

“My garden is the one with no trees:” Residential Lived Experiences of the 2012 Asian Longhorn Beetle Eradication Programme in Kent, England

Emily F. Porth¹ · Norman Dandy² · Mariella Marzano³

Published online: 9 October 2015
© Crown Copyright 2015

Abstract Studies on the management of biosecurity outbreaks have increased in recent years. Whether these outbreaks affect plant, animal, or human health, there is a strong tendency to employ an “emergency modality” management approach which focuses on speedy eradication and containment. However, there is conflict between rapid response management and prescribed best practices for stakeholder engagement. To explore these tensions, we focus on the 2012 Asian longhorn beetle outbreak and eradication programme in Kent, England. Hailed as a success story by policy leaders, this case study is explored using qualitative research with residents who were directly affected by the eradication. By considering the specific impacts of tree health management on a local level, we recommend that outbreak management programmes take an “open” approach (Leach 2010). This includes focusing on good communication and long term democratic engagement, which are crucial for cultivating trust and promoting biosecure citizenship.

Keywords Outbreak management · Stakeholder engagement · Introduced species · Tree health · Qualitative research · Southeastern England

Introduction

The discovery of an introduced insect or pathogen species in a forested area often triggers dramatic and rapid environmental management responses that are similar to those used to manage human or animal health epidemics. These responses reflect a need to act quickly to contain the spread of the problem species. The drivers of, and narratives behind, such “rapid responses” (Mackenzie and Larson 2010) to an outbreak are increasingly well documented (e.g., Collier and Lakoff 2008; Leach *et al.* 2010) and by default emphasise the perceived widespread, or global, scale of potential impacts (Perrings *et al.* 2002; Collier and Lakoff 2008). Management success is consequently judged by the avoidance or minimisation of these large scale impacts.

There is, however, significant tension between the needs of local communities and ecosystems and the objectives of this globally justified “emergency modality” (Collier and Lakoff 2008) approach to managing outbreaks, which is characterised by the autocratic implementation of a set short-term management protocol. Not only are there challenges in implementing accepted “best practice” stakeholder engagement under time-constraints (Mackenzie and Larson 2010), but prioritising global needs over local needs can have important consequences.

Through a case-study investigation of the eradication programme undertaken in response to the discovery of Asian longhorn beetles (*ALB*, *Anoplophora glabripennis*) in Kent, England, in 2012, this paper explores the impacts on local residents along with the tension between rapid response biosecurity management and what is accepted as “best practice” in communication and public engagement literature. Given the problem of identifying the local impacts of infestation and eradication (Palmer *et al.* 2014) we examine the eradication programme as an embedded element of the outbreak.

✉ Norman Dandy
N.Dandy@exeter.ac.uk

¹ Forest Research, Alice Holt Lodge, Farnham, Surrey, UK
² Centre for Rural Policy Research, Department of Politics, University of Exeter, Exeter, UK
³ Forest Research, Northern Research Station, Roslin, Midlothian, UK

Focusing on residents' experiences of their interactions with the outbreak management team and the impacts of the eradication programme, we effectively highlight the local nature of such impacts and how they can come into conflict with the goals of rapid response management. We also include perspectives from the outbreak management team in order to provide context. Through this approach we aim to give voice (Cheng *et al.* 2003) to a stakeholder group – in this case, affected residents – who have only rarely had the opportunity to participate in evaluative research after being involved in such environmental management (Palmer *et al.* 2014).

The ever-increasing movement of goods and people worldwide has resulted in the introduction of many species to new environments (Brasier 2008; Hulme *et al.* 2008; Webber 2010). Human health problems, such as pandemics, are similarly often attributed to the processes of globalisation (Collier and Lakoff 2008; Leach *et al.* 2010). These introductions can have devastating impacts on local ecosystems and on the lives of human and nonhuman inhabitants. They can also be in conflict with biological diversity (Rodríguez-Labajos *et al.* 2009; Buller 2013). Significant effort has been put into preventing plant pest and pathogen introductions through border controls, inspection and regulation, as well as closer management and monitoring of major pathways, including wood packaging (Haaack *et al.* 2010, Brockerhoff *et al.* 2006; Ciesla 2011) and live plants (USDA 2005; EPPO 2012; Leibhold *et al.* 2012). However, factors such as non-compliance to these regulations, as well as limited resources at borders to carry out pest risk analysis and detect “alien” species, mean that such species are still regularly introduced (Webber 2010).

These introductions can unfold into “outbreaks” when species become established in an area and are (potentially) invasive. Once a species has spread widely into a new environment, eradication can be very difficult, if not impossible. Regardless of whether an outbreak affects plant, animal, or human health, there is a strong tendency to employ a “rapid response” or “emergency modality” management approach with the goal of containment and eradication. This approach is usually based on established best practice protocols (Mumford 2013) that have been developed strategically and are based on the experience of those managing similar outbreaks elsewhere.

Emergency modality approaches are advantageous because of their speed and applicability to multiple contexts. It has also been observed that such management techniques are attractive because they generate significant public attention and are easier to implement because they can be applied “independently of political context and socioeconomic conditions”, thus avoiding longer-term structural problems (Collier and Lakoff 2008:18) and massively reducing the scale of intervention needed. This has led to some criticism of rapid response approaches for being “acute, short-term, [and] focused on

alleviating what is conceived as a temporally circumscribed event,” rather than acting as a “social intervention” that has a long-term approach focused on community wellbeing (Collier and Lakoff 2008: 19).

In recent years there have been increased efforts at public education and community engagement regarding the introduction of non-native species. However, during an outbreak there is often a significant distance between rapid emergency responses and established best-practice stakeholder engagement in environmental management (for instance, Wynne 1989). Reed (2008) surveys the evidence relating to stakeholder engagement and notes the need for it to be a participatory process that emphasises empowerment, equity, trust, and learning. He also concludes that engagement should occur as early as possible in a management effort, proceed in a systematic fashion (which is comprehensively inclusive of all relevant stakeholders), and be facilitated appropriately (Reed 2008). Chase *et al.* (2004) identified that best-practice stakeholder involvement should be based on scientific information and have a tangible impact on the decision-making process. Stakeholders should also be treated fairly and programmes should promote communication and learning (2004). Studies highlight the need to tailor management approaches to the context of the outbreak, which can vary significantly. The perceived fairness and inclusiveness of engagement initiatives have emerged as crucial to nurturing trust in such situations: actors may not trust each other, but they want to trust the process, regardless of the outcome (Mackenzie and Larson 2010).

In their discussion of the management of Emerald Ash Borer (*Agilus planipennis*) in Canada, Mackenzie and Larson (2010) illustrate the challenges of adhering to “best practice” for stakeholder participation within rapid response situations. Even when there is a management plan in place for outbreak situations there is no guarantee that the outcome will be successful. They identify three main challenges to engagement in emergency modality approaches: a lack of time to develop interpersonal trust with the local community; a limited amount of scientific information to share with the public in order to allow for effective participation; and that government agencies may feel the need to act quickly due, for example, to political pressures and minimise stakeholder involvement entirely because they recognise that it requires time to be done well (2010). The challenges of public outreach were also particularly evident in the case of the 2009 swine flu outbreak in the UK. Chambers *et al.* present a critical analysis of the way the outbreak was handled, concluding that “the imposition of a single national approach to managing the pandemic and a disregard for the role of local authorities seriously impaired the ability of local agencies to respond in a flexible, timely, and pragmatic way to the rapidly emerging situation” (2012: 737).

Those managing outbreaks also have specific expectations of affected communities. Often, as in the case of the swine flu pandemic, there is a simple, overarching expectation that instructions will be followed without question, even when others involved feel they have valuable knowledge or ideas that may change the course of action (Wynne 1989). Whilst there is a growing recognition that in these situations it is often more valuable for power to be distributed and expertise to be accepted as both plural and negotiable (Chambers *et al.* 2012: 738), there is often still an instinct for those governing outbreaks to “close-down” and emphasise short-term stability during the management programme (Leach *et al.* 2010).

Background: the Asian Longhorn Beetle Outbreak in England

The Asian longhorn beetle (ALB, *Anoplophora glabripennis*) is a wood boring insect native to eastern Asia that can cause widespread tree mortality (Macleod *et al.* 2002). Outbreaks in China began in the 1980s when reforestation programmes planted tree species susceptible to ALB infestation; ALB favour mature broadleaved trees and can be hosted on dozens of tree species from at least 15 different families (Haack *et al.* 2010).

A single live ALB was found in the garden of a local resident on the edge of the town of Paddock Wood, Kent, in 2009. At that time plant health inspectors from the UK government’s Food and Environment Research Agency (FERA) took the beetle and surveyed trees in the immediate vicinity. They did not find any evidence of an established beetle population. Annual site visits were then conducted by Forest Research (FR) to monitor the area. It was during one of these routine surveys, in early March 2012, that FR entomologists found evidence indicating a possible ALB infestation. The presence of ALB was confirmed on 15 March 2012 and a joint Outbreak Management Board between the Forestry Commission (FC) and FERA was established on 24 March (Straw and Tilbury 2012). Although biosecurity professionals were aware of the risks posed by ALB and had intercepted a number of beetles of this species entering the UK since the late 1990s (Macleod *et al.* 2002), this case represents the first time a population had been found established in the wild in Britain.

The location at the centre of the outbreak site was a former stone import business that had regularly brought in material from China. It is considered very likely that ALB was introduced into the area through the wood packaging in which the stone was shipped. A programme of inspection and “sanitation felling” (removing and burning trees) was implemented, based on the rapid response protocol adopted for ALB outbreaks in North American (Haack *et al.* 2010; Palmer *et al.*

2014) and European contexts. All felled trees were burned to ash in a large capacity air-assisted incinerator located in the field at the centre of the outbreak area and work continued until mid-August 2012 (Fig. 1).

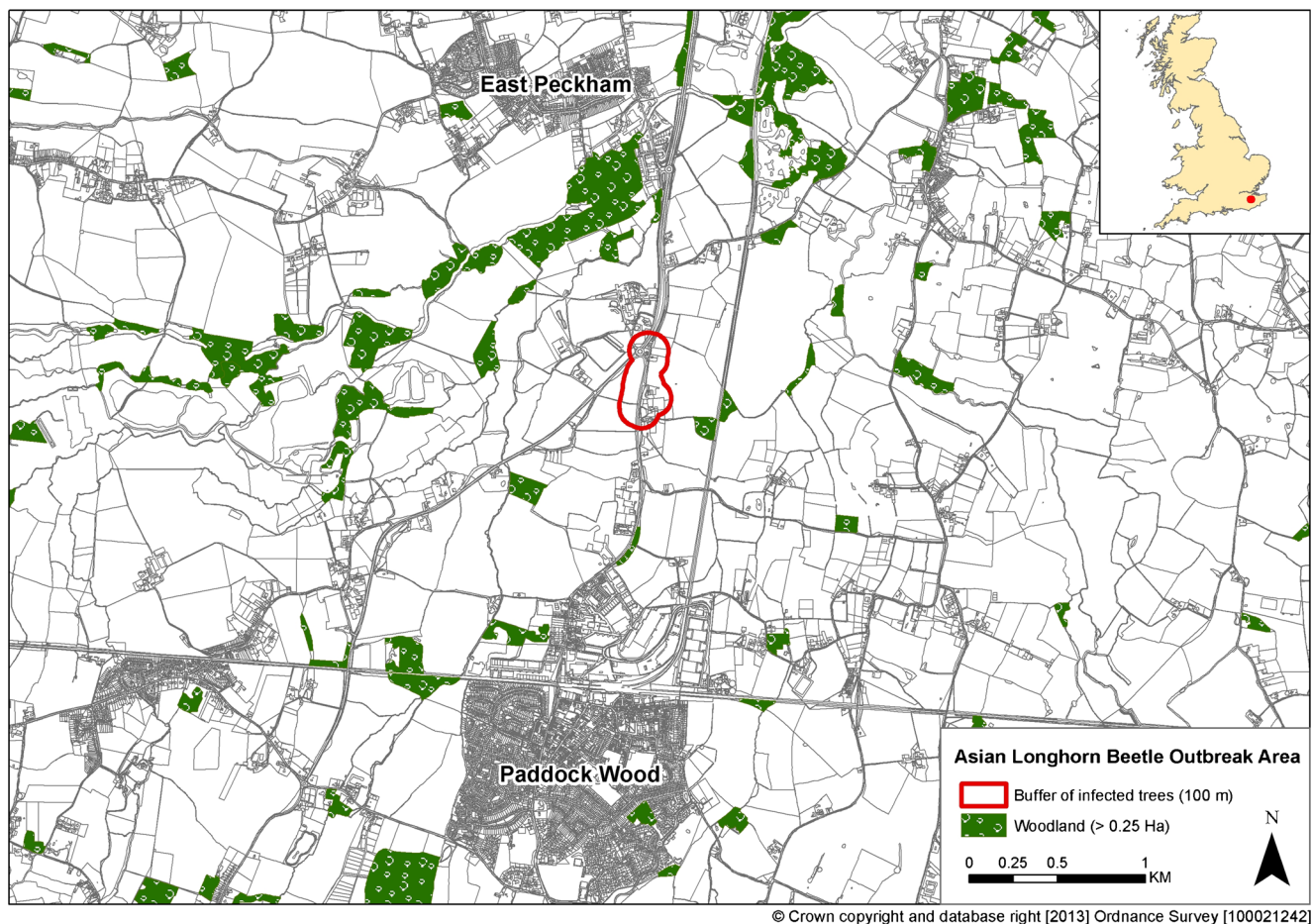
In total, 2166 trees were felled over a fourteen hectare (0.14 km²) site. This is a significant number of trees over such a small area, but relative to other tree pest outbreaks, including ALB infestations, this outbreak was very limited. For instance, ALB was found in Canada in 2003 and during the next 5 years nearly 26,000 trees were removed over 152 km² (Haack *et al.* 2010).

Initial analysis indicated the infestation had occurred in 2006 (Straw and Tilbury 2012), but further research on woody material retrieved from the site found an exit hole dated to 2003 (FR, *pers comm*). If an adult beetle exited the tree in 2003, the first eggs would have been laid on the tree in 2001, a much earlier “release date” for the beetle than initially suspected. Importantly, the management response appears to have achieved its goal of eradication.

Methods

This paper is based on qualitative data obtained through semi-structured interviews with local stakeholders. These included four residential owners (Eve, Holly, Sarah, and Michael and Rebecca¹), two small business property owners (Owen, Brian), and one landowning couple (Charles and Jane) who were directly affected by the eradication. These nine people represent the majority of those whose properties were directly affected by the outbreak (we were unable to interview one couple who often worked outside Britain). Two civil servants who played a central role in managing and implementing the eradication programme (referred to as FERA Representative and FR Representative) were also interviewed about their experiences. All of these respondents were selected because of the depth of experience they had with the outbreak and they can be considered key informants. Significant data can be generated through in-depth interviews with small samples of key informants because they occupy significant positions of expertise or have had particular experiences. Key informants thus have specialist knowledge of an issue and are able to provide high quality, information-rich data (Gilchrist and Williams 1999). Fundamentally, the depth of information gleaned through qualitative methods provides insight into how an outbreak needs to be “understood as relational; that is, both integral to, and always part of, an entangled interplay of environments, hosts, pathogens, [pests] and humans” (Hinchliffe *et al.* 2012: 2).

¹ All names have been changed to protect participants’ anonymity.



© Crown copyright and database right [2013] Ordnance Survey [100021242]

Fig. 1 A map of the outbreak area in Kent. This eradication zone is quite minimal and largely confined to the vicinity of a roundabout. (Map provided by Forest Research)

Interviews were conducted in private homes and offices, at a café in Paddock Wood, and at FR's Alice Holt Research Station in Surrey. Informed consent was obtained prior to each interview and all agreed to have the conversation documented on a digital recorder. The audio files were transcribed by a professional transcription service and checked for accuracy. Qualitative data from these interviews were analysed following a grounded theory approach (Corbin and Strauss 2008) that results in categories and explanations emerging inductively as researchers interact with the data. Significant themes and categories were identified using an open coding strategy (Robson 2002), and codes were used as labels to attach meaning to sections of data that documented interviewees' experiences of, and feelings about, the eradication programme. Quotes presented in this paper have been edited for readability.

All but one interview was carried out in May and June 2013, 8 months after the eradication programme was completed. The personal stories that emerged from these interviews provide an important glimpse into an often-neglected aspect of rapid response environmental management.

Results

Interviewees had detailed recollections of events and still had strong feelings about what they experienced during the eradication programme. In general, interviewees told a chronological story about their experience, beginning with how they found out about the ALB outbreak, and then progressing to their navigation of the management response. The three key themes that emerged from these stories in the interview data are personal experiences of 1) eradication programme implementation, 2) communication about the outbreak management, and 3) the impacts on residents' lives.

Discovering the Asian Longhorn Beetle

The first time the ALB population was discovered by residents was in 2009, 3 years prior to the outbreak that necessitated a management response.

We found [the ALB] on the driveway. Well, the dog did. She sniffed it out and found it, and then my kids were

like, “What’s that?!” So we googled it and thought, “Ah, maybe we didn’t want to find that!” We emailed Defra [Department for Environment, Food, and Rural Affairs], and it was FERA in the end... somebody rang me back and said, “Oh, that sounds exciting.” My son, being a small boy, kept it in a jam jar – thinking it might be a nice pet, obviously – and they took it away with them. It didn’t look like anything that lived in this country. You could see it was strange... the man who came to take it away just said, “Oh well, I wouldn’t worry, it’s just appeared out of a packing case. That will be it.” Eve 8/5/2013

The FERA representative who collected the insect felt more anxious about the discovery than Eve’s narrative suggests:

I had a call from a lady... to say she’d found something on her drive. She had good plant knowledge, and she worked in a garden centre nursery so she knew that it was something strange. I went straight down and had a look, and it was a beautiful female *Anoplophora glabripennis*. I then started to sweat profusely and thought, “Oh my God where’s this come from?” I looked around the garden for any sign of a new plant, but she hadn’t brought anything in... She then said the people next door import stone. The penny dropped and I went over to see the guy. I spoke to him and, worryingly, he knew quite a lot about the pest and thought he may have seen it before. FERA Representative 05/6/2013

The beetle’s discovery was not shared with others who owned adjoining properties. It was 3 years later when neighbouring residents learned that not only had a beetle been found previously, but that a wild population of Asian longhorn beetles had just been located in the same area. In a sense, therefore, there were two discoveries. Even months after the eradication programme had concluded, participants expressed frustration that they had not been told about the earlier beetle discovery.

What really annoyed us was that [Eve] found the bug in 2009, and we weren’t told. Now it’s not [Eve]’s fault because she just found the beetle; she didn’t know the consequences When we looked it up and saw the problems they’ve had in the States, and in Italy... We realised that it’s almost like somebody’s machine gunned a tree. It would have been very nice to know what was going on... The secrecy didn’t help. Michael 10/5/2013

Eve echoed these concerns and expressed regret – not about her own actions but that the ALB population had not been located when her dog had found the beetle:

I tried [to prevent the outbreak]. I think it’s because nobody at the time thought of anything except it had just popped out of a packing case, but actually it had popped out of a tree – so we were already at the wrong stage weren’t we? Eve 8/5/2013

Experiences of Eradication Programme Implementation

[A man] appeared in our drive in his bright yellow jacket I thought it was a snap inspection for the farm, so I was very evasive (*laughter*). I asked him for his ID and then he came back again. He was very, very defensive. I can understand why. Michael 10/5/2013

The experiences of residents during the eradication programme were mixed. All, however, were still reeling from what happened when interviewed because the process proved painful for everyone, albeit in different ways.

There was so much devastation. I think the Forestry Commission was too radical and took too long to do it. The beetles were found [three] years ago in the area – why wait until it’s taken hold on something, and then decide to eradicate 95 % of the trees? Sarah 10/5/2013

I still feel very angry. I lost an awful lot of trees, but not only that – it wasn’t handled with respect. It was more bullish and a lot of damage was caused on areas that shouldn’t have been affected... That was their way of dealing with it, eradicate, just kill or napalm everything in a knee jerk reaction. Holly 9/5/2013

We lost about a dozen trees... it rather exposed our site here, so we’re still feeling a bit naked. But I think the speedy reaction and the careful checking of all the facts before chopping down all the trees was done effectively and efficiently. I think the whole programme was well devised, well planned and well carried out. Owen 04/6/2013

During the outbreak, programme managers had expectations of the local people, particularly in regard to their compliance with eradication protocols. Managers also recognised that local residents had expectations of them as well, although working between government agencies and deciding which agency or department was responsible for what had its own challenges.

It was very difficult to find a chain of command as to who was actually running the show and I don't think they knew themselves. They were running around like headless chickens but intelligent headless chickens - and they just didn't know what they'd got, I think. That was the problem. Michael 10/5/2013

In the early stages one of the biggest concerns... we had was defining what we were going to use as the exact host list and what we were going to do about replanting... we had to hold [residents] off for weeks whilst these decisions were being made. FERA Representative 05/6/2013

Some residents also fundamentally questioned the chosen management programme and were sceptical that it was truly necessary to remove and incinerate *all* tree species that could act as potential hosts for ALB.

I think the icing on the cake was when they reported that they didn't find a single beetle on my land. And that's a lot of trees. Holly 9/5/2013

Trust emerged as a significant concern for residents and was intimately connected to whether or not they felt they received competent care from the eradication programme managers. It was also linked to clarity over the chain of command. Affected residents wanted to know that managers and contractors not only knew what they were doing but that, crucially, they also cared about their property and about the trees. Again, experiences of this varied widely, and some residents felt a need to supervise contractors to ensure they did not cut down the wrong trees.

[The contractors] were nailing things to the masts of the trees they said they were going to cut down. And I said, "You've given me your list of known hosts, you're not cutting that down because that tree is not that species." I felt, "Why am I having to do this?" I have trees [in my garden today] that ... have got half their trunk... because they started cutting and then realised that one shouldn't be touched. They really didn't care. Holly 9/5/2013

There was no care to the community to be quite honest... The [contracted] tree fellers were actually lobbing the branches off the top of the trees, hitting the road... So it was dangerous to anybody who was standing by, or even in a car. I just thought they were very unprofessional. Sarah 10/5/2013

One resident also returned home to discover that her phone line had been cut by the contractors during the tree felling, and

so the FERA Representative found himself at a local supermarket late that evening to purchase and deliver a replacement phone for her to use until the line could be repaired. This was further proof to Holly that she could not trust the contractors to competently carry out eradication activities, and that they didn't "care" about her wellbeing or that of the wider environment.

Many of those interviewed felt disempowered by the eradication programme and the impacts it had on their land. Interestingly, outbreak managers felt disempowered too: constrained in their ability to do the work.

When you think that the reason for the work you're doing is so clear and necessary, it's frustrating that you still can't get co-operation on the ground, as evident in the great deal of resistance at taking out every individual tree. I think we got caught in the middle between wanting to take a "softly, softly" approach and not upset anybody and not get any bad press, and getting the job completed as quickly and efficiently as possible. The "softly, softly" approach can also give the wrong impression about the seriousness of what we're trying to do. FR Representative 7/9/2012

Despite his own perceptions, this outbreak manager was seen by respondents as a capable and trustworthy mediator.

Communication and Engagement Within the Outbreak Management Programme

Three different levels of communication became apparent during the interviews. The first of these was the communication amongst those managing the eradication programme, including FC, FR, FERA, and the contractors hired to do the tree removal; the second was between outbreak managers and those who were immediately impacted by the eradication programme; and, finally, communication between these managing bodies and the broader public (including local residents in the Paddock Wood area, as well as via media sources who communicated it to those further afield).

Two consultative meetings were held in the first 10 days of the outbreak. The first was held on site and attracted approximately 80–90 local residents and land owners, along with arboriculturalists and other tree professionals from the region and beyond. The purpose of this meeting was to alert people to what was going on and provide information about how to identify ALB, and what to do if any were seen. A hotline was established at this time (FERA Representative 05/06/2013), and the media (including the BBC, ITV and local news outlets) covered the "story" through March and April. The second meeting was held to discuss the management response (i.e., felling and inspection work) with local residents and councillors, and this attracted about 30 people.

The eradication zone was expanded partway through the management programme from its original boundary when another infested tree was found at the edge of the zone. Thus, residents who were not present at the initial meetings seemed to find themselves abruptly facing the removal of hundreds of their trees and they were at a significant disadvantage in terms of information. Amongst these latecomers were the two residents (Holly and Sarah) who had the strongest negative feelings about the eradication programme and how it was carried out.

Some residents received no information initially and had to seek it out for themselves, and when residents did receive information, they felt it was often inconsistent and directly contradicted information they had received from other parties. For instance, there was confusion at the very beginning of the eradication programme because FERA officials distributed information leaflets to nearby homes that depicted Citrus longhorn beetles (CLB, *Anoplophora chinensis*); CLB is closely related to ALB and looks very similar, but they are found on different parts of the tree. There was also supposed to be a leaflet drop throughout the town, containing information about ALB and the management programme, but which did not transpire.

Only half a mile down the road, people wouldn't have a clue as to what it was about... and that was quite surprising ... by the time they got around to thinking of a house to house leaflet drop in July when the beetles were likely to emerge, everything was in full swing or almost through, so it was all too late. FR Representative 7/9/2012

Residents also suggested that showing people what the beetle looked like may have resulted in increased cooperation from residents:

I think maybe what you're saying about [the beetle] being so big... maybe if we'd seen one, if even a dead one in a little pot, "This is what we've just got out of the field and this is what's going to be in your tree, and we've got to eradicate it from the country." Maybe more visible would have been better. Jane 8/5/2013

Inconsistent information led to rumours about what kind of work was going on, especially in the main field where the incinerator was located. Uncertainty led to unnecessary confusion and speculation, which in turn became part of residents' lived experience of the outbreak. The couple who owned the field felt particularly maligned by other Paddock Wood residents about what was happening:

One of them said, "That field up the road, they've cut all the trees down." I said, "Yeah, I know, it's my field." "Oh, what did you do that for?" And I said, "Well, because of this beetle." "Oh, that beetle? I read about that."

But he didn't associate [cutting down the trees] with the beetle. Charles 8/5/2013

Some locals were convinced the field was being razed for the construction of a secret laboratory, a shopping mall, or a new housing development.

There's so much speculation from passers-by and people we've met who say, "What are you building there? ... "What have you got against trees? ... You haven't had the field five minutes and you're cutting them down already." As if we wanted to! Charles 8/5/2013

My daughter ...came back from school and said they were chopping all the trees down to **save** the beetles (*laughter*). I did say that that's slightly back to front. Eve 8/5/2013

The landowners even received threats of violence from people who wanted to take wood that was going to be incinerated but which could not be removed from the site.

The biggest problem whilst the work was going on was people wanting wood... they threatened to murder the digger driver because he said, "No, you can't have any." Charles 8/5/2013

In response, FC hired a security guard to stay on site at the field.

As the data illustrate, despite media covering the outbreak, there was a significant disconnect between local knowledge of the event and an understanding of the outbreak location and management.

...You've got to have a bit of a conflict about keeping things low key and protecting the people affected and letting the wider community know what's going on. But I do think the vast majority of people aren't connected to the kind of communication channels that we use. FR Representative 7/9/2012

Impacts of the Outbreak

One resident, when describing to a researcher how to find her home for the interview, said "My garden is the one with no trees" (Holly 9/5/2013). It was a powerful statement, and one that captured her despair at losing hundreds of trees. Her sadness over the loss of trees was echoed by other affected residents, whether or not they agreed that sanitation felling was an appropriate course of action.

The seclusion provided by trees was another important loss: "We've lost our windbreaks, we've lost our privacy. ...



Fig. 2 The field at the centre of the outbreak area, as it looked before the ALB eradication programme was implemented. The arrow indicates the approximate perspective of Figure 3 (directly below), which was taken after the eradication programme was complete. (Photo courtesy of land owner)

it's going to take too long to replace [the trees], and I won't see it in my lifetime." (Sarah 10/5/2013). This was further linked to loss of residents' economic opportunities and interference with their future plans for their land. The couple who owned the field where the incinerator was located for the duration of the eradication programme had only owned the field for a few months. When they purchased it, it was surrounded by trees and sheltered from the surrounding roads. Having recently retired, Charles had planned to rent small plots of land as garden allotments. They have felt unable to follow through with this plan once the trees were removed (Figs. 2 and 3):



Fig. 3 After sanitation felling and incineration (which took place on this field), there is a complete lack of trees on the far edge that borders the roundabout. The earth has been disturbed by the work completed, which dredged up old plastic and piping from the former hop farm on site. Since the eradication, the land owner has felt unable to rent allotments on this property as intended because it is no longer "quiet" or "secluded". Local residents also reported feeling "disoriented" as they approach the roundabout because of the dramatic change in landscape. (Photo by Emily F. Porth)

Well, we certainly couldn't advertise "security with seclusion" anymore (*laughter*). People were coming along to actually enjoy being there ... because it was so peaceful. Despite all the traffic around, it was incredibly quiet because of all the trees and bushes. That first lady [who rented from us] said, "Oh, that's lovely, I'll bring our grandchild up and then we'll have a run around," but they never really came back much after [the eradication]. Jane. 8/5/2013

Each resident was provided with a list of trees susceptible to ALB infestation and were instructed not to plant those species until eradication has been declared. This has caused stress to some residents who felt a strong need to re-plant trees in order to shelter their homes:

It was made clear to me that if I use any of the tree species that are on the host list [to replant my garden], they'll come back and cut them down again. ... most of them are the broad leafed native trees, and I don't want a tropical garden, thank you very much. I want to blend in with the countryside. But can I really stand that awful bareness for another 4 years? Holly 9/5/2013

Beyond these losses some residents were also concerned about the impacts on their animal neighbours:

I think [the loss of] my bird colony probably hurt me the most... I had fantastic colonies of woodpeckers, four varieties... But the shoulders were shrugged, so all of those [birds] have moved on now. Holly 9/5/2013

There seem to have been limited impacts on the wider community of Paddock Wood because of the small size of the eradication zone. However, several interviewees did mention that the loss of so many trees in one area had drastically changed the look of the landscape and impacted navigation in the area for local residents.

I think a lot of people used to use the trees as a landmark and so... it doesn't even look like the same countryside any more... it disoriented them because the landmarks were gone. Sarah 10/5/2013

There was also concern from some residents and business owners that the outbreak would negatively impact the value of their homes, or affect their business.

I think the difficulty the [outbreak managers] had was the sensitivity of the other neighbours... the people who live alongside here didn't want [the outbreak] well-advertised because they didn't want the effect on their property prices. They didn't want the stigma. Jane. 8/5/2013

Discussion

Through interviewing a small sample of key informants, we have generated substantive data regarding the local and specific impacts of tree health management. While there have been some prior studies on community experiences of pest outbreaks (e.g., Flint 2006, 2007), the lived experience of outbreak management is a very under-researched area. This study provides fresh insight, despite the relatively small scale of the outbreak itself. At a “global” level this eradication programme appears to have been a clear success. However, the data presented here demonstrate that there are important local impacts on people and the wider environment when rapid response eradication programmes are implemented. Although there is a trade-off between the number of trees felled in Paddock Wood and the potential loss of trees across Britain if ALB were not eradicated, the local impacts are still substantive and require serious consideration by policy-makers and outbreak managers. Impacts included a strong sense of personal loss, loss of privacy, reduction in economic opportunities, undesirable changes in the area’s aesthetics, and damage to valued wildlife. These results are also significant in that they represent a case study that, whilst situated within a specific cultural and historical context and within a small geographical area, can be used to inform the management of future outbreaks of ALB or other similar pests and diseases.

By searching on the internet and discovering the global impacts of ALB – that trees infested by ALB look like they have been “machine gunned” – Michael and other interviewees became aware of the dangers that ALB posed to local trees, woods, and forests; their comments indicated that they were aware of the possible negative “global” impacts of the spread of Asian longhorn beetles. This pervasive “outbreak narrative” (Leach *et al.* 2010) that residents encountered on the internet was also echoed in the information they received from FC and FERA. Many interviewees were thus motivated to “do the right thing” and cooperate with the eradication programme, despite being devastated by the loss of trees on their land, fearful of their property value being decreased, or concerned about negative impacts on their business.

That said, some individuals did attempt to take active roles and exercise agency regarding the fate of their trees. This, unfortunately, seemed to label them as “troublemakers” in the eyes of some other stakeholders and is perhaps evidence of trust being an issue amongst residents, rather than just between residents and eradication programme managers. This is a key difference between what our study and others have found (e.g., Flint 2006; Palmer *et al.* 2014), and may be a consequence of the scale of our study. Carrying out research with a small number of people within a limited geographical area provided us with an opportunity to explore the close group dynamic and expose intra-group trust issues that might not have emerged from a study of a large-scale outbreak.

There were relatively strong networks at play within this area, so it is perhaps surprising that these trust issues emerged when one might expect them to be more common in a study of larger groups where people do not necessarily know one another.

There are also, however, shared themes across our study and Flint (2006) and Palmer *et al.* (2014). These emerged particularly in regard to the ways that outbreaks and management responses have impacted community cohesion, and where there are differences of opinion amongst residents over how outbreaks should be managed. Our study echoes Flint’s (2006) research on the experiences of residents in six Alaskan communities affected by the spruce beetle, where she reported poor information provision and a lack of coordination in government efforts to respond to outbreaks. Flint noted the loss of trees and associated reductions in privacy previously afforded by wooded landscapes, an impact also identified by Palmer *et al.* (2014) as an example of ‘exposure’ following an ALB outbreak in Massachusetts. Both Flint (2006) and Palmer *et al.* also report negative changes in local aesthetics and the ‘feel’ of an area after an eradication programme. Importantly, Flint (2006, 2007) highlighted that attitudes toward outbreaks and their management change over time, thus calling for longitudinal studies on community responses as the strength of emotions begin to fade.

The need for more communication and increased input from residents emerged as a key theme across all three studies; this is especially remarkable because each study investigated a different scale of outbreak. In fact, much of the literature around the topic of community engagement in outbreak situations reflects Mackenzie and Larson’s statement that “it is not enough to merely include people through techniques such as public meetings, as it is not the technique or even the outcome that matters as much as the perceived fairness and inclusiveness of the process” (2010: 1014). Public meetings, leaflets, and websites were the primary ways in which the ALB eradication programme attempted to engage with local people in Paddock Wood. Many interviewees expressed strong feelings regarding the lack of publicity around initially finding the beetle in 2009. Palmer *et al.* (2014) identified the importance of prior awareness and inclusion as key to minimising vulnerability to outbreaks, and this can thus be considered a missed opportunity in the case of Paddock Wood. Our interviewees also noted the (mis)communications about the eradication programme, and about the perceived lack of care and trust regarding trees being felled. It was clear that some management officials felt that the provision of information was sufficient to “engage” the community during the outbreak. However, they were frustrated that people did not want to engage by looking at information on websites, but rather by being involved in the actual eradication. Flint (2006) suggests that dialogue should be established early on, but that managers need to remember that attitudes towards management options will vary depending on the scale, stage of outbreak, and type of

personal loss involved. In addition to information provision, establishing a forum where residents can voice their concerns and input their knowledge also allows residents a more active role in management decisions – as in the case described by Palmer *et al.* (2014).

Arguably, instead of resisting the more participatory scenario demanded by some stakeholders, eradication programmes need to allow space for this active involvement despite the obvious need for swift action. Management protocols need to be open to alternatives and a more participatory process could facilitate rather than hinder the containment of an outbreak. There is a need to include communication and engagement specialists as staff within eradication programmes, rather than expecting scientific and technical specialists to add engagement – for which they are rarely trained – to the already complex list of demands on their time. Leach *et al.* (2010) argue the case for this, noting that management approaches need to “open up” in ways that embrace resilience, flexibility, adaptation, and a diversity of knowledge and values (Reed 2008; Leach *et al.* 2010). Unless skilled specialists are in place to achieve this there is a real danger that, as in this ALB case, programme managers’ experiences will leave them less inclined to “open up” in future outbreak scenarios.

Taking an “open” approach to an outbreak situation has the potential to directly influence the choice of management programme. In the US, ALB outbreaks have been most commonly managed by treating trees with insecticide, rather than felling and incineration; Illinois, for instance, cut down only 1,552 infected trees and another 220 “high risk” trees, and they chose to treat another 286,227 trees with insecticide annually. Through this effort, the state has successfully declared ALB to be eradicated (Haack *et al.* 2010: 528). However, the use of chemicals can be controversial, and in other instances of beetle outbreaks residents raised significant concerns over their potential environmental impacts (Flint 2006). Nevertheless, had the eradication programme in England been open to treating trees with insecticide, the lived experiences of those directly affected might have changed dramatically, along with the subsequent impacts they are still negotiating through the loss of so many trees. Simply discussing alternative management approaches could have had a substantive effect on residents’ perceptions of fairness of the eradication programme.

Conclusion

The management of tree pest outbreaks, as with other biosecurity threats, often has to take place within stringent time constraints and a rapidly changing context. This presents substantial challenges for effective stakeholder engagement, which normally requires long term interaction

and trust-building among stakeholders. Our study details the occurrence of Asian longhorn beetle in Kent, England, and the interplay of management strategies and engagement with residents, as well as the resulting impacts. Residents within the management zone were generally supportive of eradication but experienced significant impacts as a result. We have argued here that these impacts, although commonly justified by reference to the avoidance of more “global” impacts, are both substantive enough at the local scale to deserve greater consideration by policy-makers, and could be minimised by more effective, open, and participatory engagement. Our analysis revealed variable communications about the outbreak during the eradication programme. This finding echoes the limited number of other studies that focus on residents’ perceptions of tree pest outbreaks, and it is informative that these issues persist even at the very restricted geographic and social scale of the ALB outbreak we studied. Fundamentally, our results demonstrate that the emergency modality approach can be problematic at all scales, even in a very small area where people are not dependent on trees as in a resource-based economy.

It is far too easy to conclude that “the public” simply needs to be more aware of introduced species and ready to cooperate in preventing and managing outbreak situations. Instead, the lived experiences of those who were directly affected by the Asian longhorn beetle outbreak in Paddock Wood emphasise the importance of identifying a range of potential community responses to contentious management options before eradication programmes begin, as well as better coordination of the management effort. Successful and open tree pest management programmes are needed to contribute positively to the development of biosecure citizenship (Barker 2010), wherein community members are aware of threats, yet are also included and empowered within democratic decision-making processes. Without these, scepticism and a lack of trust will easily permeate communities and wider society, resulting in continuing poor levels of engagement and, critically, limited reporting of tree pests and diseases where they are found or suspected.

Acknowledgements This research would not have been possible without the residents of Paddock Wood who so generously gave us their time and their stories, and we are sincerely thankful for their participation. We are also grateful for comments and suggestions from Edward Eaton and Chris Quine on early versions of this paper, as well as for the constructive and thoughtful feedback we received from reviewers at *Human Ecology*. The Department for Food, Environment, and Rural Affairs (Defra) supplied funding for this research as part of the Tree Health and Plant Biosecurity Action Plan (Project TH0107). Please note that the study results expressed in this paper are those of the authors and do not necessarily reflect the views of funders.

References

- Barker, K. (2010). Biosecure citizenship: politicising symbiotic associations and the construction of biological threat. *Transactions of the Institute of British Geographers* 35: 350–363.
- Brasier, C. M. (2008). The biosecurity threat to the UK and global environment from international trade in plants. *Plant Pathology* 57: 792–808.
- Brockerhoff, E. G., Bain, J., Kimberley, M., and Knížek, M. (2006). Interception frequency of exotic bark and ambrosia beetles (Coleoptera: Scolytinae) and relationship with establishment in New Zealand and worldwide. *Canadian Journal of Forest Research* 36: 289–298.
- Buller, H. (2013). Introducing aliens, reintroducing natives: a conflict of interest for biosecurity. In Dobson, A., Barker, K., and Taylor, S. L. (eds.), *Biosecurity: The Socio-Politics of Invasive Species and Infectious Diseases*. Routledge, London, pp. 183–198.
- Chambers, J., Barker, K., and Rouse, A. (2012). Reflections on the UK's approach to the 2009 swine flu pandemic: conflicts between national government and local management of the public health response. *Health and Place* 18: 737–745.
- Chase, L. C., Decker, D. J., and Lauber, T. B. (2004). Public participation in wildlife management: what do stakeholders want? *Society and Natural Resources* 17: 629–639.
- Cheng, A. S., Kruger, L. E., and Daniels, S. E. (2003). "Place" as an integrating concept in natural resource politics: propositions for a social science research agenda. *Society & Natural Resources* 16(2): 87–104.
- Ciesla, W. M. (2011). *Forest Entomology: A Global Perspective*. Blackwell, Oxford.
- Collier, S. J., and Lakoff, A. (2008). *The Problem of Securing Health' in Biosecurity Interventions: Global Health and Security in Question*. Columbia University Press, New York, pp. 7–32.
- Corbin, J., and Strauss, A. (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Sage, London.
- EPPO. (2012). EPPO Technical Document No. 1061, EPPO Study on the Risk of Imports of Plants for Planting. EPPO, Paris, www.eppo.int/QUARANTINE/EPPO_Study_on_Plants_for_planting.pdf.
- Flint, C. (2006). Community perspectives on spruce beetle impacts on the Kenai Peninsula, Alaska. *Forest Ecology and Management* 227: 207–218.
- Flint, C. (2007). Changing forest disturbance regimes and risk perceptions in Homer. *Alaska Risk Analysis* 27: 1597–1608.
- Gilchrist, V. J., and Williams, R. L. (1999). Key informant interviews. In Crabtree, B. F., and Miller, W. L. (eds.), *Doing Qualitative Research*, 2nd ed. London, Sage, pp. 73–88.
- Haack, R. A., Herard, F., Sun, J., and Turgeon, J. J. (2010). Managing invasive populations of Asian onghorned beetle and citrus longhorned beetle: a worldwide perspective. *Annual Review of Entomology* 55: 521–546.
- Hinchliffe, S., Allen, J., Lavau, S., Bingham, N., and Carter, S. (2012). Biosecurity and the topologies of infected life: from borderlines to borderlands. *Transactions of the Institute of British Geographers* 38(4): 531–543.
- Hulme, P. E., Bacher, S., Kenis, M., Klotz, S., Kühn, I., Minchin, D., Nentwig, W., Olenin, S., Panov, V., Pergl, J., Pyšek, P., Roques, A., Sol, D., Solarz, W., and Vilà, M. (2008). Grasping at the routes of biological invasions: a framework for integrating pathways into policy. *Journal of Applied Ecology* 45: 403–414.
- Leach, M., Scoones, I., and Stirling, A. (2010). Governing epidemics in an age of complexity: narratives, politics, and pathways to sustainability. *Global Environmental Change* 20: 369–377.
- Leibold, A. M., Brockerhoff, E. G., Garret, L. J., Parke, J. L., and Britton, K. O. (2012). Live plant imports: the major pathway for forest insect and pathogen invasions of the US. *Frontiers in Ecology and the Environment* 10(3): 135–143.
- Mackenzie, B. F., and Larson, B. M. H. (2010). Participation under time constraints: landowner perceptions of rapid response to the emerald ash borer. *Society and Natural Resources* 23: 1013–1022.
- Macleod, A., Evans, H. F., and Baker, R. H. A. (2002). An analysis of pest risk from an Asian longhorn beetle (*Anaplophora glabripennis*) in the European Community. *Crop Protection* 21: 635–645.
- Mumford, J. (2013). Biosecurity management practices: determining and delivering a response. In Dobson, A., Barker, K., and Taylor, S. L. (eds.), *Biosecurity: The Socio-Politics of Invasive Species and Infectious Diseases*. Routledge, London, pp. 105–120.
- Palmer, S., Martin, D., DeLauer, V., and Rogan, J. (2014). *Vulnerability and Adaptive Capacity in Response to the Asian Longhorned Beetle Infestation in Worcester, Massachusetts*. Human Ecology, [available online]
- Perrings, C., Williamson, M., Barbier, E. B., Delfino, D., Dalmazzone, S., Shogren, J., Simmons, P., and Watkinson, A. (2002). *Biological Invasion Risks and the Public Good: an Economic Perspective*. *Conservation Ecology* 6(1): 1.
- Reed, M. S. (2008). Stakeholder participation for environmental management: a literature review. *Biological Conservation* 141(10): 2417–2431.
- Robson, C. (2002). *Real world research*, 2nd ed. Blackwell, Oxford.
- Rodríguez-Labajos, B., Binimelis, R., and Monterroso, I. (2009). Multi-level driving forces of biological invasions. *Ecological Economics* 69: 63–75.
- Straw, N., and Tilbury, C. (2012). Report on the outbreak of Asian longhorn beetle (*Anaplophora glabripennis*) at Paddock Wood, Kent, in 2012. Internal report for Forest Research 02/10/2012
- USDA. (2005). Addressing the Risks Associated with the Importation of Plants for Planting: A White Paper, www.aphis.usda.gov/import_export/plants/plant_imports/downloads/q37_whitepaper.pdf.
- Webber, J. (2010). Pest risk analysis and invasion pathways for plant pathogens. *New Zealand Journal of Forestry Science* 40: 45–56.
- Wynne, B. (1989). Sheepfarming after chernobyl: a case study in communicating scientific information. *Environment Science and Policy for Sustainable Development* 31(2): 10–29.