Towards a more-than-human approach to tree health

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Abstract

New ways of working and thinking in relation to tree health and plant biosecurity are required. The climate is changing and the number of pests and diseases is increasing. A review of the social science literature on plant health reveals that scholars are not quite sure what this 'new thinking' might entail. In this chapter, we begin the process of re-imagining tree health by starting with the trees and our research engagement with them. Trees are acknowledged in this chapter as never static, but rather fluid, shape-shifters, translated across time and space. Health and disease are revealed as relational, and a fixed approach to tree health management won't work. In a world of rapid change, this way of working is not just relevant for trees.

> "…humans are not the only ones caring for the Earth and its beings – we are in relations of mutual care" (Puig de la Bellacasa 2010, p.164)

> "I am the Lorax, I speak for the trees, I speak for the trees, for the trees have no tongues." (Dr. Seuss 1971)

1. Introduction

The climate is changing and the number of pests and diseases affecting trees is increasing. For Anderson and Bows (2012, p.640) writing in *Nature Climate Change*: "The world is moving on and we need to have the audacity to think differently and conceive of alternative futures." Nowhere is this more pressing than in the context of tree health, and the ways that we respond to and manage plant health risks (plant biosecurity). As Atchison and Head (2013, p.951) argue: "We cannot appeal to a past or stable Nature, separable from human activity, as the basis of decision-making". We must pay closer attention to the entanglements between humans and non-humans in order to "energise our thinking about new ways of living in the world" (Atchison & Head 2013, p.965). In light of the complexities of disease and biosecurity, human and non-human relations are being re-theorised. In this chapter, we examine how we might re-imagine tree health by starting with the trees themselves and our research engagement with them.

This chapter begins by exploring the roles that trees play within human society, considering how humans define trees and the values people associate with trees, what contradictions surround tree health management, and what social science research exists in this area. Section 2 then discusses current theorisations of human and non-human relations, with Section 3 describing a two-day event in Epping Forest, North London, entitled 'In conversation with oak trees'. Section 4 draws together the theoretical lessons from the event in Epping Forest, and finally, Section 5 highlights

some of the applications of this approach for tree health and plant biosecurity research.

1.1 Trees and human values

Let's begin with 'what is a tree?' There are many scientific definitions of trees, commonly referring to trees as perennial plants with woody stems, supporting branches and leaves. When more details are added to the description, problems and exceptions arise. For instance, many trees don't have a single stem, either by accident of growth, by grazing, or by active human management. Most of these scientific descriptions regard trees as individual entities, but when we consider how closely a tree lives with other organisms, it is hard to draw boundaries between what is part of the tree and what is not. Similarly, the relationships between trees of the same species are close and entangled. When a tree reproduces vegetatively, by suckers growing off its roots, are its offspring still a part of the parent tree or are they separate individuals? The challenge of untangling 'what a tree is' is further complicated when scientific definitions are met with very different social science understandings of trees. As Jones (2014, p.112) describes: "there are always multidirectional flows of actions, meanings and *feelings* as communities and agencies respond to trees and act with and upon them". Trees, as in the wider case of plants, "*emerge* as an assemblage of shared differences from other beings, where common capacities manifest in different material form" (Atchison & Head 2013, p.955).

Trees pose a particular challenge in that they live very different lives from humans over timescales that can span several generations of human life. The lives of managed trees, for example, are both accelerated and often truncated in order to bring them

closer to human timescales of production and investment. Over its lifespan, a tree will host many different organisms that will have some negative or positive effect on its health. Furthermore, as a tree moves into old age (if it isn't taken as a timber harvest) it will have a long period when it is no longer growing vigorously, may lose limbs, or can become hollow. This begs the question, is what a human might perceive as decline an undesirable state for a tree? Viewing trees through human eyes, it is difficult not to anthropomorphise and to impose our understandings onto trees. However, recognising the norms associated with anthropomorphism may allow us to move beyond it to a new 'differently human' understanding of trees.

For humans, particularly those living in the UK, there are "strong values associated with the countryside and rural spaces, and the cultural, affective and symbolic meanings of woods and trees" (Pidgeon & Barnett 2013, p.6). As a consequence, Western management of tree health is governed from a very human perspective that makes preservation of the current state of the environment a priority. In turn, it puts the lives of trees above the organisms that depend on them. As a result, attitudes to and management of trees are full of contradictions.

1.2 Tree health management and social science responses

This chapter responds to Sinden's (1990, p.9) request to find new ways of "living happily with trees" by starting with the trees themselves and our research engagement with them in the context of UK plant health policy. Recent documents such as the *Tree Health and Plant Biosecurity Management Plan* (Defra 2014) are focussed on 'threats' and the desire to create biosecure space, specifically to manage and avoid attacks on UK trees from non-native pests and diseases.

Following the spread of *Phytophthora ramorum* to Japanese larch in 2009 in the UK, the discovery of *Chalara* dieback of ash in the autumn of 2012 raised the profile of tree health to a priority issue for the Department for Environment, Food and Rural Affairs (Defra). In this period, social science research supported the agenda of prioritization, governance and response in the context of biosecuring space. In 2013, when Defra commissioned a social scientist (Hall 2013) to review the role of social science in tree health, the resulting brief focused on a securitised approach to human attitudes and behaviours post-outbreak. Tomlinson et al. (2015) used similar language in their study on the governance of urban tree health issues.

The alternative to these securitized narratives, specifically the potential for co-existence with disease, is seen as failure, while tacitly accepted for some tree health issues. Examples include Dutch elm disease, where no solution has been found (Harwood et al. 2011), or knopper gall, where the issue is seen as minor. Porth et al. (2015 and this volume) question the appropriateness of an emergency modality to managing tree health issues. Drawing on lived human experience, they propose a more open approach that would promote trust and foster biosecure citizenship.

With much work focusing on the consequences, rather than the causes of tree health issues, this emphasis is suggestive of a realization that the causes are so complex that to control all human and non-human factors would be beyond any capacity to act. As the number of 'threats' to tree health increases, the causes and consequences of tree health issues become unmanageable and uncontainable. We need, therefore to think differently and imagine alternatives (Atchison & Head 2013; Barker 2010; Hinchliffe

et al. 2013). This chapter responds to the challenge by introducing theories from human geography, science and technology studies (STS) and the environmental humanities on human and non-human relations that propose a shift away from human exceptionalism (Bastian 2016). Such an approach involves unsettling the existing ways of doing tree health research and enables us to question notions of what constitutes healthy and unhealthy and the potential to research *with* rather than *on* trees, fungi and beetles (Bastian et al. 2017).

1.3 PuRpOsE: researching acute oak decline

This chapter is based on the work of the PuRpOsE (Protecting Oak Ecosystems) project[i], which investigates the context of Acute Oak Decline (AOD). AOD is a syndrome that was first described by Denman et al. (2014). A great deal of uncertainty surrounds AOD, though symptoms include: stem bleeds that are associated with two previously unknown bacteria; dieback of branches in the crown of the tree; and, in some trees affected by stem bleeds, the presence of the oak jewel beetle, an *Agrilus* beetle that has long been associated with old oak trees. Other environmental factors such as drought are thought to be involved, but the relationships are not clear. Affected trees appear to go through cycles of symptoms and recovery. Some trees die suddenly, while others recover. Our multi-disciplinary PuRpOsE project aims to address some of those unknowns by looking more broadly at the context of affected trees to understand the factors that put trees at risk, mapping the risk of oak trees to AOD when taking into account climate and soil data and other factors that may affect oak health in the future. Imagining a future where oak decline will be widespread, researchers are investigating alternative tree species to understand which of these could replace oaks in terms of the ecosystem services they currently

provide. These results all feed into engagement with stakeholders to develop adaptive or mitigating tree health management practices.

Underpinning all of this, we recognise AOD as a loose and undefined syndrome – entangling trees, invertebrates, bacteria, water, humans and others – which offers an apt case study through which to begin investigating the more-than-human worlds of tree health. This marks the beginning of a turning point in tree health management by commencing the work of re-connecting humans and non-humans in AOD and revealing the possibility of "a more relational, less managerial alternative to biosecurity" (Nading 2013, p.68).

2. Current theorizations: towards a more-than-human approach to tree health

We have already established that plants are challenging to think with and that ambiguity surrounds what constitutes health or successful management. These issues have been compounded by tight legislation and a desire to biosecure space. Whilst tree health has largely been the preserve of the natural sciences, we use this section to introduce natural scientists, foresters, plant pathologists and others to the social sciences and environmental humanities and explore the implications of the false nature/culture binary.

2.1 Nature-society relations

There has been a long-standing social science interest in how non-humans and their lives are understood and valued by humans (Castree 2013). Beginning with Arne Naess's 'Deep Ecology' understanding of ecological interdependence (Luke 2002)

and moving through David Abram's (1997) theorization of embodied and affective engagement with more-than-human worlds in the mid-1990s, there has been an academic movement towards the recognition of the perspectives of non-humans. In human geography, researchers have been examining the interconnections between nature and society and how they differ culturally and spatially. In acknowledging the active role of non-humans in shaping the world, researchers have examined the politics, histories and geographies of nature (Hinchliffe 2007). Here nature is no longer regarded as passive, static and mute. Instead, the non-human world resists and unsettles. In her book *Hybrid Geographies*, Sarah Whatmore (2002, p.3) advocates for a more-than-human approach to understanding how the world is made and re-made, whereby "other modes of travelling through the heterogeneous entanglements of social life" are explored. Such approaches, Whatmore suggests, "attend closely to the rich array of the senses, dispositions, capabilities and potentialities of all manner of social objects and forces assembled through, and involved in, the co-fabrication of socio-material worlds" (2006, p.604). A key thinker from STS, Bruno Latour has influenced research in this area on 'matter', arguing for researchers to attend to *all* participants that "are gathered in a thing to make it exist and maintain its existence" (2004, p.246). This thinking is useful in understanding trees in the context of tree health. Rather than viewing trees merely as natural resources, they "become again things, mediating, assembling, gathering many more folds" (2004, p.248). Latour's work resonates with changes in the field of human geography towards more fully understanding the 'material' world, with Hinchliffe (2008) suggesting that topics become much more interesting when we include non-humans. Jones and Cloke expand this further in their book *Tree Cultures* (2002, p.1), in which they argue that "nature-society relations are continually unfolding in the contexts of specific places,

in which meanings arise from particular interactions between different assemblages of social, cultural and natural elements". Feminist STS scholar Donna Haraway (2008) has been instrumental in making sense of these encounters between humans and non-humans. She suggests that when people are 'in touch' with things – in her example she talks about dogs – then people begin to care for and develop a sense of 'response-ability' for them. This is echoed in the work of feminist theorists by notions of the ethics of care, particularly developed in the area of human-animal relations in the work of Gruen (2015) and Donovan and Adams (2007). In the next section, we discuss recent research on human and non-human entanglements in the context of disease.

2.2 Disease: entanglements of humans and non-humans

Defining health as "the combination of practice and epistemology by which people confront *disease*, the manifestation of symptoms associated with biophysical disorder" (Nading 2013, p.60), we witness the entangled relationship between humans and non-humans. In the biological sciences, a disease triangle shows the combination of pest/pathogen, host and environment in which disease manifests (McNew 1960). There is no mention of human agency. Instead, plant diseases are explained as the result of pathogens that can be biotic, such as fungi, nematodes, bacteria, viruses, and/or abiotic factors, such as environmental conditions relating to temperature, moisture, light and chemicals (Agrios 2005; Baudoin 2007). Such pests and pathogens have found a susceptible host and a favourable environment. Plant disease management is offered as the solution to reduce the damage caused by disease, with diagnosis – the identification of the correct pathogen – being key to any management strategy.

The identification of insects and bacteria as pests and pathogens, and the accompanying securitised language of threat, attack and security, has led many people – including scientists – to "treat [pests and diseases] as Others, objects of cultural scorn and as subjects of detached strategies of technological control" (Nading 2013, p.61) and human and non-human relations are regarded as pathological rather than normal. This approach both in the UK and elsewhere has led scholars in the humanities and social sciences to question which bodies and lives are fostered, protected, managed, threatened or killed (Haraway 2008; Collard 2012). In the case of tree health, the complexity of control (Atchison 2015) and "this ambivalent interdependence between life and death, between co-existence and instrumental relations" (Beisel et al. 2013, p.10) has yet to be fully discussed.

In the face of such a legacy of scientific plant health research and technical management, we challenge the contemporary disease paradigm by re-imagining the disease triangle as an entanglement of humans and non-humans that 'live with' rather than manage against 'disease'. This more-than-human approach acknowledges: that humans, non-humans and their disease relations are "anything but static" (Nading 2013, p.63); that in order to take this approach seriously researchers and others must "step away from the modernist dismissal of nature and non-humans as anything but resources" (Bastian et al. 2017, p.2); that this way of working and thinking means "we may envisage a different biopolitics of living with these plants" (Atchison & Head 2013, p.956); and finally, that researchers are not always 'free' to think with plants because of the complicated and contradictory notions of health and management, the

desire to biosecure space, the need for impact agendas and to acquire research funding.

A body of work around biosecurity and invasive species is emerging with attention being paid to opening up to include humans, and management/biosecurity programmes (Barker 2008). Two studies in particular inform our thinking here. We address each one in turn, before employing them both in our discussion of methodological approaches to work of this nature. First, Hinchliffe et al.'s novel theorization of 'borderlands' in relation to the entanglements and intensities that constitute animal health issues, whereby "disease is understood as relational: that is, both integral to, and always part of, an entangled interplay of environments, hosts, pathogens and humans" (2013, p.532). Here, "disease and the responses to it are marked more by intense entanglements of hosts, environments and institutions than a simple geometry of fixed objects invading pure, or more or less resilient, spaces" (2013, p.540). Whilst biosecurity and keeping disease 'out' is not the focus of our chapter, we do want to think differently about disease, specifically because disease does not neatly inhabit spatial and temporal borders.

Second, we are inspired by Atchison and Head's work on plants where they draw on the work of feminist theorists (Bennett 2009; Haraway 2008) to challenge Western colonial thought in terms of conceptualisation of the body and the individual and "discourses of defence, invasion, and fear" (2013, p.953). They instead acknowledge "the planty subjects with whom we cohabit, as well as greater ethical engagement with questions of our mutual living and dying" (Atchison & Head 2013, p.965).

Writing about invasion, Atchison and Head describe it as "a relational process in which many different lives – human and non-human – are embedded together" (2013, p.952). In her work on the control of invasive plants in Australia, Atchison reveals the range of practices involved in eradication, and highlights the urgent need to pay closer attention to the humans and non-humans that form 'biocommunities'. Biosecurity thus gives life to new entanglements, with plants resisting control and new collaborations emerging both between humans and with non-humans (Atchison 2015). Research in this area must interrogate this complexity and critique established modes of diagnosis, management, and desirable future(s). One way of achieving this, as advocated by Atchison who draws on wider geographical interests in the nature of scientific experiment (Davies 2013; Greenhough 2012), is to consider biosecurity as experimentation, whereby "scientists, field practitioners, human and nonhuman together enact biosecurity as an experiment in co-existence through embodied learning and adjustment" (2015, p.1709). We respond to these theoretical challenges by considering how researchers in a multidisciplinary team might make a step change to embrace non-humans in the practice of their work.

3. In conversation with oak trees

3.1 Approaches to more-than-human participation

Whilst ethnographic methods have been favoured by the aforementioned researchers in order to reveal what is taking place (Nading 2013; Atchison 2015; Hinchliffe et al. 2013), we have been inspired by Bastian's (2017) 'speculative experiment' in more-than-human participatory research. Bringing traditional participatory research

methods together with more-than-human research, Bastian, her colleagues, and their 'fellow enquirers' – dogs, bees, water and trees – ask:

> What might it mean to invite 'the more-than-human' to be an active participant, and even partner, in research? How are prevailing ways of conceiving research in terms of issues of knowledge, ethics, consent and anonymity challenged and transformed when we think of the more-than-human as a partner in research? How might it be possible to transform existing frameworks, practices and approaches to research? What would this transformed research look like? (Bastian et al. 2017, p.1)

In asking what matters to non-humans, Bastian et al. used a series of workshops entitled 'In conversation with…' to cross borders and connect human and non-human worlds. These events focused on being in conversation with non-humans (bees, dogs, water and trees) and those humans who have a close relationship to them, either through work or leisure. To do this effectively, humans and non-humans have to be given equal weight, "in ways that are situated, embodied and non-homogenising" (Bastian et al. 2017, p.3). These speculative experiments were about interrogating the issues of power and agency central to traditional participatory research. We employed Bastian et al.'s more-than-human approach in a two-day event 'In conversation with oak trees' in order to attune ourselves to the trees in our research and explore new ways of working and thinking differently about tree health. The event took place in September 2016 at Gilwell Park, a mixed woodland park, and in Epping Forest, North London.

Using diverse ways of knowing to engage with non-humans, our 'In conversation with oak trees' event brought to life Atchison's (2015, p.1699) observation that "A framework of experiment in co-existence […] offers an opportunity to move beyond a human interventionist debate and thus has the potential to re-engage concerned publics and scientists alike in the ongoing challenge of living with invasive species". Through our experiment, we expanded Hinchliffe et al.'s work that "engage[s] with infected life as part of a *borderlands* within a mutable disease environment" (2013, p.532) and its focus on the fluid and interactive spatialisation of disease and intense entanglements, in order to consider breaking down boundaries of expertise, power relations, seniority, hierarchies and disciplines associated with particular roles and activities in a research project that can stifle the possibility of researching and living differently. We also extended Atchison and Head's discussion of 'relational intensions' (2013, p.953), which allow us to access new perspectives on established processes and spaces, acknowledges uncertainty in regulation and risk, attends to the temporalities of invasion, and understands the specificities of each species. We examined more fully how humans and non-humans mingle in a research context focused on 'infected life', mounting a serious challenge to prevailing notions of tree health management, asking how we might transform our understanding of oak ecosystems and AOD, and transforming ourselves as researchers.

3.2 The participants and new ways of working

The event brought together a subset of the researchers involved in the PuRpOsE project. We asked that each project work package (soil analysis, risk mapping, ecosystem services, and narratives) was represented, giving participants with backgrounds in microbiology, molecular biology, soil science, eco-hydrology,

community ecology, woodland ecology, silviculture, cultural geography, and political ecology at different levels of seniority thereby making this event truly interdisciplinary. This also served to recognise the different mandates of the organisations involved in the research. In total there were 14 participants, including the three organisers. In addition, a woodland manager, a conservation manager and a wood turner joined the conversation at different times. Non-human participants were oak trees and their surrounding contexts at Gilwell Park and Epping Forest.

Rather than using conventional scientific knowledge-exchange practices through conference-style presentations, the event involved practices of attunement, listening, attention, conversation, encounter, and storytelling. Box 11.1 lists the activities and describes their intended outcomes. The activities enabled humans and non-humans to be in conversation in the borderlands at a range of intensities, such as moments of being in intense relation with trees in a diversity of 'states', encountering infected life beyond the lab, and in quiet contemplation at dawn or via textual accounts.

Box 11.1: Outline of the 'In conversation with' workshop

	Session	Activity	Intent
Day one	Introduction to the workshop	Introduction of key concepts and agreement on principles of engagement with (non-)humans throughout the event.	Setting the scene for a different mode of working.
	Tales of trees	Exploration of some preparation questions (for example: what kind of tree would you be?) and a visit to Epping forest with two forest managers discussing their approach to tree health management and AOD and to observe oak trees in context, encountering infected life beyond the lab.	Moving through and beyond anthropomorphism and using story-telling for a location-focussed encounter between (oak) trees and humans.
	Handling wood, a story from a local wood turner	A wood turner talked about his journey into wood and presented bowls made of different woods.	Understanding human cultural connections with trees through viewing the life of a tree from within.
Day two	Good morning with oak trees	Reading of a short extract from the poem by Alice Oswald "Tithonus: 46 Minutes in the Life of the Dawn", followed by an invitation to spend some time alone with trees and engage senses beyond the visual	Giving an opportunity for intense attention to difference and to develop attunement.
	Reflections so far	Facilitated conversation that invited oral reflections on developing more-than-human understandings.	Bringing out reflections on more-than-human approaches.
	Methodologies of PuRpOsE	5-minute preparation and a short pitch by everyone of the methods (to be) used in their part of the PuRpOsE project.	Building understanding across disciplines.
	'Silly questions'	Discussion based on post-it notes capturing a silly question or particular interest from each individual.	Building a critical understanding informed by more-than-human thinking.
	Narratives of Oak tree health and AOD	Narratives of AOD were created in groups using available materials (pictures, natural materials, the site archives) and presented to the group in whichever way seemed appropriate (acting, singing, presenting, walking, et cetera).	Moving beyond scientific narratives of disease and gain greater understanding of cultural and historical contexts.
	Lessons learned and the project work packages	Meeting in work package groups to bring more-than-human understandings to working with trees into the research going forward.	Moving the abstract discussions of earlier in the event into planning for future work.

	Revisiting principles of engagement with (non-)humans	Revisiting the principles we developed on day one based on our conversations with oak trees to form a set of principles to be used across the project.	Establishing consensus and giving a concrete outcome to the event.

3.3 The start of a conversation

Before meeting at Gilwell Park, the participants received a very brief outline of the two-day programme via email and were asked to be willing to engage in an experiment. Each person was asked to do some preparatory work in thinking about their relationships with trees by answering a set of questions. Examples were: how did they see their expertise and role within the project? If they were a tree what kind of tree would they be and why? What did they think about AOD? These responses were used in the event as a way to get to know each other.

At the outset of the workshop participants arrived at Gilwell Park with a sense of apprehension as no one really knew what was going to happen. Participants said they were "up for joining in with whatever was planned" and expressed their appreciation for being "out of the office" in the wooded surroundings of Gilwell Park. The organisers (authors of this chapter) then opened the event with a short presentation about two important concepts that had inspired the design of the event: "borderlands of health and ill-health" (Hinchliffe et al. 2013; Hinchliffe & Bingham 2008) and a 'more-than-human' approach to research (Bastian et al. 2017). Sharing our activities for the next two days (detailed in Box 11.1), we posed two overarching questions to participants: how might we transform our understanding of oak ecosystems and AOD, and what might it mean to *research with* trees and *live with* disease?

3.4 The conversations

In conversation with Epping Forest – Tree histories

Before visiting the oak trees of Epping Forest, we spent some time sharing our responses to questions designed to facilitate thinking about how we relate to trees,

with discussion focused on the how the response of a tree might differ from that of a human. With these thoughts in mind, we went on a walk with the woodland and conservation managers of Epping Forest to give us an insight into the lives of oak trees. The visit gave voice to the historic management practices in Epping Forest. From around 1365 (Dagley & Burman 1996) branches were considered communal and were pollarded (cut back to the trunk) on a 13-15 year cycle by local people. However in 1878 the Epping Forest Act prohibited further pollarding and by the beginning of the twentieth century all such activity ceased (Dagley & Burman 1996). We were introduced to a tree that was a composite of a tree trunk of over 400 years old and branches that were around 200 years old illustrating the tree as a fluid shape-shifter: "While the trunk of the tree ages, its canopy is rejuvenated and the life of the tree can be extended hugely, often by many centuries" (Dagley 2016). That tree embodied its historic relation with humans, the practice of pollarding illustrating how the different temporal resolutions of trees and humans collide.

Over time, due to the lack of pollarding and environmental stresses (such as compaction), several of the veteran trees in the Forest are suffering ill health. This has had severe implications for current management strategies. These trees now have very large limbs of around 200 years old and stems that have hollowed over time, with increased risk for humans as well as the trees themselves as the limbs are very heavy and not well supported by the trunk. Since the 1980s, the forest management team have reintroduced pollarding activities and carefully monitoring how best to support the trees to keep as many alive as possible. The forest managers take into account the climatic conditions in current and previous years in order to identify the level of stress a tree is likely to be under. These management practices suggest an attunement to the

needs of the tree and a relationship between humans and non-humans of interdependent care.

In conversation with wooden bowls

Before dinner on the first night, the voices of different kinds of wood were given life by a wood turner. He had brought with him a large selection of bowls made from different tree species. Each bowl had a different story to tell. He talked about their different colours, textures, and their different uses. One bowl showed how the health of the tree was represented in the wood with a fungus affecting the colour and structure in a way that told an additional story line that was interwoven with the fabric of the tree (See figure 11.1). The wood turner emphasised that only through hands-on experience was he able to really get to know the different species of trees and how to manage their wooded 'personalities'.

Figure 11.1. A turned bowl showing fungal spalting.

In conversation with human experts

We returned to the overarching question on how we might transform our understanding of oak ecosystems and AOD in the 'Silly Questions' activity. Participants of the PuRpOsE research team brought their own expertise and experience of working with tree health into the conversation. The activity offered a space in which people could query their own, and other peoples' expertise as well as reflect on how their perspective on AOD had changed.

Participants were given time to reflect individually and write their question or reflection on a piece of paper which was then added to the wall. The questions were then grouped into themes and some were discussed in small groups. This exercise gave rise to a set of questions related to the different roles of organisms in the context of AOD. One researcher posed that "Pathogens are just a member of the community", a reflection on the value judgement put on pathogens in the story of tree health. Another point was raised when referring to AOD as a "disease created out of natural ecology - not [an issue of] a non-native invasion/poor sanitation". This reflects that disease may not be easily preventable when it is related to the host and environment. Another participant asked "If the abiotic stress mechanism is the problem, what other symptoms are occurring in oak trees and oak ecosystems?" and "Time scale of beetle vs bleeding - is it not associated or causal?" These questions point to the current uncertainty in the understanding of the assemblage of AOD and to the complexity and temporality of organisms within the disease triangle giving rise to new questions for investigation.

3.5 Using different senses: being in intense relations

The organisers observed how participants used different senses during each activity and through this started to build an intense relation with their surroundings. In the walk in Epping Forest participants moved through the landscape looking for symptoms of health and ill health. When we came upon a tree with symptoms of the beetle and bleeds, a small group of participants rushed to the tree itself to observe it closely, feel the bark, listen to the cavities underneath it by knocking on the bark and discussing the spatial location and context of this unhealthy tree (see figure 11.2). Others remained at a distance at first, but after the forest manager had stopped talking they also went to look at the symptoms more closely. When later asked why people rushed to the tree that showed symptoms, participants said they were intrigued by these signs of disease 'in the flesh'.

Figure 11.2. The PuRpOsE team inspects a tree with AOD symptoms.

Participants themselves were asked to reflect on using different senses during the 'Reflections so far' activity on the second day. Participants revealed how they had tried to connect with a tree's perspective during the 'Good morning with oak trees' activity, namely what it could be like to be a tree, and how trees sensed noise, sunlight

and space. One participant highlighted the sense of feeling and touch of sunlight on the skin and wondered whether a tree would feel that change from night to day as a good thing, as food would be able to be produced through photosynthesis. Another reflected on the sense of space that a tree takes up and decided to experience this by walking the circumference of the canopy and the trunk. Another reflected on the noise of the landscape, and wondered whether trees experience noise? They themselves were very aware of the noise of the motorway nearby, although another participant reflected on being a source of noise themselves when they became aware that they were sharing the space with a squirrel.

3.6 Our principles for engagement with oak ecosystems

Following (Bastian et al. 2017) and feminist traditions in the ethics of care (Gruen 2015; Donovan & Adams 2007), we asked what it might mean to *research with* trees and *live with* disease. To bring this into our ways of working in the PuRpOsE project, we chose to develop a set of principles of engagement with oak ecosystems, relating both to humans and non-humans. We agreed on a set of principles at the start of our event, which were refined at the end based on our conversations with oak trees. Our 'Principles of Engagement' (see Box 11.2) offer a clear outcome from our experiment and afford other researchers some insight into how we might now work and think differently about tree health.

Box 11.2: Principles of Engagement (underlined text was added at the end of the event)

Engagement with Humans

- Respectful listening – Preparedness for different understandings;
- Looking after each other – To be inclusive of all abilities and career levels;
- Avoiding disturbing others with distractions;
- Ensuring that those who want to contribute can speak;
- Biosecurity: Taking care to not spread disease and to help non-humans.

Engagement with Non-Humans

- Keep disturbance to a minimum;
- To be respectful at all times;
- To appreciate all trees, including young saplings that may become veteran trees;
- Encourage the use of other senses and attunement to the non-human;
- Consider temporality, the past and future as well as the present;
- Consider geographic scales in addition to the one in which you work;
- Consider the community of non-humans rather than the individual trees studied.

4. Becoming differently human

In this chapter, we have moved beyond an active, securitised and human-centric management paradigm towards one that is more holistic, where the voice and agency of non-humans is acknowledged and valued and in which human agency in determining the health of non-human entities is more fully accounted for. We now discuss the implications of this work in adopting differently human perspectives.

Being in conversation with oak trees gave us the opportunity to explore new ways of working and thinking in relation to tree health. Whilst the immersive activity of being in the company of trees discussed in this chapter is in its infancy, our conversations in Epping Forest largely related to attuning ourselves to trees, suspending professional

scientific identities and drawing other aspects of self forward to become 'differently human'. As we reveal below, time, visceral and embodied experiences, becoming care-ful, and re-imagining our research subjects, are important aspects of any attempt to develop more 'concrete' ways of working with plants or the more-than-human more generally.

Human identities

Being in close proximity to trees meant many participants were able to move beyond professional and expert modes of being, creating encounters in the borderlands of academic disciplines and interests. Several participants mentioned that they were aware they had been listening to the forest managers with their 'project hat' on. By the morning of the second day some participants began to feel that they were participating more directly with the trees and the Forest. Their perspective as professional scientists had morphed into a conversation between humans and non-humans.

Visceral and embodied experiences

Going into the woods at dawn and sharing the experiences of the wood turner and woodland managers afforded participants many opportunities for different human experiences and to draw those into their professional lives. As a result, new ways of being, doing and thinking emerged in relation to our research, and also to our personal and collective engagements with trees. We were aware that some participants found it easier than others to access visceral and embodied experiences. To this end, we sought activities that focussed attention on senses beyond the anthropocentric concentration on the visual, in the half dark, allowing touch and hearing to take over

the privilege that daylight gives to the visual. Being in the woods for no purpose other than to experience being *with* trees also allowed for visceral and embodied experiences that are otherwise usually marginalised in the research process.

Time

Becoming attuned to oak ecosystems and gaining a deeper understanding of the history, management practices, and contexts of oak ecosystems is a slow process. This reflects tree time itself as much slower than human time. Our event gave us the time and space to reveal new histories involving politics, economics and attitudes to trees. One of the most obvious illustrations of this were the ancient oaks of Epping Forest, for whom management changes 200 years ago are still playing out and impacting on their vulnerability to ill health in the present.

Becoming care-ful

Through different embodied experiences with trees, matters of fact were transformed into matters of care: "transforming things into matters of care is a way of relating to them, of inevitably becoming affected by them, and by modifying their potential to affect others" (de la Bellacasa 2011, p.99). Working in a multi-disciplinary group that was (un)comfortable with unfamiliar ways of working had a way of allowing participants to not only step outside their professional boundaries, but to also revitalise their expertise by uncovering care within their disciplines. We were reminded that ecology does not take sides in competition between species, or that a long decline may not necessarily be an undesirable state for a tree.

Re-imagining our research subjects

The event inspired some new ways of questioning, specifically giving space for some fundamental reflections on AOD and tree management, and freedom to contemplate new thoughts resulting from the experience with trees. Participants were able to ask new and difficult questions in the 'Silly Questions' and narrative development sessions, which brought to the fore the uncertainty that many of the team were feeling about the actuality of AOD. During the event our research 'subject', Acute Oak Decline, was identified as a word, an idea, a challenge, a question, a health issue, an imagined syndrome, and a physical manifestation. Discussing and being in touch with oak trees with AOD symptoms, and acknowledging this uncertainty, enabled us to situate AOD within oak health issues more generally. This re-imagining/re-positioning felt like a more comfortable place from which to address oak health, rather than containing it within the conventional boundaries of pests and disease.

5. Non-human perspectives at work in tree health research

'In conversation with oak trees' was a first step towards enacting a more-than-human approach in tree heath. Our success in uncovering and accessing attunement to the more-than-human with a group of researchers in a multidisciplinary team illustrates that we have made some significant progress. The challenge now is to find the language and practices to bring this research into policy and practice arenas. Following our newly defined principles of engagement this will involve putting management and policy actors into conversation with trees at future workshops.

Shifts need to be made not only in attitudes to trees and other organisms, but also to the way that biosecurity practice views scientific knowledge. If scientific knowledge

can be regarded as referential, capable of shifting and changing, then biosecurity practice can shift more readily in response. We have identified trees as fluid shape shifters, where health and ill health are relational rather than distinct and separate states. A very simple recognition of this would be to avoid using individual trees as units of analysis.

In on-the-ground management, direct caring relationships with trees already exist and were clearly evidenced by the Epping Forest managers in their consideration of the location and context of each tree and the stresses that are at play. Drawing this care to the fore means building attunement by considering the borderlands of trees: the fuzzy borderlands of individuals and community; between species; between timescales; across states of being, health and ill health, and ways of relating to the world. In practice this means stepping out of the lab, stepping out of disciplinary boundaries and invite more-than-human perspectives to influence our work and help us think differently.

By taking non-human life and the entanglements of human/non-humans seriously, the complexity and the role of humans in the co-creation of disease can be addressed. The work presented here, and existing research on the co-creation of disease, borderlands, and intentional relationalities, make it possible to: first, acknowledge the human created factors in tree ill health such as human global trade and movement; and second, explore the potential to live *with* ill health, offering a more viable option to address those factors which it is not possible to fix. Indeed, the notion of *living with* disease is not about doing nothing, rather it is about re-thinking our human notions of time, challenged by the lower temporal resolution of trees and the higher temporal

resolution of bacteria, and the ways in which humans force trees to live truncated and accelerated lives in order to become more resilient. Taking these complexities into account requires a reworking of the neat traditional disease triangle into a web of entanglement. Time and temporality, space and relations between trees add further dimensions. The presence of humans in the co-creation of ill-health becomes an under and over-lying layer. By attuning ourselves to these new possibilities and imagining alternative futures, we challenge business as usual in tree health research.

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