*.

However, the various modes of rewilding differ significantly in their approach to how conservation territories are composed: through enacting boundaries, or through transgressing boundaries (see Buller, 2013c:189). Lorimer and Driessen (forthcoming) describe this in terms of "binary" or "hybrid" spatialities. The former rely on the demarcation of pure territories: human spaces vs. non-human reserves. The latter are instead enacted topologically throughout landscapes, and thus inflect ideas about land-sharing rather than land-sparing amidst conservation and agriculture (Phalan *et al* 2011), with a nuanced and more wide-ranging spatial sensibility. Indeed, such hybrid spatialities have much in common with Hinchliffe's (2008:95) notion of a "*careful political ecology"*; rejecting spatialities of inside/outside, and operating through "*openness*" and "*curiosity"* rather than "*sheltering"*, this mode of conservation as co-production would be generative of, "*a gathering together that is not too tight and can thereby work to confirm rather than to assimilate others"*. The Wildlands Project and

particularly the Oostvaardersplassen style of re-wilding sit firmly in the former, binary category; species migrations (facilitated, or not prevented), and species translocations to un-fenced locations sit in or towards the latter hybrid spatiality.

Given the terminological imprecision of the catch-all 'rewilding', and the importance of the distinction between bounded and unbounded forms of wilding in the following argument, I henceforth refer to the latter style as **revitalizing practices.** That is, revitalizing is about the facilitation (positively, or through relevant forms of inaction) of more lively ecologies – perhaps through the (re)introduction of species, perhaps through facilitative actions more broadly - but in a manner that does not require the spatial purification of rewilding (that relies on demarcating 'wild' from 'non-wild' through structural and other forms of spatial incision; and thus 'people' from 'nature' similarly, see discussion in chapter five). Revitalizing thus shuns the use of all sorts of fences where possible (Woodroffe *et al*, 2014). It points towards what Jørgensen has imagined as a more "inclusive" form of rewilding strategy, and away from the "reactionary" tendencies identified by Lorimer & Driessen (forthcoming)[21].

Pine marten re-stocking can be conceptualised as a form of planned revitalizing. Like broader forms of rewilding, augmenting the population of pine martens in Wales gains support on both species-specific and functional logics (see chapter six). Yet unlike binary modes of rewilding, territorialisation in this case is a hybrid more-than-human process. New marten territories may be influenced through the (human) choice of release sites, but they will be enacted through animal mobilities and not constrained by fences (except, of course, for fences *keeping them out* of chicken pens, rather than fences *keeping them in* reserves).

[21] But it may nevertheless prove controversial in practice, as suggested by the polarized reaction to journalist George Monbiot's (2013) popular evocation of a similar tack in his recent book *Feral*.

Similarly, wild boar expansion in England can also be conceptualised as a form of tolerated (within limits) revitalizing[22]. Thus far in the thesis, the (re)introduced boars have been largely fenced off from the empirical chapters, corralled into the spaces in-between the discussions of conservation practices due to their ambivalent status in contemporary conservation frameworks. Revitalizing as a mode of environmental practice serves to break such barriers down, and let the boars back in: accepted and valued both as both facilitators of ecological processes (enacting disturbance regimes etc) and as a species (if not necessarily as individuals – which is a different, and perhaps larger biopolitical debate).

Revitalizing conservation is consonant with the shift to larger scale action, but enacted through topological (enfolded) rather than networked (demarcated in/out) spatial imaginaries. It is also consonant with a shift towards incorporating systemic objectives in conservation management, but considers these as additional to species concerns rather than as an alternative; operating through logics of '*and*' rather than '*or*'. But it does not rely upon, nor necessarily support, neoliberal logics of marketization and non-state governance; indeed, the blurring of boundaries necessary for revitalizing to occur relies instead upon collective action. Thus revitalizing conservation also, positively, is supportive of and reliant upon a more affirmative form of socionatural connectivity. Specifically, rather than valuing organisms instrumentally as systemic process inputs, capable of securitisation through market mechanisms, and/or in anthropocentric terms as having utility (e.g in terms of promoting 'resilience'), instead organisms are valued in intrinsic terms (see Sagoff, 2009). Revitalizing conservation thus considers non-human mobilities, rather than simply nonhuman movements, as essential to both ecosystem function and an ethical biopolitics.

Revitalizing conservation is thus a mode of conservation action that is enacted through a recomposition (Latour, 2010) of the connectivity multiple. It resonates to some extent with Rosenzweig's notion of 'reconciliation ecology' (as introduced in chapter two), described as an

[22] Whereas in Scotland, where proposals have been made to introduce boars into fenced reserves to enact vegetational disturbance, the term 'binary rewilding' would still be more appropriate; see Sandom *et al*, 2014.

approach that: *"discovers how to modify and diversify anthropogenic habitats so that they harbour a wide variety of wild species ..... it seeks techniques to give many species back their geographical ranges without taking away ours*" (2003:201). It also resonates to some extent with Hoole & Berke's (2010:304) *'collaborative landscape model for biodiversity conservation'*, which they develop through an engagement with socio-ecological systems thinking as, *"featuring institutional linkages and integration between community-conserved areas, integrated conservation corridors for connectivity, and dynamic, mobile reserves collaboratively integrated with national parks management"*; an approach perhaps more achievable in the Namibian context of which they write, than in England and Wales with their deeply entrenched and fragmented patterns of land tenure. But differently to both, it relies upon reconceiving space in less binary terms: not 'their geographical ranges' and 'ours' (as in Rosenzweig), nor 'corridors' and 'reserves' (as in Hoole and Berkes), but enfolded, shared spaces.

Revitalizing connectivity thus resonates also with practical ecologies that move beyond logics of nativeness (Davis *et al*, 2011) to work with rather than against 'novel ecologies' (Hobbs *et al*, 2006). It does not, however, equate with a *laissez-faire* rationality of simply "letting things go"; as Rotherham (2014:ii) notes, we cannot assume that such novel ecologies will lead to *"some utopian and golden age of ecology"*. Indeed, revitalizing as a mode of conservation practice should not be confused with a slippage back towards the reification of wilderness, or of nature as distinct from humans and culture; instead, it is about sharing space, living with and facilitating a livelier ecology. After all, as the same author suggests, "*[e]ven to not intervene is a positive intervention … The question therefore is concerned with the type of our human interventions in nature and the responses and changes that follow"* (ibid). Revitalizing is thus an approach that is concurrent with Mansfield *et al*'s (2014) conceptualisation of an "*environmental politics after nature*", in which environments are understood as always socioecological, and in which ecological politics thus concerns what forms of 'social natures' to facilitate.

Of course, sharing spaces will require both the development of new (Lorimer and Driessen, 2011), and the rediscovery of old (Chapron *et al*, 2014), modes of 'living with' nonhumans. Such learning will require attending to modes of attunement (see chapter four), empathy (Despret, 2013) and companionship (Haraway, 2008). Significantly, much of this learning will need to take place in agricultural spaces (Daily *et* al, 2001; Balmford *et* al, 2012; Monbiot, 2013). It will also require an informed and ethical biopolitics through which to address inevitable conflicts and concerns, between and amidst all manner of more-than-human actors (J.Lorimer, 2012, 2015). Much difficult political work is required. For example, revitalizing conservation as a mode of action does not solve the squirrel quandary (i.e. the problem for an affirmative mode of biopolitics of the choice between either protecting reds through culling greys, or not culling greys and letting reds go locally extinct); indeed, there is often significant tension between practices of re-wilding and biosecurity (Buller, 2013c); but perhaps through facilitating spatially reconfigured 'atmospheres of curiosity' (see chapter five) it might also presage creation of an 'atmosphere of democracy' (Latour & Weibel, 2005) in which such a quandary can be reconsidered. Indeed, curiosity has a 'subversive' potential as Phillips (2014) has recently argued, through which politics can be re-thought.

7.5 Conclusions

In this chapter I have shown, through a detailed reading of contemporary national-level conservation policy in England and Wales, how the connectivity multiple can be composed – and perhaps recomposed. I began by identifying three trends in contemporary conservation policy across multiple jurisdictions, that have been documented in the literature and that are evident in England and Wales; these are: (i) a shift towards large(r) scale action; (ii) a shift from species towards ecological processes as the objectives of conservation policy; and (ii) an ongoing shift towards neoliberal modes of governance in environmental management. I then turned to tracing how scientific discourses about connectivity, in structural and functional terms, have been discursively translated in English

and Welsh policy through notions of 'ecological networks' and 'the ecosystem approach'. Through tracing the linkages between these particular connectivity discourses, and the three trends in wider conservation policy identified earlier, I showed how the composition of the connectivity multiple both draws on and contributes to the enactment of specific modes of conservation policy-practice; and further suggested that, as such, the spatial practices of connectivity in conservation might serve as a site of resistance, through which alternative modes of conservation politics and practice might be pursued. I then suggested, through a reading of recent literatures on 'rewilding' as a mode of conservation action, how a specific 'hybrid' form of rewilding – herein termed **revitalizing conservation** – might offer significant promise in terms of recomposing the connectivity multiple in such a way as to facilitate a more connected and affirmative biopolitics of 'living with'.

This chapter thus contributes to existing literatures in three important ways. First, it adds to work tracing contemporary shifts in conservation policy by illuminating the spatial imaginaries and spatial practices involved in and affected by these changes. Second, it demonstrates how the connectivity multiple can be composed in a particular situation (conservation policy in England and Wales), but thus also points towards ways in which it might be recomposed. As such, it offers important resources for re-thinking conservation practice. Therefore, third, it offers a specific normative proposal for recomposing connectivity through a more affirmative mode of spatially-inflected biopolitics.

The notion of revitalizing conservation draws together and relies on much of the work from previous chapters. It operates through a hybrid spatiality in which shared spaces are facilitated (chapter six); in which nonhuman mobilities are attended to (chapter four) through atmospheres of curiosity (chapter five); but that remains realistic that about the limitations of curiosity in situations of conflict (also chapter five). Revitalizing conservation thus operates as a form of spatial practice that contributes towards a particular atmosphere of democracy in which such questions might be

(re)considered. In interpreting these affirmative forms of biopolitics in spatial terms, there is an ever-present danger of spatial fetishism: reifying a particular spatial imaginary for its own sake, and assuming space as agential rather than as an outcome of multiplicitous agencies (see Cresswell, 2013:252). The criticism does not stand, however. This is not a misplaced lauding of topology, but an informed preference for a series of activities, approaches and events that can be traced as a particular form of 'spatial formation' (following Whatmore, 2002). Spaces are made through spatial practices; it is *what actors do* that matters. A more problematic critique points to situations where forms of purified space and territorial disconnectivity *are necessary* to protect particular forms of life – the squirrel quandary is repeated many times over; conservation is full of examples. Indeed, that is why revitalizing is perhaps best understood as a tendency towards reconciling multi-natural spaces subject to situational contingencies. Thus, and as the pages of conservation journals frequently attest, there is no simple solution to the complex, entangled problems of environmental degradation and species extinction: there are no panaceas. Revitalizing conservation is not proposed as such. But in reworking the spatial practices of democracy through more affective, connected modes of living (see chapter five), alternative possibilities might be generated. Indeed, revitalizing is about re-thinking spaces of wildlife as not distinct to those of humanity. It is about land sharing, rather than land sparing, in the dichotomous terms that sometimes provide a framework for similar debates in conservation theory (Phalan *et al* 2011), but that often fail to draw out the wider socio-political inferences and implications of such modes of action. It is about making spaces together for reconciliation (Rosenzweig, 2003), conviviality (Hinchliffe & Whatmore, 2006), cosmopolitics (Stengers, 2005), and a more multinatural geography of conservation (J.Lorimer, 2012).

8. Conclusions and contributions

> *"…* coming to terms with our ecological desires will force us to admit that novel ecologies are simultaneously 1) *gardens* of our own crafting albeit, in the words of Emma Marris, wholly unruly and rambunctious ones, 2) *monsters* born of our tinkering albeit, in the words of Bruno Latour, ones deserving of our love, and 3) as sites of *struggle,* albeit in the words of Neil Smith, ones of production and accumulation. Understood this way, paths emerge in the forest to guide our decisions to either proliferate or extirpate novel ecologies" (Robbins & Moore, 2013:12, emphasis in original).

In this final and concluding chapter, I reiterate the main arguments, conceptual developments, and contributions made in and by the thesis. Most importantly, the thesis argues that connectivity is enacted in conservation as a multiple (following Mol, 2002), through various spatial practices (following Whatmore & Thorne, 2000), that shape the possibilities for living with non-human life (following Haraway, 2008). Since this multiple is composed, it can also be recomposed (following Latour, 2010). Thus, through tracing the various conservation practices relating to several types of woodland mammal in England and Wales, I suggest that contemporary trends in conservation policy (towards larger-scale action, targeting ecological processes, and neoliberal modes of governance) might be rethought and differently articulated through the conceptual and practical approach of **revitalizing conservation**.

The key conceptual developments include: the concepts outlined in chapter two for making sense of connectivity practices, i.e. **territorial, ecological, and socionatural modes of connectivity**; the concept of **animal mobilities** developed in chapter four; the concepts of **more-than-human political connectivity** and **atmospheres of curiosity** outlined in chapter five; the framework for considering the **biopolitics of the connectivity multiple** introduced in chapter six; and the concept of **revitalizing connectivity** suggested as an alternative mode of composing the connectivity multiple in chapter seven. Furthermore, the thesis also contributes towards methodological developments in

contemporary more-than-human geography through the various **methodologies of attunement** presented in chapter four.

The chapter concludes by outlining directions for further research suggested by the work herein. In summary, these are: (i) a new direction in more-than-human mobilities research that attends to the l**ived experiences of mobile animals** in the Anthropocene; and (ii) further empirical investigations of **diverse enactments of the connectivity multiple**: i.e. how spatial practices of territorialisation, more-than-human mobilities, and modes of 'living with' cohere, stabilise or dissipate through environmental practices of diverse types.

8.1 Conceptualising connectivity

As anticipated in chapter two, the multiple enactments of connectivity described in squirrel and marten conservation practices, and with respect to the management of wild/feral boar, can be conceptualised in three intersecting ways (see Figure 8a).

Figure 8a: Connectivity practices relating to pine martens, red squirrels and grey squirrels.

Connectivity practices	Red Squirrels	Grey squirrels	Pine Martens
Socionatural	**Biopolitics**: affirmative (but resting on nativity logics) **Atmospheres:** curiosity **Spatial practices**: defence through (bio)security	**Biopolitics:** not affirmative; nativity/ invasion logics. **Atmospheres:** repudiation, violence **Spatial practices**: discipline & (bio)security	**Biopolitics**: affirmative; living with. **Atmospheres:** curiosity **Spatial practices**: facilitative; security
Ecological	Connectivity enacted through **animal mobilities**, but not encouraged due to threat from greys / squirrelpox viruses.	Attempted enactment of borders through culling; but transgressions at multiple scales; connectivity enacted through **animal mobilities**	Mobility facilitated through creating potential places; connectivity enacted through **animal mobilities**
Territorial	No attempts to intervene on structural forms of connectivity (i.e. habitat linkages), except through utilising existing coastlines as structural disconnections	No attempts to intervene on structural forms of connectivity (i.e. habitat linkages), except through utilising existing coastlines as structural disconnections	Policy documents suggest improving structural habitat linkages but little evidence of this being enacted in practice. Possible augmentation of populations a form of de/reterritorialisation.

Connectivity practices

The concept **'socionatural connectivity practices'** describes the ways in which various 'connections' between (or better, amongst) humans and nonhumans are enacted. It addresses the forms of connection through which various modes of biopolitics are performed, and as such also identifies sites of resistance through which alternative modes of living with more-than-human life might be imagined.

Conservation practitioners enact socionatural connectivity in diverse and sometimes conflicting ways: on the one hand, passionately seeking to strengthen and deepen connections between human and more-than-human lives; on the other, enacting a human/nonhuman binary through spatial practices of segregation (see chapters five and six). These forms of connectivity are enacted through the creation of spaces of encounter (chapters four, five and six), through the careful sculpting of **affective atmospheres** (both affirmative and repudiating; see chapter five), and through a vast array of societal discourses relating to the status of both 'humans' and 'nature' too proliferative to cover herein (see, for example, Dryzek 2012). Socionatural connectivity is thus not a simple matter of 'connecting' or even 'reconnecting' 'people and nature' (see chapter five), but is instead a conceptual placeholder for the many different modes of connection that are enacted through diverse more-than-human practices; it is a label for a particular category of relation, a category that is crucial in understanding how environmental politics are performed.

The concept **'ecological connectivity practices'** describes the ways that non-human mobilities are enacted, and also the role of human actors in facilitating such enactments. Thinking with the idea of **animal mobilities** forces recognition of the alterity of non-human worlds (chapter four), but also demands an empathetic response to such worlds (chapters four, five, six and seven). Mobilities are not simply geometric movements; (following Ingold) animals do not lead meaningless lives.

Conservation practices relating to ecological connectivity take sometimes starkly different forms: affording movement through creating potential places; preventing movement through (often fatal) attempts at prescribing places; or indeed remaining ambivalent (chapter six; boar interludes). Thus, depending on the specific goals of conservation, ecological connectivity of various types might be affirmed or denied (chapters six and seven). Protecting particular species might require the control (spatial, and/or vital) of organisms of another; facilitating specific ecological processes might also favour some organisms over others. Enacting ecological connectivity also necessarily enacts particular modes of biopolitics (chapter six).

The concept **'territorial connectivity practices'** describes the ways in which conservation actors attempt to enact structural forms of connectivity through acts of territorialisation. It involves practices of creating, improving (or indeed removing) structural linkages between habitats of similar types. It overlaps with the concept of ecological connectivity practices, because structural linkages may afford nonhuman mobilities; structural and ecological connectivity are not synonymous, but the former may facilitate the latter (it may be sufficient, but is not necessary).

Territorial connectivity practices underlie many of the high profile connectivity corridor schemes referred to in chapter two, but were muted in the specific situations explored here. Woodland corridors were neither planted to facilitate pine marten mobility, nor felled to protect red squirrels from invasive greys and the squirrelpox virus; albeit the sea was enrolled as a form of territorial defence within particular squirrel projects (chapter six). Indeed, as chapter six demonstrates, ecological connectivity practices may also operate through *different kinds of territorialisation* that rely not on structural linkages, but instead demarcate space through targeted culling; through such regimes of discipline, particular areas are territorialised for red squirrels ('strongholds'), and prescribed for greys.

The connectivity multiple

All of these modes of connectivity practice overlap in constitutive ways. This is not a weak claim that they are somehow implicated with each other, but a stronger claim that they are, in differing ways depending on context, necessarily related and co-constitutive of the other. Connectivity is a multiple. However, and to reiterate, I use the term not to proliferate an assumed unity (as in Mol, 2002); but to point to the necessary interconnections between an assumed plurality.

The connectivity multiple is enacted in different ways in conservation practice. Indeed, utilising the connectivity multiple as a lens is an informative way to explore such practices. In situations of pine marten conservation in Wales, I showed how a particular form of affirmative socionatural connectivity was carefully composed by conservation workers; how they utilised and shaped affective atmospheres of curiosity to assemble a more-than-human collective (chapter five); and how these collectives enacted forms of ecological connectivity through the creation of potential places for mobile mustelids (chapter six). I explored the mobilities assumed in such practices, trying to open a door into othered non-human worlds; trying to understand what was implied by such understandings of movement and mobility. What is it to traverse such lands from box to box, I wondered quickly wandering (chapter four).

In red squirrel conservation in England and Wales, I found the connectivity multiple composed somewhat differently. Here, modes of non-structural territorialisation were brought to the fore as conservationists and volunteers worked to prescribe purified places for reds and, separately, for greys. Ecological dis-connectivities were enacted through regimes of control, albeit that such regimes were repeatedly transgressed, in multiple directions, and at multiple scales (chapter six). A similar yet different form of socionatural connectivity was performed, in which collectives were assembled

but through a different form of affective atmosphere: selectively affirmative (towards red squirrels), but strongly repudiating (towards grey squirrels). This atmosphere of repudiation was grounded in (and reproduced) logics of detachment, species invasion and nativeness (chapter five).

Feral boar roamed inside and outside of the chapters, never the subject of sustained and institutionalised conservation practice, but caught up in (or more accurately, excluded from) the politics of conservation nevertheless. Their uncertain status reflects the uncertain composition of the connectivity multiple in their case; their future will be enacted through it. It depends on the mode of biopolitics enacted on and through them in England and Wales: how affected humans relate to, live with, or demarcate themselves from boar. It depends also on boar mobility and place-making activities.

The connectivity multiple in English and Welsh national-level policy was then mapped. Through a discursive analysis of scientific discourses of connectivity in policy, I demonstrated how particular spatial practices and imaginaries intersect with three contemporary shifts in wider conservation policy, towards: (i) large(r) scale action; (ii) ecological processes as objectives; and (iii) neoliberal modes of governance (chapter seven). My argument was that these three trends both enable, and are enabled by, particular forms of spatial practice; and that, as a result, spatial practices might serve as a space of intervention, where alternative modes of biopolitical practice might be imagined and performed. I thus traced a particular normative approach towards the spatial practice of conservation, informed by the arguments of preceding chapters, and specifically: (a) a concern with facilitating nonhuman mobilities (chapter four); (b) a recognition that spatial practices are generative of affective atmospheres through which modes of biopolitics are enacted (chapter five); and (c) a desire for a more affirmative form of spatially practiced biopolitics (chapter six). Drawing on existing literatures on rewilding, and in particular Lorimer & Driessen's (forthcoming) distinction between 'binary' and 'hybrid' spatialities, I suggested that the latter provides resources for (re)conceptualising

certain contemporary affirmative practices with tendencies towards diversity and the sharing of space. Termed '**revitalizing conservation**', such an approach does not provide ready answers for conservation quandaries where the needs of one species are pitted against another; such universalist principles of (bio)ethics are usually found wanting. Instead, it is suggestive of tendencies towards spatial practices that mark a significant rupture with the dominant mode of conservation as currently enacted in much of the world. Not 'human' spaces and 'natural' spaces, but shared spaces. It thus resonates with a parallel set of contemporary literatures relating to urban ecologies and their various conservation atmospheres and modes of attunement (for example, Hinchliffe *et al*, 2005; Hinchliffe & Whatmore, 2006; J. Lorimer, 2008b; Ginn, 2014); but widens the spatial context beyond this informative but limiting urban/rural binary. Such an approach will no doubt appear unpalatable, even anathema to many in the conservation establishment; but in the 'Anthropocene', such a 'multi-natural' alternative (J.Lorimer, 2012) is perhaps the only realistic path.

This thesis is, therefore, not normatively neutral regarding the construction of the connectivity multiple. First, and most obviously, it has taken a particular line on how socionatural connectivity *should* be understood and enacted. Preference has been given to ontologies that move beyond Cartesian dualism, that replace essentialist formulations of 'humans' and 'nature' with relational understandings of socionatures or naturecultures (chapters two, five, seven). Second, in foregrounding nonhuman mobilities, this thesis has also tended towards a strong preference for the enaction of ecological connectivity (chapters four, six, seven). Such a move has much support in ecological literatures (Crooks & Sanjayan, 2006; Worboys *et al*, 2010). Yet, as the case of both squirrels and wild boar suggest, not all mobilities are necessarily desirable from a human or nonhuman perspective. Encouraging unfettered mobilities would, other ecological literatures suggest, lead to the spread of invasive species and perhaps usher in 'homogeneous' ecosystems as scarce locally adapted species struggle to compete against aggressive newcomers (Olden, 2006). Despite personal misgivings about the emphasis in such arguments, they do reflect a very real

concern that cannot and should not be easily swept aside through appeals to conviviality; situational specificities matter. Thus the preference towards ecological connectivity remains a tendency to be tempered by context. Third, this thesis has offered a sometimes muted, sometimes explicit critique of conservation practiced through a model of spatial purification. Thinking with connectivity *implies* such a critique. As such, it suggests a normative tendency towards territorial modes of connectivity that encourage structural connections not through networks of demarcated space, but through the structural facilitation of landscape permeability (see chapter two). It is about corridors *and* stepping-stones (as in English and Welsh policy and ecological network theory), but it also goes further. It is about sharing space (understood as a relational achievement and not simply as a geometric grid), through an affirmative spatial biopolitics that revitalizes conservation.

Key contributions

This thesis thus makes several important contributions to geographic literatures, and these are highlighted at various points throughout the text; I will summarise the key points again here. First, it engages with existing work tracing affirmative possibilities for conservation (bio)politics (Whatmore, 2002; Hinchliffe *et al*, 2005; Hinchliffe, 2008; J.Lorimer, 2010, 2012, 2015), by illuminating the intersection of spatial practices of connectivity, and the potential these offer for alternative modes of 'living with' more-than-human lives. The concept of 're-vitalizing' conservation draws together much existing work regarding conservation practice, and takes this in new directions with an eye to application. Furthermore, the conceptualisation of multiple modes of connectivity enacted through affectual means adds to existing work on material politics (Braun & Whatmore, 2010) and the politics of affect (Anderson & Harrison, 2010) through illuminating the various different forms of affective spatial practice through which more-than-human politics is enacted in situations of wildlife conservation. And by reconceiving connectivity as a multiple, this thesis addresses an important gap in existing literatures regarding the spatial practices of conservation management, their multiple

modes of action, and the enactment of ontologies of connectivity away from the high profile sites of corridor connectivity that have thus far dominated academic attention.

Second, following a widespread (re)affirmation of nonhuman agency in social science (e.g. Latour, 2005; Callon *et al*, 2009; Braun & Whatmore, 2010), and particularly the agential capacities of animals (Wolch & Emel, 1998; Philo & Wilbert, 2000), the thesis does much to foreground the role of woodland mammals as conservation actors enacting connectivity; and the concept of **animal mobilities** developed herein has significant promise for the wider study of animals' geographies (Hodgetts & Lorimer, 2014). However, it is important to note a sense in which there is a continuing absence of the involved animals even in this text, despite aspirations to the contrary. In part, this reflects the elusiveness of the pine martens and the scarcity of red squirrels encountered; in part also, it is reflective of the methods employed herein that retain a bias towards animal, rather than animals', geographies. To fully reap the conceptual promise of exploring animals' geographies, further innovation in methodology and presentation are undoubtedly necessary.

And thus third, in attempting to take account of these animal mobilities, the thesis contributes to the contemporary interest in, and development of, **modes of attunement** as research methodology. The methods developed herein, despite their shortcomings, have wider applicability in the field; but those shortcomings require further reflection, particularly in relation to: (i) the methods' criteria for success; and (ii) their instrumental usage. Both this methodological approach and its subsequent presentation have been presented herein as 'experimental', in the sense of being speculative practices that are 'open to surprises' (see section 3.3). Such open-ended forms of inquiry play to a different register of success and failure than, for example, positivist-inspired approaches to hypothesis testing. Indeed, not only are such 'wild experiments' (Lorimer & Driessen, 2014) often unable to provide answers to tightly focussed questions, they also often subvert the questions themselves. Thus, in chapter four, I suggest that some of my attempts at attunement are 'failures'

inasmuch as they are unable to provide answers to some specific, tightly-focussed questions regarding mammal mobility; running in woodlands does not tell me what it is like to be a squirrel on the flying-run, for example. However, it is exactly this 'failure' that leads to the generation of insights regarding the degree to which alterity can be known; through subverting the question, wild experiments are successful inasmuch as they are generative of new perspectives on the inquiry. Wild experiments do not so much provide answers as proliferate questions; doing so is judged a help rather than a hindrance; and their ability to generate new avenues of inquiry is the measure of their success.

The instrumental usage of attunements in policy-making, when conceptualised as 'wild experiments', might at first glance appear problematic; a clash between the proliferative possibilities of this methodology and the focussed goals of "measurementality" (Turnhout *et al*, 2014) that dominate the generation and application of conservation policy-practice. Yet there are (at least) two clear routes out of this impasse. The first is to highlight the extent to which traditional conservation science always-already relies on forms of attunement in practice, before muting them in presentation (see chapter four); the challenge, as noted herein, is thus to give such attunements more discursive weight in policy-making and public debate. The second and perhaps more important path relates to Lorimer & Driessen's (2014:172) third axis of 'wild experiment': a dialogic politics of experiment that opens such practices to 'emergent collectives'. Herein, public debate and policy-making are not held apart as separate spheres, but instead scientific practices are democratized in meaningful ways (see Callon *et al*, 2009). The methodology of attunement has much to offer such a democratized vision of conservation: it provides an important conceptual link between the everyday knowledge and practices of many people involved and living with wildlife, and the regulated knowledges and practices of the policy-making elite. Drawing on existing practices of attuning to more-than-human life, and encouraging new and widespread forms of everyday attunement, could thus drive a 'bottom-up' democratization of conservation policy-making.

8.2 New directions in connectivity research

This thesis is suggestive of two directions, in particular, in which more research would be interesting and useful. The first relates to both a widening and a deepening of work on the connectivity multiple; the second, to work that attunes to the lived experience of nonhuman mobilities.

First, work exploring how the connectivity multiple is composed in diverse situations would allow for a comparative approach to understanding current practices, and also would generate more resources for re-thinking future directions. Wildlife conservation spans the globe, encompasses myriad ecosystems, taxonomic divisions, polities and people. Here I have focussed on England and Wales; on terrestrial ecosystems in general, and practices relating to three types of woodland mammal in particular. Other animals have made but fleeting appearances; plants and microbes less so. Marine ecosystems get hardly a passing mention. The focus on woodlands led to an emphasis on rural rather than urban geographies; ironically, given the subject of the thesis, I spent much time isolated in isolated places, at the coastal and mountainous 'peripheries' (at least, according to human geographies of the land). As recognised in chapter three, such case study research is limited in its applicability. I do not claim that the situations herein are representative for all conservation practices, only that they are particularly interesting when it comes to elucidating the enactment of the connectivity multiple. Additional work that facilitates comparative analysis would be beneficial.

Moreover, whilst the thesis has focussed on some modes of practice, this has inevitably left others in the shade. For example, I have done little in the way of 'political ecology' herein; there is more to say about how connectivity practices support and are generated through particular socioeconomic-ecological relations. Moreover, I have done little to unpack the fraught political histories of land ownership, conservation, agriculture and enclosure that have led to particular spatial practices being the norm in England and Wales. There is more to say about how connectivity is enacted in urban

ecologies, and how it intersects with the rise of policy discourses relating to socio-ecological systems and resilience; and there is more, also, to say in terms of international comparisons of connectivity practices. Such work would be both interesting and useful.

Through both widening and deepening the research agenda suggested by attention to the connectivity multiple, more also could be said about the ongoing and nefarious legacies of purifying space in wildlife conservation, and the possibilities of alternatives that might revitalize conservation practice through the sharing of space.

Second, the work herein on animal mobilities and attunement is suggestive of a research agenda that attends more closely to the lived experience of moving animals – i.e. to animals' geographies rather than simply animal geographies (Hodgetts & Lorimer, 2014). There are many ways in which geographers could take this work further, but of particular interest would be attending to how new modes of sharing space are enacted through animal mobilities; how nonhuman actors might enact such spaces differently to how human planners might imagine; and how such mobilities might enable new forms of biopolitical relations to emerge. It is to such questions that I hope to turn next.

8.3 Final words

From an interview with a volunteer conservationist working at a local scale on a particular species-based project, England, 2013:

Interviewer: In your experience is that old model of reserve-based conservation changing much or is it still pretty dominant?

Interviewee: I don't know. I can't answer that to be honest with you. But what I will say is that animals don't respect hard boundaries. You know, you can have a nature reserve set up there and you can do everything you want for it, but they have got their own free mind and they will do whatever

they want. Obviously they're going to stick somewhere that's, you know, ideal habitat, is going to be where they'd rather stay. However, regardless of what you do, they are, you know, they will move if they want to. So they will shift about, and you will find things in places you shouldn't find them, and they're quite happy to be there. So I think really, you do need to look at it on a broader scale, if you want overall, sort of conservation habitat management. I think habitat management is the key, because without anywhere decent to live, things are going to struggle regardless, aren't they?

Appendix 1: Summary of field visits and interviews

In the vast majority of cases, individuals (and when relevant, respective organisations) participated in this research project with the understanding and agreement that their contributions would be presented anonymously. The information below thus serves as a guide to participants' situations and roles, and to the broad location of field sites, rather than a detailed and identifying record.

Table A.1: Field visits

Dates / Duration	Site	Organisation (if relevant)
Jan-Feb 2013 2 months full-time participant observation	'England' (many sites)	Squirrel conservation group
Mar 2013 One week – various visits	North Wales	Various squirrel sites
Mar 2013 Two weeks	Cumbria, England	Various squirrel sites
Apr 2013	Exeter, England	Squirrel conservation conference
Apr 2013	Exeter, England	Mammal conservation conference
Apr – Jul 2013 3 months full-time participant observation	West Wales (many sites)	Vincent Wildlife Trust pine marten project (not anonymised)
Apr, Aug, Sep 2013 Series of visits	South Downs, England	Not applicable (see Chapter Four)
Jul 2013 1 week participant observation	Scotland	Mammal survey group
Jul 2013 Several days participant observation	Wales	Squirrel conservation group
Aug 2013	Wales	Conservation conference
Aug – Sep 2013 Several visits to various locations	Forest of Dean, England	Various
Sep 2013 Single visit (one day/night)	Sussex woodlands, England	Individual hunters
Sep 2013	Newcastle, England	Squirrel conservation conference

Note that the main group with whom I worked on squirrel conservation did so under an anonymity agreement. Specifying location, in this instance, would undermine this anonymity.

Table A.2: 'Formal' Interviews

Dates	Interviewee Role	Type of organisation
Nov 2012	Director	Conservation NGO, UK
Nov 2012	Project Officer	Conservation NGO, UK
Nov 2012	Scientist	Advisor to 'Lawton' inquiry
Nov 2012	Senior civil servant	Involved in 'Lawton' inquiry
Nov 2012	Senior civil servant	Involved in 'Lawton' inquiry
Dec 2012	Panel member	Lawton inquiry
Jan 2013	Project Officer	Squirrel conservation group, England
Jan 2013	Trustee	Squirrel conservation group, England
Jan 2013	Volunteer	Squirrel conservation group, England
Jan 2013	Trustee	Squirrel conservation group, England
Feb 2013	Leader	Squirrel conservation group, England
Feb 2013	Funding consultant	Charity finance consultant, UK
Feb 2013	Conservation officer	Local conservation organisation, England
Feb 2013	Board member	Squirrel conservation group, England
Mar 2013	Animal breeder	Wales
Mar 2013	Managing Director	Zoo, Wales
Mar 2013	Project Officer	Squirrel conservation group, Wales
Mar 2013	Director	Squirrel conservation group, England
Mar 2013	Secretary	Squirrel conservation group, England
Mar 2013	Project Officer	Squirrel conservation group, England
Mar 2013	Head Forester	Forestry group, England and Wales
May 2013	Project Officer	Government body, Wales
Jun 2013	Head Forester	Forestry group, Wales and Ireland
Jun 2013	Head of conservation	Conservation NGO, UK & Ireland
Jun 2013	Project Officer	Pine marten project, Wales
Jun 2013	Conservation officer	Forestry body, Wales
July 2013	Project manager	Pine marten project, Scotland
Aug 2013	Boar ecologist	England
Sep 2013	Ecologist	Forestry body, England
Sep 2013	Civil servant	Conservation body, England
Sep 2013	Boar hunters (two)	England
Sep 2013	Wildlife film-maker	England & Wales

As noted in the text of Chapter Three, this table (A.2) merely represents the formal interviews (consented, recorded, transcribed). In addition, very many conversations were had with a variety of actors during the course of the participant observation and field visits summarized in Table A.1.

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