

Report Cover Page

ACERA Project		
0801		
Title		
Using stakeholder mapping and analysis with a mental models approach for biosecurity risk communication with peri-urban communities		
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Material Type and Status (Internal draft, Final Technical or Project report, Manuscript, Manual, Software)		
Final report		
Summary		
<p>This report presents the findings of a field-based study on biosecurity risk communication in the Yass region. The study tested the usefulness of a 'mental models' approach to support communication strategies for the management of pests and diseases in this area.</p> <p>The study found that the size of landholdings was not an important factor associated with knowledge and behaviour about biosecurity issues. Between 80 and 100% of people were aware of the main vectors and pathways for both weeds and animal diseases. Similarly high percentages of respondents employ appropriate risk management practices. There were lower levels of awareness of animal diseases than of weeds. The term 'biosecurity' was not widely understood.</p> <p>The study's findings, based on the 'mental models' approach, suggested that a biosecurity communication strategy for the region should be developed and delivered on a landscape scale, be directed to all landholders, and appeal to the drivers that the landholders themselves identified, specifically with respect to weed control – good land management, being a good neighbour and cost management. It should use trusted, influential agencies and use existing local networks to disseminate information.</p>		
ACERA Use only	Received By:	Date:
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	DAFF Endorsement: () Yes () No	Date:

Using stakeholder mapping and analysis with a mental models approach for biosecurity risk communication with peri-urban communities; ACERA Project No. 08/01

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Final Project Report

May 2009



Acknowledgements

This report is a product of the Australian Centre of Excellence for Risk Analysis (ACERA). In preparing this report, the authors acknowledge the financial and other support provided by the Department of Agriculture, Fisheries and Forestry (DAFF) and the University of Melbourne,

We acknowledge the assistance of the Yass Valley Council in providing us with maps of the area, a database of addresses in the Yass LGA and free publicity in the Yass Valley newsletter. We also acknowledge the input of the Reference Group members who met three times throughout the course of the project and provided valuable advice and feedback.

Thanks also to those who attended one or both of the stakeholder meetings in Yass and to the Yass Rural Lands Protection Board (now the Tablelands Livestock Health and Pest Authority) for allowing us to use their facilities. These meetings provided important insights into the issues from the perspective of the local community. Finally we acknowledge the generosity of the people in the Yass area for giving their time and feedback in both interviews and surveys.

Disclaimer

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1. Executive Summary

This report presents the findings of a field-based study on peri-urban biosecurity risk in the Yass region of NSW. This region was identified for the study as it had been selected by the Division of Product Integrity and Animal and Plant Health for the development of a biosecurity communication strategy directed specifically towards peri-urban landholders. This study was designed to test the usefulness of a mental models approach to inform the communication strategy.

The study has found that defining peri-urban landholders based on the size of their landholding is unlikely to be productive for the purposes of communicating about biosecurity risk. Whilst the study identified some minor differences between landholders, based on landholding size, in terms of their knowledge and behaviour about biosecurity issues, these differences were not substantial.

By using a mental models approach, the study found that, with some exceptions, between 80 and 100% of respondents (with some variation across landholding sizes) were aware of vectors and pathways for both weeds and animal diseases. This awareness was reflected in practice with similarly high percentages of respondents reporting appropriate risk management practices. The study did reveal lower levels of awareness of animal diseases than of weeds.

This study confirmed the findings of other studies that the term biosecurity is not widely understood. While it was acknowledged as being either very or somewhat relevant by 89% of respondents, it was not rated as a high concern for land, crop or animal management.

The study's findings suggest that a biosecurity communication strategy for the region should:

- be conceptualised and delivered on a landscape scale – directed to all landholders in the region;
- appeal to the drivers that the landholders themselves identified, specifically with respect to weed control – good land management, being a good neighbour and cost management (see Table 5, p.35);
- use those agencies that are trusted within the community and that are acknowledged as being influential (see Section 5.2, pp 20-24);
- take into account that these trusted agencies are likely to be different depending on the size and purpose of the landholdings; and
- use local networks and consult on a regular basis with local stakeholders.

Due to the specific demographics of the Yass region (in particular, the high percentage of people with English as a first language), the researchers note that the local findings from this study may not necessarily be applicable to other peri-urban areas. The study has, however, successfully demonstrated the usefulness of the stakeholder mapping and mental models tools in building an in-depth knowledge of biosecurity awareness and practice as the basis for effective communication strategies.

2. Introduction

The peri-urban landscape is generally accepted to mean that geographic region that is adjacent to metropolitan centres and surrounding regional/rural centres. It is distinguished by mixed land uses and contains elements of both urban and rural landscapes.(Maller et al,2007 p 3).

For the purpose of this study, biosecurity was defined as the protection of people, farms, animals and plants from the entry and spread of unwanted animals, pests, diseases and weeds.

In 2004 the Bureau of Rural Sciences (BRS) (Aslin, Kelson, Smith & Lesslie 2004) undertook a scoping study into peri-urban landholders and biosecurity issues in response to concerns about possible biosecurity risks posed by the behaviour of these landholders and recognition of the need to target them in communication campaigns. The BRS report drew on previously published studies, BRS land-use mapping work and three brief geographical case studies to identify the characteristics of peri-urban dwellers, their motivations and how best to communicate with them. The study identified the key locations around Australia where peri-urban landholders were found, that their primary focus was on lifestyle, amenity and environmental factors, not on primary production, and that, in order to be effective, communication needs to appeal to these interests.

Subsequent studies have also suggested that peri-urban landholders potentially pose a greater biosecurity risk because of their behaviours, knowledge of biosecurity and land use practices. This is further complicated by the rapid growth in these peri-urban regions resulting in unknown numbers of people and lack of knowledge of their agricultural pursuits. (Houston, 2005). Aslin and Mazur (2005) conducted three case studies around Australia on peri-urban landholders investigating their land management practices. They found that “many of these landholders lack experience on the land and may be unaware of biosecurity risks related to their practices” (p. 70). This was particularly in relation to risks of spreading existing pests and weeds and risks associated with poor land management and animal husbandry practices. Hollier, Reid and Fenton (2005) have had similar findings in Victorian studies and suggest that it is not only the lack of prior agricultural knowledge and experience but lack of local knowledge and networks of people who can provide information and assist with property management.

There has been a growing focus within the Department of Agriculture, Fisheries and Forestry (DAFF) on peri-urban farmers and the challenge of communicating with them about a range of issues from biosecurity to natural resource management (Maller, Kankans & Carr 2007). The Division of Product Integrity, Animal and Plant Health (PIAPH) proposed to initiate a biosecurity risk communication program in the Yass region targeting the peri-urban/hobby farmer community. While the Yass region was identified as having an increasing number of peri-urban dwellers and has experienced significant demographic change over recent years, it was, nonetheless assumed to be a low risk area for biosecurity threats due to the population's high level of education and access to information given its proximity to Canberra.

In 2008, ACERA was commissioned by DAFF to conduct a study on peri-urban landholders and biosecurity risk in the Yass region. It was proposed that the tools developed in ACERA Project 06/09 *Stakeholder mapping for effective risk assessment and communication* (Gilmour & Beilin 2007) together with a mental models analysis, be used to undertake a comprehensive examination of the stakeholder landscape and of stakeholder knowledge and attitudes, in order to inform the development of this proposed communication strategy and to

address the following key research questions:

1. How do peri-urban landholders view risk and how does this understanding of risk affect their practices vis-a-vis biosecurity and natural resource management risk? How important are issues of trust and processes for knowledge transfer or flow?
2. What do peri-urban landholders in the Yass region know about biosecurity risk and what is their understanding and awareness of issues? Does this differ from the more traditional rural landholders' understanding and awareness? What informs their knowledge?
3. How can biosecurity and natural resource management risk be communicated most effectively between the relevant DAFF agencies and the peri-urban community? What are the most productive processes for practice change?
4. Does increased knowledge of biosecurity and natural resource management risk change people's practices? If so, in what way?

The study was undertaken by a small team of researchers with input and advice from a Reference Group (see Appendix A) consisting of representatives from DAFF, the NSW and Victorian Departments of Primary Industries, a landowner from the Yass region, a consultant and an academic. The Reference Group met three times during the course of the project as well as providing input and advice at other times.

3. Literature Review

A number of databases were used to perform a literature search including Web of Science, Science Direct, Academic Search Premier, Expanded Academic ASAP and SCOPUS. Search terms included multiple combinations from the following: *mental models*, *risk*, *communication*, *biosecurity*, *hobby farmers*, *lifestylers*, *practice change*, *stakeholder mapping*, *social networks*, *peri-urban*, *urban fringe*.

Risk can mean many different things to different people, depending on the available information, as well as their opinions, values and preferences, including their risk propensity or aversion (Fischhoff 1995). This means that communicating risk needs to be undertaken within an interdisciplinary framework which integrates scientific knowledge, cultural perceptions and norms, together with stakeholder (or lay) knowledge, beliefs and preferences. An appreciation of what people already know and understand, what their attitudes and values are with regard to a potential risk, whether there are people within the community whose opinions and actions they trust above others, whether there are issues that are of major concern to them that may or may not affect their response to a risk situation – all this information is critical to the development of an effective stakeholder communication process. By strengthening risk communication, the entire process of risk management is improved. When risk communication fails, so will the management process fail (Gray, Stern & Biocca 1998).

Building effective relations with stakeholders and incorporating their knowledge into decision-making improves decision-making and contributes to stakeholder acceptance of policy decisions. (Wynne, 1996, McDaniels, Gregory & Fields, 1999) A number of stakeholder analysis and mapping tools have been created to help organisations build better relations with stakeholders through developing an understanding of issues that are of concern to key stakeholders, how they may influence the outcome of those particular issues and identifying the relationships between the stakeholders.

Influence and interest maps are one of the tools used in stakeholder mapping. Mapping the relative influence and interest of stakeholders in an issue provides useful insights into which organisations are likely to be in a position to influence the outcome in a particular situation and the extent to which they may be motivated to do so. Those stakeholders identified as having high interest and high influence will likely be key players in any communication strategy around the issue. Those with high interest but lower levels of influence may need to look at how they can align themselves with those with higher levels of influence if they wish to achieve a particular outcome. Similarly, those with low interest, but high influence may be co-opted by those with lower levels of influence in order to further their objectives (Bryson 2004).

Gilmour and Beilin (2007) have evaluated other tools and methods useful for stakeholder mapping and analysis and provide a review of the literature of stakeholder involvement in risk analysis.

Zaksek and Arvai (2004, p 1504) see mental model analysis as a 'systematic and empirical method for informing the design of a risk communication process'. A 'mental models' approach has been found to be useful in eliciting people's intuitive knowledge or understanding of a specific risk (Fischhoff, Bostrom & Jacobs Quadrel 2002; Morgan, Fischhoff, Bostrom & Atman 2002). Mental models have been defined as "the mechanisms whereby humans are able to generate descriptions of system purpose and form, explanations of system functioning and observed states, and predictions of future system

states" (Rouse & Morris 1996, p. 351) If these mental models do not encompass the potential seriousness of a risk or a complete understanding of exposure pathways, they can lead to erroneous conclusions, even in situations where people are otherwise well-informed about an issue (Morgan *et al.* 2002).

A mental models approach addresses some of the issues around stakeholders having different values and concerns about risks and differences in their technical understanding of a risk (Shepherd 2008). It can also address some of the issues around language and terminology. The importance of using lay language in risk communication is well researched (Abel, Ross & Walker 1998; Finucane & Holup 2006). Rowan (cited in Bier 2001) states that one of the main barriers to comprehension of risk communication is the lack of familiarity of a concept or term.

Creating an expert model (or influence diagram) is the first step in a mental models approach. These are often initially derived from technical expertise and literature and then expanded to include issues raised by other stakeholders (Gregory, Fischhoff, Thorne & Butte 2003). Within the mental models literature, influence diagrams are not seen to represent a consensus of expert opinion about the risk issue, but to be a process for pooling all that is known about the risk issue (Morgan *et al.* 2002, p 205). Further to this, Gregory, McDaniels and Fields (2001) suggest a focus on achieving consensus can lead to some issues being ignored when the group decision-making process does not take into account the values and objectives of those involved. By including values and being clear about what these values are and what the stakeholders want to achieve from the decision-making process it is more likely that the outcomes will receive wider support because they address the concerns of the main parties involved (Arvai, Gregory & McDaniels 2001).

Mental models interviews are then conducted in order to elicit people's beliefs about the risk expressed in their own terms and then analysed against the expert model. Morgan *et al.* (2002, p. 89) state that "an appropriate sample of 20 to 30 individuals should reveal most of the beliefs held with any substantial frequency in the population from which they were selected". A confirmatory questionnaire is then developed from both the concepts in the influence diagram and mental models interviews to help understand how well the concepts are understood, where there are knowledge gaps and if there are any misconceptions which appear to be widely shared. The premise in the mental models literature is that through surveys informed by semi-structured interviews there will be "more accurate estimates of belief prevalence identifying relevant issues and familiar language" (Gregory *et al.* 2003, p 1295).

Attempting to change a person's mental model through the provision of further information is not always successful as information that does not support an existing mental model may be rejected (Abel *et al.* 1998). Mental models are influenced by people's values and beliefs which in turn affect their motivations and interpretation and use of new information (Atman, Bostrom, Fischhoff & Morgan 1994). Therefore, in order to influence a person's mental model, the focus needs to be around that person's circumstances and an understanding of the logic that motivates their actions (Hjortso, Christensen & Tarp 2005).

Padmawati and Nichter (2008) undertook a study to compare the needs of backyard farmers and commercial poultry farmers with respect to the structure and information required for preparedness programmes for Avian Influenza (AI). They concluded that the opinions of each group were motivated and supported by different logic and so any communication programme needed to identify these different motivations.

Eliciting a comprehensive model (or models) of how stakeholders understand risk and the values they attach to it will inform the process and content of risk communication and how the transmitted information is likely to be used (Fischhoff 2006). Breakwell (2001) proposes that people will be better placed to make more informed decisions if new information is consistent with their initial belief system. Recent research on the application of mental models analysis to a variety of risks, has concluded that while non-expert stakeholders may indeed lack fundamental knowledge about a specific risk, experts' assumptions of stakeholders' knowledge were often incomplete and inaccurate leading to misjudgments about stakeholders' information and decision-making needs (Morgan *et al.* 2002). Further to this, non-expert stakeholders have, in some instances, shown that they not only have different initial risk identification processes but can also highlight areas of concern that have not previously been identified (Shepherd *et al.* 2006).

Communicating about biosecurity risk to peri-urban landholders is seen to be a challenge as the peri-urban community is a growing demographic in the Australian landscape and little is known about their numbers, behaviours, attitudes, knowledge of biosecurity and land use practices (Maller *et al.* 2007).

In an attempt to characterise peri-urban landholders, studies have looked at various features of landholdings in peri-urban areas and activities on the land. Varying landholding size categories have been suggested including 1 to 200 hectares (Maller *et al.* 2007), 1 to 100 hectares (Guise & Narducci 2005) and 2 to 100 hectares (Hollier, Francis & Reid 2004a). Other studies have defined the peri-urban population according to their lifestyle, values or sources of income and have given them various titles including lifestylers, hobby farmers and tree changers. Alternatively, Houston (2005) looks at these areas in terms of population density, proportion of employment in non-rural industries and proportion of new residents.

Low Choy (2006) proposes that trying to define the peri-urban landscape with a single distinctive attribute does not allow the complexities of the structures and functions of the areas to be adequately described. Although there is not an agreed definition of peri-urban, there is agreement that the peri-urban area is adjacent to urban areas with diverse land use. (See Buxton *et al.* (2006) for an extensive review of the literature on this issue.) However, for the purpose of the current research we used Maller *et al.*'s broad definition of peri-urban as "the transitional zone between rural and urban Australia" (p. 4) without defining other attributes.

4. Methodology

4.1 Methodological Approach

In order to get a more complete answer to the research questions we decided that it would be most constructive to use both qualitative and quantitative processes. Mixed-method approaches are recognised as providing a fuller picture of what is being studied (Bryman 2006) and, to strengthen the research, one method is often used to inform the other (Greene *et.al.*1989).

In the mental models component of our study, we used qualitative in-depth interviews to elicit people's belief about biosecurity risks, their awareness of vectors and pathways and their practices. Each question in the interview was related to a component in the influence diagram. Any new concepts that arose in people's responses that were not present in the influence diagrams were added. The components of the resulting influence diagram were the basis for questions in the survey. These sought quantitative data on people's awareness of the vectors, pathways and practices, together with their levels of understanding about biosecurity risk and any misconceptions or gaps.

We also used a combination of qualitative and quantitative methods of elicitation to understand people's networks together with their information sources. Further exploration of these in stakeholder consultations allowed us to understand the importance of trust and influence in the region with respect to biosecurity and land management issues.

So that the study could be as inclusive as possible, we identified those stakeholders who were presumed to be relevant to the issue and continued to consult key stakeholders throughout the course of the study. This was essential as the stakeholders provided valuable local information. Through this process of engagement, we were also able to build trust for the project. The stakeholder consultation process also aided triangulation in that we were able to report our findings at different times throughout the study and used the local knowledge and experience of the stakeholders to substantiate (or not) our findings.

4.2 Stakeholder Analysis

Using tools previously identified by Gilmour and Beilin (2007), we undertook a process of stakeholder identification, mapping and analysis, with a view, firstly to identify all those stakeholders relevant to the issue of peri-urban farmers and biosecurity risk in the Yass region, and secondly to understand their roles with respect to the issue, their levels of interest in it and their capacity to influence outcomes. In undertaking this mapping process, we used the widely accepted definition of stakeholder as any group or individual who can affect or be affected by the achievement of an organisation's objective (Freeman 1984, Donaldson & Preston 1995).

Based on consultation with a few key people in the region who were selected based on their position in responsible agencies or in community organisations, the research team developed an initial list of stakeholders relevant to the issue of biosecurity risk in peri-urban communities. Those consulted were asked to identify others they thought would have an interest in the project. Stakeholders were divided into six categories; government, community groups, private organisations, research institutions, clubs and industry associations and were identified through the following questions adapted from the World Bank Source Book for Participatory Planning and Decision-making (1996):

- Who will be affected?

- Who has the power to influence the outcome?
- Who are the potential allies and opponents?
- What coalitions might build around this issue?

The search process continued based on general information provided by DAFF about the Yass area (S. Gibbons, [DAFF] pers comm., 10 April 2008) followed by a search of the Yass Valley and Upper Lachlan Councils and Yass Rural Lands Protection Board websites to develop an understanding of main activities in the area. Industry associations in the Yass region linked to these activities were then added to the map. Two local community websites, *Murrumbateman.org* and *Yass.com.au* were also used as a source of information for clubs, groups and events.

The resulting map was presented to a group of stakeholders (Appendix B) at a meeting in Yass in May 2008 in order to get further local input and to ensure its robustness and relevance to the local situation. The stakeholder map evolved over the course of the project and the modified map (Figure 1) was then presented at the final stakeholder meeting in February 2009. Most of the attendees from the first meeting were present at the final meeting as well as some additional landholders who participated in the interview process. Further additions were made to the map at this time.

At the first stakeholder meeting, those present were invited to reflect on the relative 'interest' and 'influence' of the various stakeholders in the issue. As this exercise progressed it became clear that the positions of stakeholders on an interest/influence grid differed depending on whether the focus was on weeds or on animal diseases. It was agreed that two different grids needed to be developed.

In building these maps, 'influence' and 'potential to influence' were assessed from the point of view of the landholder. The assessment of the level of 'interest' was taken from the perspective of the specific organisation, based on the researchers' knowledge and comments from stakeholder interviews. When the maps were discussed at the second stakeholder consultation (Appendix B), there was some debate about the levels of 'interest' and 'influence' attributed to some organisations and some amendments made.

The final influence/interest grids (Figures 2 and 3) reflect the accumulated data from the surveys and interviews, as well as the feedback from the stakeholders at this second meeting.

4.3 Mental Models

There are several methods that can be used to conduct a mental models study and we closely followed the approach outlined for use in risk communication by Morgan *et. al.* (2002) when conducting this research. This approach has been used by others (Vasquez, Regens & Gunter 2006; Wagner 2007) and entails developing influence diagrams, conducting interviews to elicit the interviewees' mental models about a specific issue followed by a survey to understand issues and knowledge gaps.

We developed influence diagrams for weeds and animal diseases following conversations with specialists in those fields and people working with those issues in the Yass area. Through these discussions we started to understand the types of biosecurity and land management issues present in the area as well as potential issues. For example, we asked people to list the top five endemic and exotic animal diseases and weeds that exist or pose a potential threat to the area and then reviewed the literature on those listed to develop the initial influence diagrams. We built the diagrams using the following widely accepted conceptual risk pathway framework - prevention, point of entry or detection, establishment,

spread, intervention or management. Through a thematic analysis of the literature, we expanded these diagrams focusing on identifiable sub-themes within each variable of the risk pathway framework e.g. spread of weeds through attaching to animal fur ('attachment') was considered a sub-theme of the 'point of entry' variable.

The constructed influence diagrams (Appendix C) were reviewed by two University of Melbourne experts, one specialising in veterinary pathology and the other in plant physiology and ecology. The diagrams were then presented at a workshop at the University of Melbourne attended by researchers working on various aspects of environmental and biosecurity risk as well as experts in plant physiology and ecology and in the social and psychological aspects of risk. Modifications were made to reflect the feedback from this workshop. These diagrams formed the basis for developing the interview questions on biosecurity awareness and practices. After the interviews, key points from interview data were also abstracted and added to the diagrams (Figures 8 and 9) to represent the full extent of the known and expected pathways associated with the particular risks. The survey questions around biosecurity awareness and practice were formed from these diagrams.

Using the survey results, we were able to identify how well people understood the various pathways for entry, establishment and spread of weeds or diseases and what actions they were or were not taking on a regular basis. We have used a traffic light system to represent survey responses with respect to knowledge and awareness and practice. This was done based on the percentage of responses for each question and an explanation is provided in the keys in Figures 8 and 9.

4.4 Interviews

Semi-structured interviews were designed to provide comparability, particularly in respect of demographic data, with other peri-urban survey questionnaires including studies by the Victorian Department of Primary Industries (Hollier *et al.* 2004a; Hollier, Reid & Francis 2004b) the Western Australia Department of Agriculture and Food (Guise & Narducci 2005), and the Upper Murrumbidgee Catchment Coordinating Committee in association with Land and Water Australia (Harding 2008). They also included a series of questions relating to understanding and awareness of biosecurity issues and land management practices, which were structured around the influence diagrams. The final section included questions pertaining to sources of and access to information and networks.

The survey outline was presented to the Reference Group (Appendix A) and their suggested amendments made. We conferred with a statistical consultant from the Mathematics and Statistics Department at the University of Melbourne about the number of interviews we should conduct to get a representative sample on which to base the surveys. He suggested 30 to 40 interviews given the population. The landholding size groups (0-2 hectares, 2-40 hectares, 40-100 hectares, 100-500 hectares, over 500 hectares) were determined after consultation with key stakeholders in Yass and after referring to a map of holding areas by hectares in the Yass Valley local government area (LGA) provided by Yass Valley Council. The semi-structured interviews were piloted in the Yass area with four people from different landholding size categories. These interviews were transcribed verbatim and several modifications were made to the interview structure to ensure that the questions were appropriate to the local situation.

Following the pilot, one of the researchers was based in the Yass district for three weeks to undertake 33 interviews in the stratified sample. A single interviewer to conduct all interviews, if time and resources permit, is recommended to provide for the greatest consistency (Morgan *et al.* 2002). The interviewees (Appendix D) were selected from the different landholding sizes as well as a selection of people representing key stakeholder

groups. Interviewees were identified through a number of processes including website searches, snowballing, cold sampling, attendance at events and an article placed in the Yass Valley Council newsletter in July 2008 (Appendix E).

The semi-structured interviews averaged about one hour and were held at participants' properties, offices or local meeting places. Much of the interview involved eliciting respondents' insights into and awareness of biosecurity and establishing their practices, sources of information and communication networks. Immediately following the interviews, the researcher recorded her own commentary on the interview process and her impressions of it. All interviews were recorded and transcribed soon after, as were the researcher's comments.

The researcher also visited relevant businesses including local shops, nurseries, real estate agents, equipment hire, newsagencies and an information service centre to gain further insight into the area. Observations from these visits were also recorded and transcribed by the researcher.

4.5 Surveys

The surveys were based on the semi-structured interviews and influence diagrams. The basic objective was to understand how well concepts are understood, whether there are misconceptions and if so, whether they are widely shared.

A draft survey was presented to the Reference Group generating discussion around technical jargon, formatting issues, the colour of paper for the survey (to make it distinguishable from other correspondence), open-ended versus closed questions and survey length. Some of the landholder typologies as described in the DPI and Port Phillip and Westernport Catchment Management Authority's (2008) report on landholders in Melbourne's rural hinterland were also drawn upon. We consulted the statistician again to ensure the answers would allow for statistical comparison and also asked for input on length and format issues. Ten pilot surveys were sent to landholders and key stakeholders in the Yass region asking for feedback about completion time, ease of reading and comprehension. Six of these were returned completed and with comments. After examination of the returned surveys amendments were made to allow for more closed responses in two of the questions and the final six page survey was developed (Appendix H).

Surveys were sent in September 2008 to a stratified sample of 930 people across the landholding size groups (Table 1). The sample size per group was determined on the basis of the statistician's advice in order to allow for comparability of responses between landholding sizes. A follow-up card was sent four weeks later to the same people and a reminder announcement was made on Yass Community Radio.¹ The total response rate was 15%.

¹ As an incentive we offered those who filled out the survey a chance to enter a draw for a \$50 wine or book voucher. Over 60% of respondents replied with their details

Table 1. Survey distribution and return rate

	Yass Valley LGA (1 ha and over)	Surveys sent	Surveys received	Surveys received (%)
0 – 2 ha	519	190	18	9
2 – 40 ha	1465	204	37	18
40 – 100 ha	661	196	28	14
100 – 500 ha	553	191	38	20
Over 500 ha	150	150	23	15
Overall	3350	930	144	15

The survey results may reflect respondent bias as those who completed the survey may have a pre-existing or greater interest in the issue. However, the results did not generate any surprise or disbelief when they were presented to and discussed at the second stakeholder meeting.

Both the interviews and the survey were accompanied by a statement about the research project. This statement included the following definition of biosecurity and statement about its importance.

Biosecurity is the protection of people, farms, animals and plants from the entry and spread of unwanted animals, pests, diseases and weeds. Australia is fortunately free of many diseases that affect agricultural production in other parts of the world. It is important to maintain this for the future of our agricultural productivity as well as the protection of our natural environment.

The term was used in the surveys and interviews to include new invasions (such as Equine Influenza) as well as the containment of diseases currently in Australia such as footrot or Ovine Johne's Disease (OJD) and of weeds.

4.6 Analysis

All survey data were entered and analysis was carried out using the statistical package Statistical Program for Social Sciences (SPSS) version 17.0. Not all respondents completed the whole survey, choosing to skip some questions. Chi-square tests were applied to a number of the results to check for relationships between survey responses and landholding size, for example did people on different landholding sizes adopt different practices or have different levels of awareness about pathways and vectors. These revealed only a small number of 'statistically significant correlations'. However the researchers are aware that this does not indicate that there are no other differences.

5. Results and application

5.1 Stakeholder analysis and consultation

5.1.1 Peri-urban landholders and defining study area

‘Peri-urban landholders! That’s a flash new word!’ (Stakeholder 2, 2008).

When it was proposed at the initial stakeholder consultation meeting in Yass to define the scope of the study by landholding size, those present questioned whether there was any difference between smaller landholders and larger commercial producers in terms of knowledge and practices in relation to biosecurity. They argued there was a mix of expertise and knowledge across both groups. In order to take on board these issues, it was suggested that the project not be limited by landholding size, but all landholding sizes be included within a given parameter of Murrumbateman (a 40 kilometre radius was suggested).

This perimeter is roughly the area of the Yass Valley LGA. Initial conversations with staff from the Yass RLPB suggested that most of the small landholdings (between 1 to 100 hectares) are around Yass, Murrumbateman and Bowning with a few around Crookwell and Gunning. Landholdings within the rest of the region extending into the townships tend to be larger than 200 hectares. This was confirmed by reference to the map of holdings by hectares. Based on these discussions we decided that our project study area would encompass the whole of the Yass Valley LGA and we would look at the full spectrum of landholding sizes.

5.1.2 Stakeholder map

The stakeholder map (Figure 1) was produced as a result of initial searches, the two stakeholder meetings and from in-depth interviews and survey responses. Over the course of the project, stakeholder groups were added and others deleted from the map if not considered relevant in the area or to the issue. Web searches provided information on the new agricultural industries within the area, such as wine, olives and alpaca farms. The first stakeholder meeting identified groups such as the adult riding club and local wine association missing from the map and suggested, for example, that the Deer Industry Association was not relevant in the area.

The stakeholder map was used as a prompt in the interviews to get people to think about those organisations that may have some interest or influence on the issue. Below are some of the comments from the interviewees after being shown a version of the stakeholder map:

“Greening Australia should be on here. They’re very good as an NGO in this area.”
(Landholder Q, 2008)

“Maybe include vets in Hall, they have started a newsletter too” (Landholder L, 2008).

“I hope you have Murrumbateman pre-school. It is very good. It is the schools that keep a community together and that’s why it worked in Gundaroo and Sutton. If you need to send the kids {away} to school then you lose a strong community link, so you then lose interactions and communication channels. It does change your focus. It’s a big influence on how people interact.” (Landholder U, 2008)

General comments from interviews also alerted the researchers to other groups that should be included in the stakeholder map.

“Even some of the policeman here deal with straying stock issues. The RSPCA in Goulburn spends a lot of time working with absentee farmers. Starvation problems and issues with animals should be included.” (Stakeholder 4, 2008)

“Oh there was the excavator that came to bury the horse. And he just has one of those little excavators and I think he lives locally and he buries one to two horses a week. So he’s going to a lot of different properties burying dead animals so that could be a possible source of cross-contamination. Especially if you don’t know what the horse has died from...But I never thought of that as a possible source of contamination. There’s a very high concentration of horses in this area but he’s going to all sorts of different properties.”(Landholder B, 2008).

A search on Truelocal.com.au (a web-based local directory) revealed there are over 35 excavators working in the Yass area – a group that, by changing its hygiene practices, may be in a position to have some influence over biosecurity outcomes by minimising the risk of contamination between properties.

The final stakeholder meeting also proposed further amendments to the stakeholder map. The Red Cross was added as it was thought to be more active in the area than the CWA although the CWA was not removed because of their current work in social welfare issues i.e. distribution of money from Safeway for community support to farmers. Other additions included the Southern Slopes Noxious Plants Authority, NSW Railways and Australian Wool Innovation. By involving stakeholders, from the beginning, we were able to build a comprehensive map of organisations and individuals relevant to this issue.

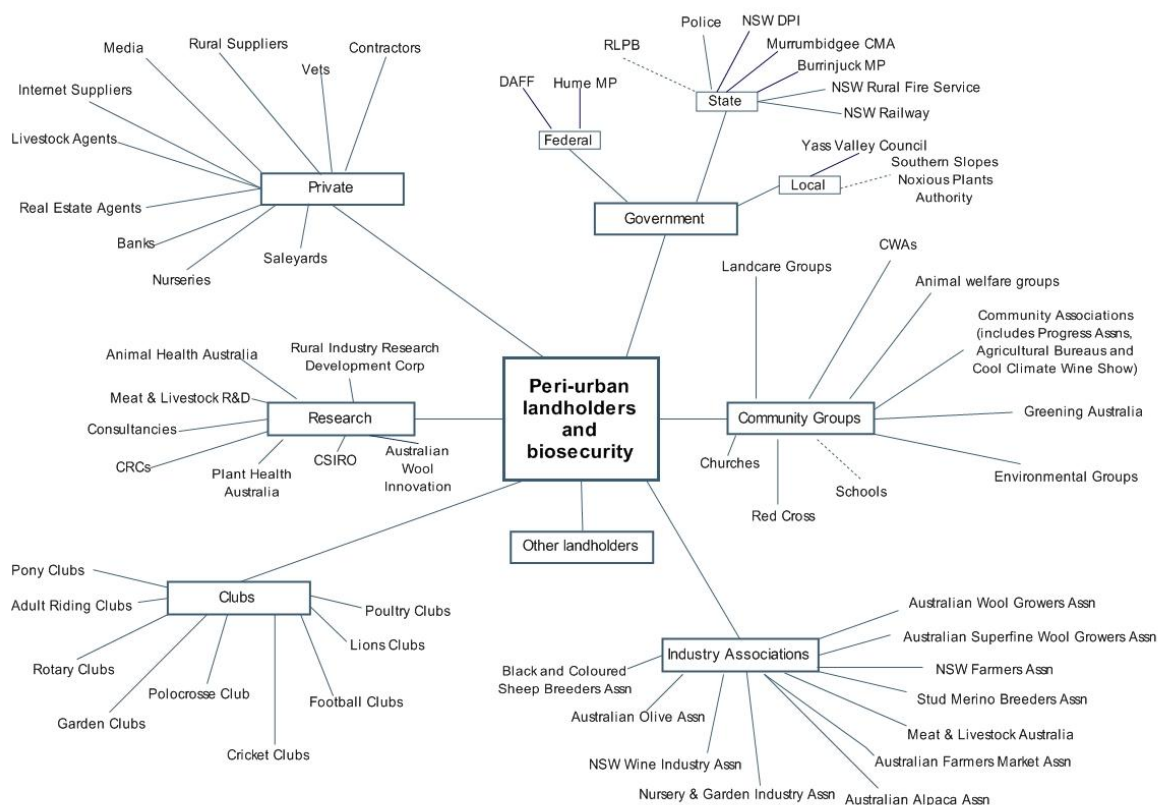


Figure 1. Final stakeholder map for biosecurity in the Yass local government area

5.2 Interest/ Influence Maps

At the suggestion of stakeholders at the first consultation meeting when we were discussing the relative interest and influence of various stakeholders with respect to the management of biosecurity risk within the region, two influence/interest maps were produced – one relating to weeds (Figure 2) and one to animal diseases (Figure 3). The stakeholders advised that the relative interest and influence of stakeholder groups differed with respect to each issue. For example, Landcare and Greening Australia both had high levels of interest in weed management issues, but limited interest in animal diseases. Veterinarians, on the other hand, had high interest in animal diseases and limited interest in weeds.

The position of relevant organisations and groups on the two maps was determined by the researchers, drawing on data from the interviews and surveys as well as input from the stakeholder consultation meetings. The ‘influence’ position reflected the survey responses to the open-ended question seeking respondents’ opinion on those organisations best able to have an impact on biosecurity in the district (Table 2). The position of ‘influence’ therefore reflects landholders’ perspective, not the actual capacity of the organisations to have an impact, although it could be assumed that landholders’ opinions are informed by a mixture of their observation of the organisations’ performance, their understanding of their role and/or their belief that the organisations or individuals have the capacity to make an impact.

Analysis of the interview and survey data revealed that some organisations had higher influence with larger landholders than with smaller landholders and vice versa. For example, DPI was identified by a smaller percentage of small landholders. Given that its target audience is the commercial producer, this did not surprise the DPI representative at the stakeholder consultation meeting. Interview data corroborated this survey data as demonstrated by the following response:

“The Department of Agriculture. Do we have one here?” (Landholder C, 2009)

The Rural Lands Protection Board (RLPB) was identified by a higher percentage of respondents across all landholding sizes, probably reflecting its more regular communication with all landholders. 41% of respondents recalled having received information about a biosecurity issue from the RLPB in the previous two years.

Table 2. Survey responses identifying those organisations best able to have an impact on biosecurity in the district

Landholding size	RLPB	DPI	Landcare	Yass Valley Council	Vets
0-2ha	39%	11%	50%	28%	11%
2-40ha	44%	11%	33%	28%	6%
40-100ha	64%	14%	25%	14%	0%
100-500ha	53%	26%	16%	11%	5%
>500ha	61%	39%	13%	9%	9%
Overall	52%	20%	26%	17%	6%

At the second stakeholder meeting there was some discussion of the role of the Federal Government agencies which had been mentioned by only a handful of respondents. Stakeholders were of the opinion that, whilst they have a national role, at the local level the responsibility lies with other agencies. They were therefore not seen as having an impact at the local level.

As previously mentioned, this survey data was only one component of the data that contributed to the decision about the levels of influence of specific organisations. In some instances, the input from the stakeholder meetings conflicted with the survey data. For example the stakeholders (and some interviewees) argued that the Noxious Plants Authority had very high influence due, in part to its responsibility for implementing the Noxious Weeds Act at the local level.

The following comment from an interviewee gives some insight into how people reflected on the question about the capacity of different organisations to influence biosecurity outcomes in the region:

"We'll keep local government out of it. they're into zoning and land control and stuff. I think the obvious one is the RLPB. There's an infrastructure that's already there. Yes they're undergoing change but they need to morph from more of the compliance type work to advisory work. I think it's the logical infrastructure. They're seen as independent. Don't reinvent the wheel. You just need to utilise what's already existing."(Stakeholder 2, 2008)

On both maps the landholders themselves are represented as having significant capacity to influence biosecurity outcomes but variable interest.

The influence and interest map for weeds (Figure 2) shows that the DPI and the Noxious Plants Authority are seen as having both high interest and high influence in the region--with the proviso that DPI's influence is greater with the larger landholders than with the small landholders. The stakeholder consultation meeting agreed that the RLPB had less influence with respect to weeds than other agencies. Contractors and rural suppliers were identified as having high potential to influence weed management, but limited interest to do so. Increasing their commitment to this issue would mean that they would be more likely to exercise their influence in a positive way. With 23% membership, Landcare has significant capacity to influence and high interest in weed control. Pony clubs were acknowledged as having higher influence than adult riding clubs because of their capacity to disseminate information through their newsletters. The Murrumbidgee Catchment Management Authority, Murrumbateman Progress Association, Bookham Agricultural Bureau and the Australian Superfine Woolgrowers Association were all seen as important players in weed management, with capacity to influence (albeit with different constituencies) and interest in the issue.

Real estate agents had been identified (in interviews, the survey and at the stakeholder meetings) as a group that could be in a position to influence biosecurity outcomes, particularly with respect to weed management. They may have a commercial interest in that they would get more money for a well cared for property and may also have a general public good interest, as suggested by anecdotal information. However, acting for the vendor prohibits them from advising purchasers about potential biosecurity and land management issues.

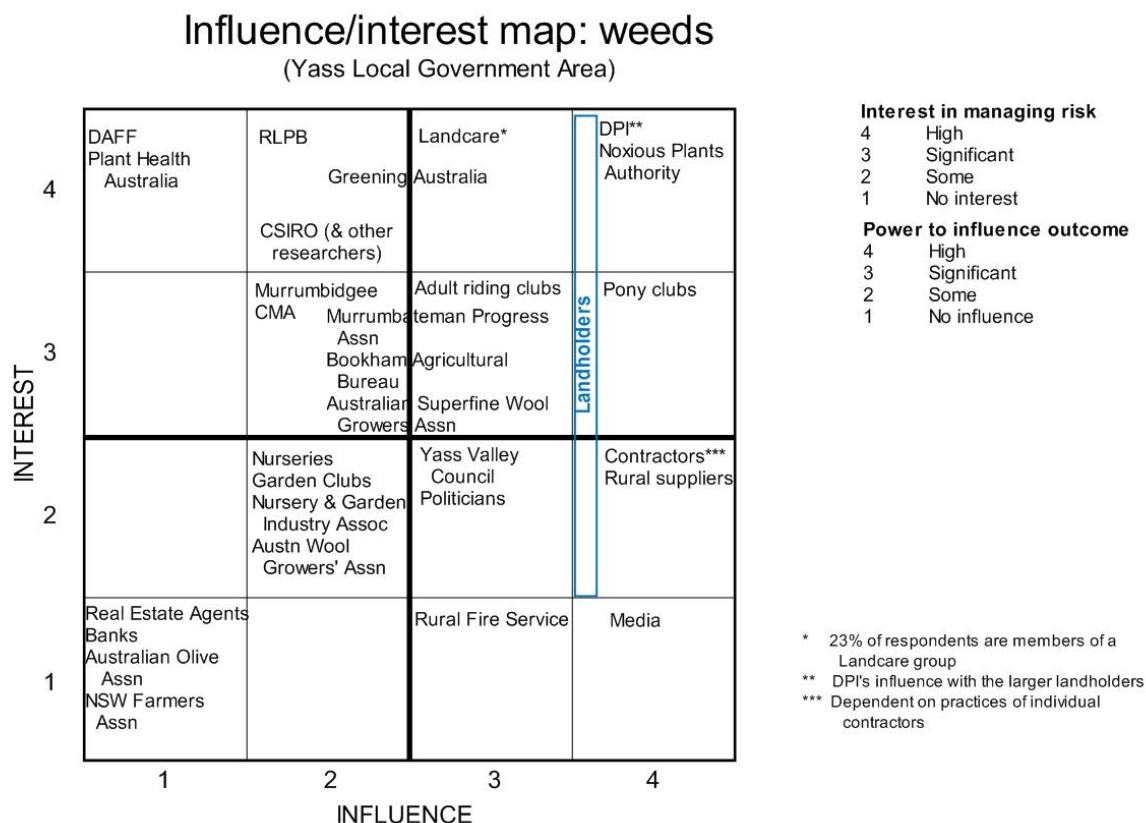


Figure 2. Final map showing influence and interest of stakeholders in the Yass Local Government Area with respect to weeds

With respect to animal diseases (Figure 3), the RLPB and DPI were both seen as having high interest and high potential to influence, the RLPB particularly with smaller landholders. Bookham Agricultural Bureau was added to this high influence/high interest category at the stakeholder consultation meeting as they saw this as an effective local organisation representing the interests of farmers.

Veterinarians were seen as having varied influence depending on the specific disease. Whilst they have a high level of interest in the issue, their capacity to influence outcomes is limited due to the small number of people they deal with. It was suggested that perhaps only about 20% of people with livestock in the area have any dealings with a vet, although 82% of respondents said they would consult a specialist if they noticed unusual symptoms in an animal on their property. This demonstrates the fact that the interest and influence of different agencies and individuals will vary depending on the context. In this research study, due to the need to ensure that the survey questionnaire was an acceptable length, specific situations, such as emergency outbreak, were not used. The interviews did, however, provide the opportunity for greater exploration of specific situations, such as the recent Equine Influenza lock-down of horses in which the pony club played a very important role, and the OJD outbreak in the district some years earlier (see box p 30).

Meat and Livestock Australia (including their Research and Development arm) and Australian Wool Innovation were placed in the top right quadrant because of their respective newsletter readership base. The NSW Farmers' Association was acknowledged as having high interest in the issue, but limited influence as its support in the Yass area has declined over the years largely as a result of the Ovine Johne's Disease (OJD) incident.

Given the high horse ownership in the area, both the pony clubs and the adult riding clubs were seen as having strong links with (and therefore high potential to influence) smaller landholders.

The police were also identified as having influence in this issue as they are the first line of contact in emergencies, such as a disease outbreak.

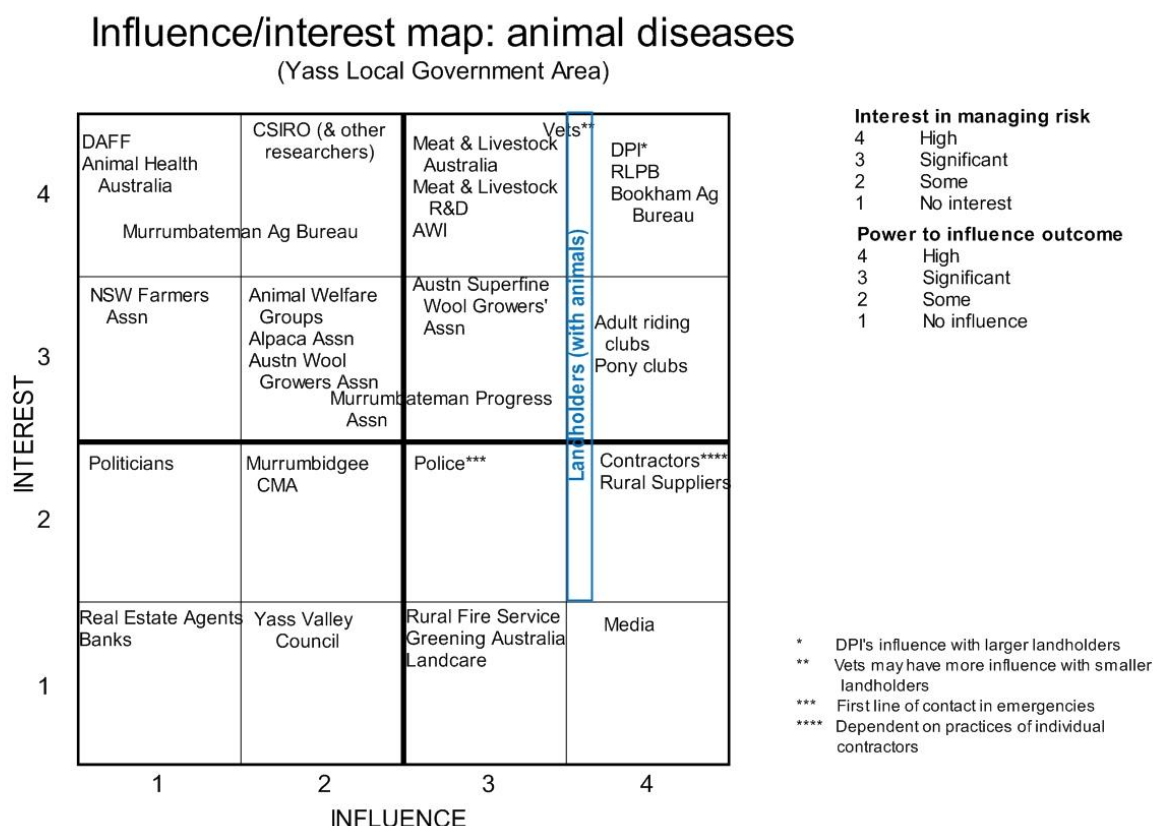


Figure 3. Final map showing interest and influence map of stakeholders in the Yass Local Government Area with respect to animal diseases.

As evidenced by the comments above, these maps are locally and, to some extent, context specific. In different regions and in different situations, the influence of organisations is likely to be different. The process of stakeholder review through the stakeholder consultation meetings was an important component of the stakeholder analysis and mapping exercise. It provided valuable insights both for the researchers and the stakeholders present, who were able to reflect on the relative roles of the different players and see how these roles are affected by specific local issues and incidents, and are subject to change over time and in response to these different situations.

5.3 Survey Results

5.3.1 Demographic Analysis

Culturally and linguistically diverse backgrounds

Demographic data from other studies show that generally, small landholders from culturally and linguistically diverse backgrounds make up a proportion of landholders in peri-urban areas (Maller *et al.* 2007). Australian Bureau of Statistics (ABS) census data (ABS 2006) shows that the Yass LGA differs in this respect, with 93.4% of the population having English

as their first language. This is in line with those that responded to the survey with 95% having English as their first language.

Turnover

Studies in Australia indicate that high property turnover is a characteristic within peri-urban areas (Aslin *et al.* 2004; Hollier, Francis & Reid 2003). Some key stakeholders and interviewees concurred as seen from the comments below:

“The other thing I forgot to mention is the massive turnover in peri-urban land. I think in Murrumbateman it’s every five years. They realize it’s not the dream they expected. They don’t have time to look after their place and are always commuting to Canberra. As time goes on people care less and less about their land.” (Stakeholder 8, 2008)

“For the small people, I guess they change. I’ve got the impression they change over reasonably quickly. Every five to seven years on a lot of places. How you keep information relevant is hard I think.” (Stakeholder 1, 2008)

“In the last ten years it is no longer a farming community It is one of the highest per capita income rural communities in Australia.” (Landholder J, 2008)

The survey data does not corroborate this assumption of high turnover, with 48% of respondents indicating they had lived on their property for more than 10 years and 59% planning to stay indefinitely. Table 3 shows a breakdown by landholding. Although 28% of respondents in the 2 to 40 hectare category indicated an intention to move from their property within the next ten years, a similar percentage (26%) of respondents from landholdings over 500 hectares indicated the same.

Table 3. Length of time at property and planned length of stay at property by landholding size

Landholding size	Length of time at property					Planned length of stay at property			
	< 1 year	1-5 years	5-10 yrs	>10 yrs	Grew up in area	<5yrs	5-10 yrs	Indefinitely	Unknown
0-2ha	5%	22%	33%	39%	0%	5%	5%	56%	33%
2-40 ha	3%	24%	24%	50%	0%	3%	25%	53%	19%
40-100 ha	4%	14%	25%	50%	7%	4%	7%	71%	18%
100-500 ha	3%	3%	18%	53%	24%	3%	3%	66%	29%
> 500 Ha	0%	0%	5%	36%	59%	13%	13%	52%	22%
Overall	3%	13%	21%	48%	17%	5%	12%	59%	24%

Income

Another characteristic of Australian peri-urban areas is that most people derive the majority of their income from activities off the property (Low Choy 2006). Our findings support this with 40% of respondents deriving no income from the property and only 20% deriving over half of their income from property related activities. Of these, half (i.e. 10% of the total number of respondents) indicated that they derived the majority of their income (between 81 and 100%) from their property.

The breakdown of this data by property size reveals that of those people on properties over 500 ha, 74% earned more than 50% of their income from their property. For those on properties between 100 and 500 ha this was considerably less with only 21% earning more than half their income from their property. As was to be expected, as property size decreases the percentage of income earned from the property decreases with only 8% of those on

properties of 40-100 ha earning more than half their income from the property and only 3% of landholders on properties of 2-40 ha doing so. These data were corroborated in stakeholder consultations where people commented that it was common knowledge that very few people were able to live solely on the earnings from their property. The fact that 89% of those people on landholdings of between 2 and 40 ha earned less than 10% of their income from their property (and 100% of those on properties less than 2 ha) confirms the assumption that small landholders in peri-urban regions are either commuters, 'lifestylers' or hobby farmers.

Nonetheless, 53% of respondents indicated their primary purpose for keeping animals was commercial. Only 4% grew fruit (including grapes) and vegetables for commercial purposes.

Tenure status and purpose of living or moving to the Yass area

With only two exceptions, all respondents owned the property. The overall tenure data for the Yass LGA is that 77% own the property, with 21% in rented property and 12% in some other tenure (or did not state their tenure status). Given our survey response, we assume that this bias towards property owners reflects the fact that those who are renters would have been less motivated to complete the survey. Fifteen percent of respondents did not live on their property permanently with a mix of weekenders, absentee landholders (less than 4 visits a year) and those who visited more regularly. Of those who had not grown up in the area, 56% had moved there for the rural lifestyle (that is, they saw their property primarily as a residence) and 47% for rural pursuits (that is, their primary purpose was to generate some income from their activity on the property).

5.3.2 Activities on property

Of those surveyed, 88% indicated that they had animals with a third of respondents having more than three types. Sheep and cattle were the most commonly owned animals (50% and 48% respectively). Other animals mentioned, apart from horses, cats, dogs and poultry, were pigs (2 respondents), goats and alpacas (6 respondents each).

There was no correlation between number of animal types and landholding size. One interviewee, a person living in the Yass township on less than half an acre, kept bees, chickens and dogs and also owned horses which were to be moved to a neighbour's spare allotment. The agistment of horses has implications for biosecurity and land management as the horses contribute to hard grazing of often marginal or already degraded paddocks. The horse owner doesn't feel responsible for the condition of the paddock which suits the well-being of the horse, as we heard at the Yass meeting. The owner of the paddock has no incentive to manage the weeds, unless there is something noxious to horses.

In both the stakeholder meeting and interviews there was comment that the Yass area has one of the highest per capita horse ownership in Australia (of those surveyed 39% had horses).

"We've got 30% ownership of horses in Murrumbateman, 1 in 3 houses owns a horse which is really quite high."(Landholder J, 2008)

People had different reasons for keeping animals and seemed to think about animals in different ways. In two separate interviews, the interviewees had forgotten about their chickens when asked what animals they had but were later prompted to remember them.

Interviewer: “Oh, so you have chickens too?”

Interviewee: “Oh yes I forgot about the chickens. There’s only four of them.”
(Landholder Q, 2008)

In a study commissioned by DAFF (2007), investigating avian influenza awareness among small flock poultry owners, it was found that people would respond differently depending on their primary motivation for keeping birds. This study distinguished between backyarders and poultry fanciers. Those referred to as *backyarders* had no emotional attachment to their birds and so therefore no focus on bird health. The *poultry fanciers* on the other hand had strong emotional attachment and a financial interest with high levels of knowledge about avian influenza and how to protect their birds.

Responses from our interviews also indicated that people viewed their animals in different ways and that these different perspectives were likely to determine their actions and possibly their response to a biosecurity risk:

“You think about a horse and it’s somewhere between a farm animal and a pet and more on the pet side so they actually do care but it doesn’t mean they necessarily do the right thing or the smartest thing.” (Landholder K, 2008)

“That’s really why I’m looking after the Patterson’s Curse. It is because of the horses. Maybe if I didn’t have horses I wouldn’t worry about it.” (Landholder J, 2008)

5.3.3 Biosecurity awareness

Hollier, Reid and Reed (2006) found that many landholders are unaware of the risks related to farming practices and the majority of those interviewed were unsure of the meaning of biosecurity. Our study had somewhat similar findings. Twenty-two percent of respondents said they were very familiar with the term. However, 61% said they were ‘somewhat familiar’ and 16% indicated they were ‘not familiar’.

Table 4 breaks this down by landholding size. Although a higher percentage of respondents in the less than 40 hectare categories indicated they were ‘not at all’ familiar with the term biosecurity, it is the group in the 40 to 100 hectare landholdings that stand out with only 4% responding they are ‘not at all’ familiar with the term. At the high end of the scale – being ‘very familiar’ with the term biosecurity – the four categories under 500 hectares have similar results with the greater than 500 hectares having 30% of respondents being ‘very familiar’ with the term.

Table 4. Familiarity with term biosecurity by landholding size

Landholding size	Familiarity with term biosecurity		
	Not at all	Somewhat familiar	Very familiar
0-2 ha	28%	50%	22%
2-40ha	23%	57%	20%
40-100ha	4%	77%	19%
100-500ha	13%	63%	24%
> 500ha	13%	57%	30%
Overall	16%	61%	22%

Comments from interviewees, when asked how they understand biosecurity, further highlight this:

“Nothing comes to mind really.” (Landholder C, 2008)

"I read your flier and I thought what are they talking about? To me it's academic bullshit." (Landholder I, 2008)

"Fridge magnets with black and white cows and purple dots. That's the image that comes to mind. And then after that bureaucracies and regulations and rules and it's a load of crap." (Landholder O, 2008)

"It's not really something I think of that much. It may be things that we do, or think about, but not necessarily in those terms." (Landholder H, 2008)

The following responses from survey respondents, when asked what the term biosecurity means to them, provide further insights into the range of people's response to the term and their different levels of understanding:

"To me it means unnecessary smug jargon. To you I assume it means defence of a species believed to be native at some recent point in time to be native to an area." (Respondent 26, 20-40 hectare, 2008)

"The management of activity and growth of undesirable organisms. (But a somewhat obfuscatory term.)" (Respondent 68, 100-500 hectares, 2008)

"Invasion of non-native flora and fauna." (Respondent 106, 100-500 hectares, 2008)

"Biosecurity is the measures taken to protect your livestock from disease and your land from weeds." (Respondent 12, over 500 hectares, 2008)

"The protection of the economy, environment and health of living things from diseases, pests and bioterrorism." (Respondent 138, 0-2 hectares, 2008)

"Preventing the spread of unwanted plants, animals and associated diseases." (Respondent 48, 2-40 hectares, 2008)

Notwithstanding this variable understanding of the term, survey respondents were more aware of the importance of biosecurity, with 60% identifying it as being 'very relevant' to them.

Whilst the above table indicates some variation in terms of familiarity with the term across different landholding sizes, no significant statistical correlation was found between property size and familiarity with the term biosecurity. Nor was there any statistically significant correlation found between property size and people's awareness of the factors contributing to the spread of pests and diseases. Figure 4 shows this graphically. This corresponds with Maller *et al.*'s (2007) findings which suggest that 'small landholders pose no greater biosecurity risk than other segments of the population' (p.82).

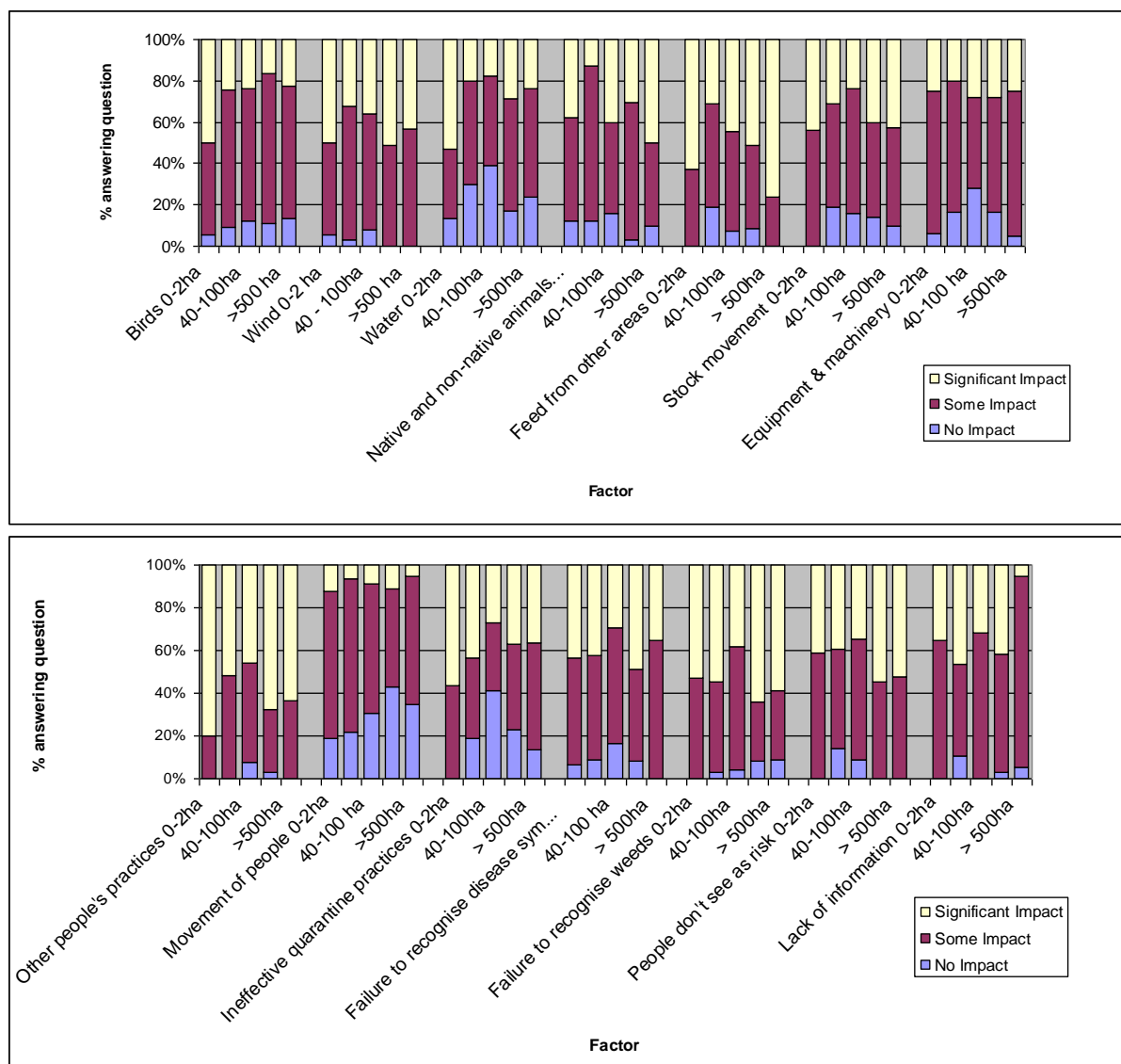


Figure 4. Awareness of significance of factors contributing to spread of pest and disease

Interviewee comments corroborate this finding:

"I mean I think some of the smaller landholders are a great concern but probably no more than the outback where people go out and they buy feral goats. Probably with all sorts of burdens"² (Landholder X, 2008)

Interviewer: "What do you think are the main factors that contribute to the spread of pests and diseases?"

Interviewee: "Negligence really. Carelessness. Ignorance. They'd be the three"

Interviewer: "With ignorance is that across the board?"

Interviewee: "Across the board really. Lots of the commercial producers are as much at fault as the blockies. ... I wouldn't have said that either group was any better off than the other. In the broader farming community there is always one or two who are not familiar with what they're handling or how to deal with it." (Stakeholder 6, 2008)

² The interviewee used this term a number of times in the interview to refer to animal diseases.

The survey results of people's general awareness around the specific factors leading to the spread of pests and diseases is analysed further in Section 5.4. However, some of the comments from the interviews suggest that, while there are issues around awareness, even if people are aware, it cannot necessarily be assumed that they will act on this knowledge:

Interviewer: *"Do you think there might be an element of lack of awareness as well?"*

Interviewee: *"No. Just laziness. Or just refuse to do it. I've got a couple of clients who refuse to drench. They've been running farms for fifty years." (Stakeholder 7, 2008)*

Interviewer: *"What do you think are the main factors that lead to the spread of pests and disease?"*

Interviewee: *"Lack of knowledge, lack of adhering to guidelines if you are aware of them. Communication would be an issue I suppose. And I guess a bit of complacency like we know our property or our animals well enough not to have to comply, and that sort of thing." (Landholder E, 2008)*

Interviewer: *"What sorts of things have you seen that cause you concern?"*

Interviewee: *"Well when the horse flu was around there were people on horses riding up and down the easements. I think they were aware of it but the degree of importance in their mind is a different thing." (Landholder R, 2008)*

Interviewer: *"What do you personally think are the main factors that contribute to the spread of pests and diseases?"*

Interviewee: *"Oh look, probably ignorance. Probably just people not realising. Even professional farmers, people who make their living, are constantly undergoing education through experience." (Stakeholder 2, 2008)*

Respondents had a greater awareness around weeds and weed pathways than they did around animal diseases. Of those surveyed, 58% could name 5 or more weeds with only 8% leaving the question blank, or indicating they didn't know (Figure 5). Whilst there was no statistically significant relationship found between number of weeds known and landholding size, the graphic representation below suggests that the power of the test may have been insufficient to detect the effect. With up to 20% of people on the smaller landholding sizes either leaving this question blank, indicating they don't know any weeds or are only able to name 1-2 weeds suggests that knowledge of weeds amongst small landholders is less reliable than that of larger landholders.

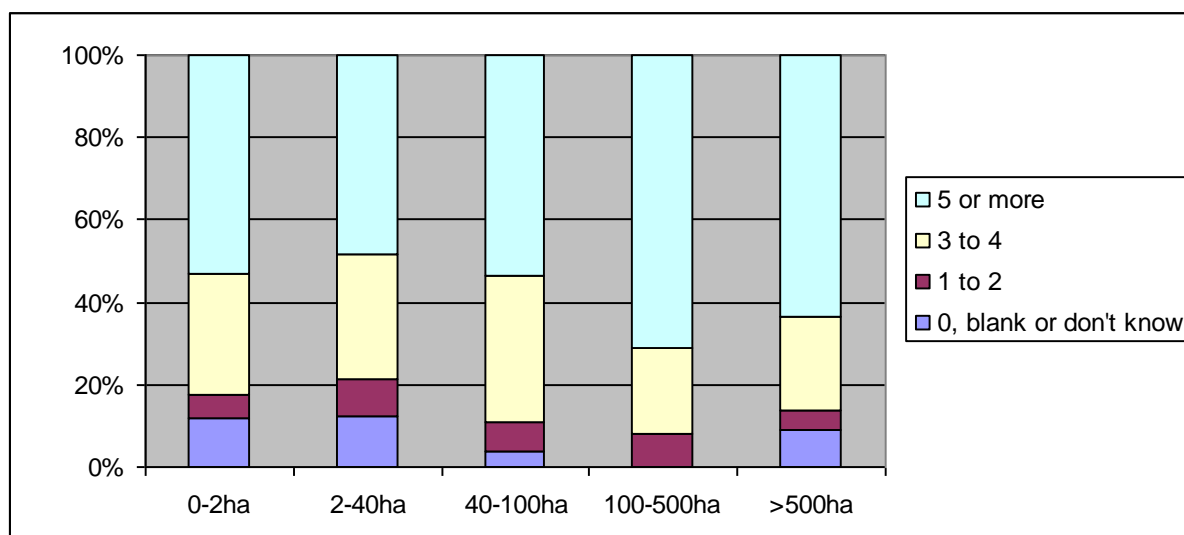


Figure 5: Number of weeds listed by landholding size

There was a total of 60 different weeds mentioned with those most commonly listed (e.g. Patterson's Curse, Serrated Tussock, St John's Wort, Cape Weed) being the same weeds that were mentioned by the DPI agronomist as problematic in the area. Of the 20 Weeds of National Significance (QLD Department of Primary Industries and Fisheries 2008) 16 are declared noxious in the Southern Slopes area (which includes Yass LGA). Only three of those 16 weeds were named by respondents. There are 104 weeds listed on the Southern Slopes County Council noxious weed declarations for the area (NSW DPI 2009). The list identifies five classes of weeds dependent on their presence and distribution in the region. Twenty of those weeds were named by respondents. Thirteen of the weeds listed by respondents that were included on the noxious weed declaration where Class 4 weeds i.e. identified as already widely distributed in the area.

When asked what they would do if they found a plant on their property that they couldn't identify 50% of respondents said they would ask a specialist and 37% said they would ask a friend or neighbour. Friends or neighbours may indeed be valuable sources of information, as demonstrated in this anecdote from one interviewee.

"And a friend of mine who bought 30 acres said oh I have these fantastic plants that have come. They're like this and that and I said that's Scotch Thistle. And she said well what will I do with it? So I said how much do you have and she said I have acres of it." (Landholder C, 2008)

With respect to animal diseases, the situation was different, with only 13% of respondents listing 5 or more animal diseases that they thought were or could become significant in the area, and 33% leaving the question blank or indicating they did not know (Figure 6). The NSW DPI (2008) provides a list of notifiable animal diseases in NSW naming 91 diseases that are considered exotic to NSW and 25 that are considered endemic or sporadic in NSW. Survey respondents named only 8 of the 91 exotic diseases and three of the 25 endemic diseases.

These findings are consistent with Maller *et al.*'s (2007) findings where 25% of commercial producers and 50% of backyard producers had an exotic disease knowledge rating of two or less out of five. A statistically significant correlation was identified between the number of animal diseases listed and landholding size (χ^2 value = 0.002) as exemplified in Figure 6, with those on larger landholdings able to identify more animal diseases than those on smaller

landholdings. The lack of knowledge about notifiable animal diseases amongst all landholders, particularly amongst smaller landholders, is of concern. Particularly surprising is the fact that only 20% were able to name Equine Influenza (EI) as a disease that was or could become significant in the area, and only 35% of those people who owned horse owners did so.

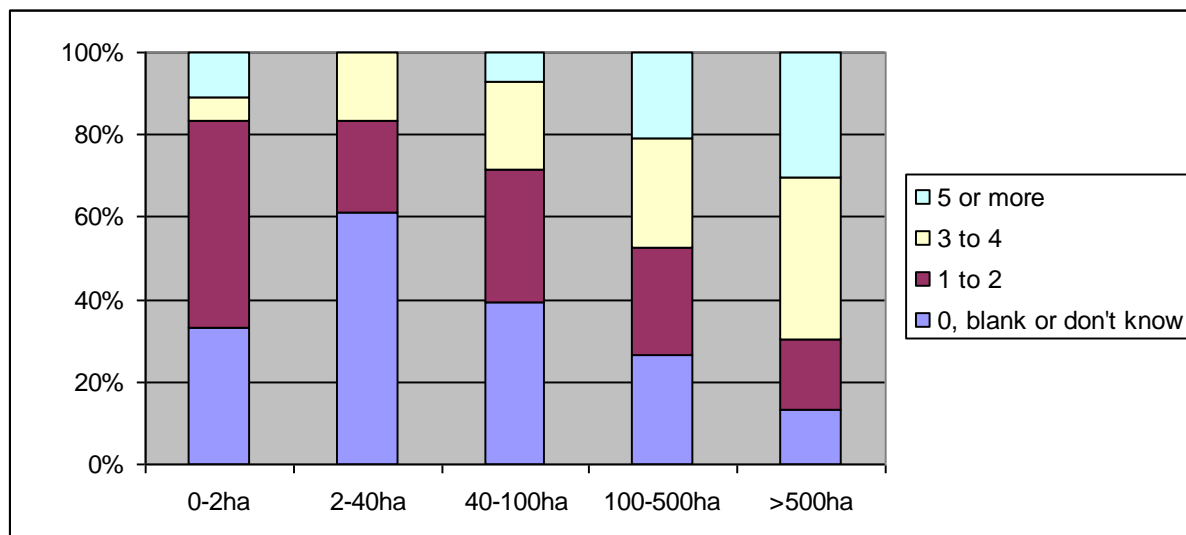


Figure 6: Number of animal diseases listed by landholding size

While the data revealed an overall low level of awareness of animal diseases, 82% of respondents said they would ask a specialist if they noticed unusual symptoms in one of their animals, indicating, nonetheless, an awareness of potential risk.

Case study: Ovine Johne's Disease

In 1998 the six year National Ovine Johne's Control and Evaluation program (NOJDP) commenced with the aim of slowing the spread of Ovine Johne's disease (OJD) while conducting research to better identify ways to handle it. Areas were identified in terms of the level of infection of stock with some having significant levels of infection, some free of infection and others in intermediate situations. Trading restrictions were imposed on NSW producers identified in areas with significant levels of infection. These areas were defined by RLPB boundaries and the Yass area was included.

Throughout the course of the NOJDP it became evident that the desired aims would not be achievable, mainly because of the disincentives created for sheep producers and the failure of government and industries to compensate those producers whose flocks were found to be infected. Those people living in the areas having significant levels of infection needed expensive testing to prove their flocks were disease free to sell outside the zone. So in regions where OJD was known to occur, producer support for the program rapidly declined.

One of the main problems that arose as a result of the NOJDP was the

“erosion of industry/producer support, particularly in endemic areas, associated with regulatory program which restricted trade and a lack of financial cooperation

leading to diminished reputations of government authorities, industry associations and individuals” (NSW OJD Advisory Committee 2003 p. 26)

There were huge economic and social costs associated with OJD during this time. Those that were found to have OJD in their flock were heavily penalised. Stud breeders were particularly hard-hit, losing on average a quarter of a million dollars a year. One of the stud breeders in Yass had one ewe in his flock test positive to the OJD. His family's stud business was immediately shut down, his property quarantined and its' value halved with their 50 year breeding program devastated (Austin 2001).

A stock and station agent interviewed in Yass provides this response to the situation at the time.

“Well they [the Department of Agriculture] ostracized people. Initially from an individual personal point of view in our own area but then they ostracized them from the rest of the farming community and the rest of the industry. You know it was very much an ‘us versus them’ thing. We were sort of the pariahs and you know initially if someone came down with the disease they were quarantined and the only way they could sell livestock would be to the abattoir. And there was certainly more than one incidence where livestock weren’t killable from an abattoir’s point of view and the only way they could get rid of them was to slaughter them on the farm. And I’ve seen a number of individuals, it nearly drove them mad. The worry and the stress of having that disease. It was terrible. And just from a human point of view the situation was very badly handled. How they could have done it better I don’t really know except to say that you know it should have been handled better from person to person point of view.” (Stakeholder 6, 2008)

A report conducted by Hassall and Associates in 2000 suggested that 90% of the losses incurred by affected farmers were as a direct result of the regulations and only 10% by the disease itself (Letts 2001). They also estimated the total potential losses to NSW sheep producers from OJD at between \$58 million and \$176 million (Austin 2000). In December 2001, it was estimated that almost 75% of infected flocks were undetected partly due to the inability to engage sufficient producers in surveillance programs because of the disincentives associated with detection of OJD in a flock.

As one farmer in the Young RLPB (bordering Yass) stated “I am not quarantined. I am suspect which means I am in limbo. I am not negative although I have a certificate to say I am. I'm not positive. I'm not allowed to trade. \$1000 ram is now worth \$10 in the slaughter yards,” he said.(Letts 2000)

It was acknowledged that the spread of diseases could not be prevented only slowed. This eventually led to zone-based trade restrictions being relaxed on the trading of sheep from areas affected by OJD in 2004. Even though it has been several years since deregulation of trade, there are some producers who still feel as though they are being discriminated against.

One of the stakeholders in the Yass district sums up the incidence as follows:

“A very good case study of how not to go about managing an animal disease problem. In the early days all they concentrated on was the disease. They ignored the comments that people manage the disease. Humans are involved, there are people involved. The disease involves animals but it also involves humans. At the critical period at the beginning, they ignored the human component, and that became the problem that got the whole thing off on the wrong foot.” (Stakeholder 5, 2008)

Frewer (2003) suggests that an event perceived to be caused by managerial incompetence and mishandling may trigger the response to a future risk or similar hazard. The following comments confirm this response:

“The OJD thing created a lot of bad feeling and resentment between the producers and the department and the RLPB. So there could be partly an impact now that we tend to leave those issues alone because if you bring them up it still rakes up old wounds. People are aware of the way it was handled and people will think very carefully whether they open their mouth. So if we had a ... Put it this way, if we had a disease arrive in Australia in 2002 a lot of producers would have kept their mouth shut. They wouldn’t have reported it.” (Stakeholder 5, 2008)

“I think people will be a little bit sceptical [because of OJD] until they are sure of what it [disease] is. Because I know there have been some attempts to keep some things hidden, local things, like footrot and things like that.” (Landholder V, 2008)

5.3.4 Biosecurity practices

We asked in both the interviews and surveys what different practices people follow to keep their land free from pests and diseases. Figure 7 illustrates responses from the survey. Over 90% of respondents indicated that they either always or sometimes undertook the specific practices identified, which included holding new stock in separate paddocks, vaccinating, rotating stock, monitoring for and removing weeds. The exceptions related to hygiene practices, where between 20 and 50% of respondents stated that they never clean vehicles, machinery or equipment or footwear and clothing. In a situation where an infectious disease has been identified within the district, this would obviously be an issue of concern, and should be a target of communication strategies. However, as one stakeholder said at the consultation meeting, if this is the only area where people’s practices are wanting, then it is not necessarily an issue of great concern within the overall context of day-to-day risk management.

Comments from the interviews corroborate this interpretation that people are effectively making an intuitive decision about the level of risk and weighing this up against the cost, time and effort involved. :

Interviewer: “Are you worried about new machinery coming on to the place?”

Interviewee: “No not really. We know the neighbours pretty well. I should be paranoid but I’m not. It’s one of those things that you think twelve months down the track I should have done that.” (Landholder F, 2008)

Interviewer: “Do you follow any practices in terms of cleaning your vehicle or shoes?”

Interviewee: “No, not at all.” (Landholder J, 2008)

Interviewer: “Do you personally follow any sort of practices, travelling around your property?”

Interviewee: “Only in the..., around here not particularly. But I sort of know where various things are.” (Landholder S, 2008)

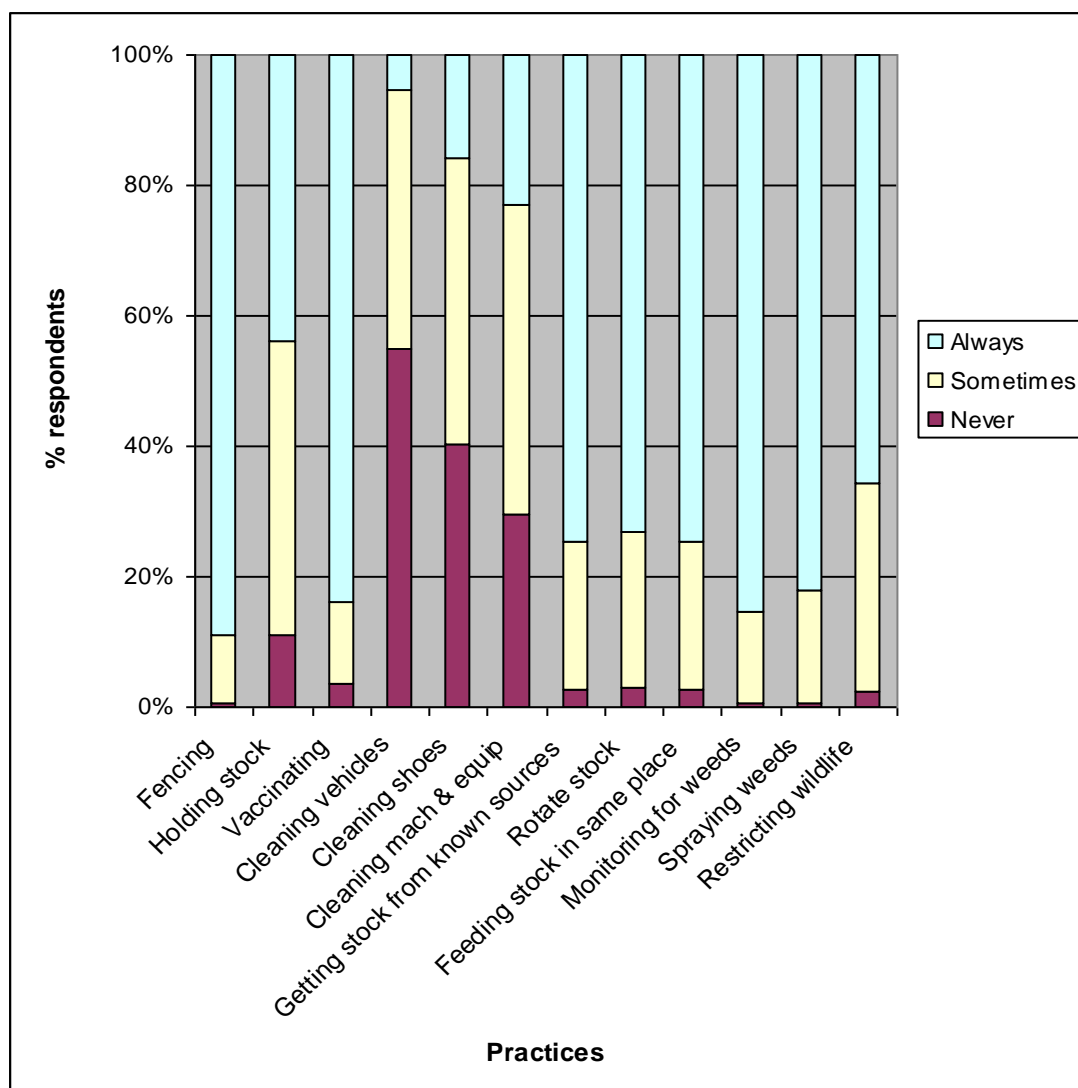


Figure 7. Steps people take to keep their land free from pests and diseases

When these data was broken down into the different categories of landholding sizes (see Appendix F), the data showed limited variation across the different landholding sizes with the exception of holding stock in quarantine paddocks and rotating stock, where those on smaller properties were less likely to implement these practices. It is possible that these data reflect the physical difficulty for people on smaller properties to have separate quarantine paddocks and to be in a position to rotate stock between paddocks.

When asked in the survey for the top three reasons people manage weeds on their land, the most common responses were 'good land management', 'pasture protection' and 'responsibility to neighbours'. Table 5 breaks this down further by landholding size category. The percentage of people who listed the reason as their first, second or third priority were grouped together as although the question asked people to rank the reasons in order of priority (by placing a 1, 2 and 3 next to the reason) a number of respondents placed a tick beside three separate responses rather than numbers. Financial considerations rated more highly with the larger landholders. Animal health rated more highly with the small landholders. Stakeholders commented that this may be due to the high proportion of horse owners on these small holdings. Nonetheless it is a significant finding for structuring communication.

Table 5. Reasons for managing weeds on land by landholding size

Land-holding size	Reasons for managing weeds on land							
	Animal health	Pasture protection	More costly if done later	Maintain land value	Good land management	Aesthetics	Compliance	Responsibility to neighbour
0–2 ha	28%	22%	28%	17%	61%	28%	28%	56%
2 – 40 ha	8%	61%	22%	14%	69%	11%	14%	33%
40-100 ha	11%	75%	32%	18%	82%	7%	21%	29%
100-500 ha	8%	89%	39%	8%	79%	3%	16%	50%
> 500 ha	4%	65%	39%	30%	91%	0%	9%	4%
Overall	10%	61%	32%	16%	89%	8%	17%	35%

When asked in an open-ended question what their main land/animal/crop management concerns on their land were, over 50% of respondents said weeds. Other responses were drought (21%), neighbours' inaction (12%), feral animals (12%) and native animals coming on to property (8%). In the interviews, when asked how they would rate biosecurity given other priorities on their land, the interviewees did not give it high priority as some of the following comments indicate:

"It's not something I put at the top of the tree but something I'm aware of. Drought, markets, social and economic impacts and biodiversity are all issues I'd probably rate above it."(Landholder T, 2008)

"In terms of weed control it does, that's the big one for me here. If we had an outbreak of an exotic disease here it'd be priority straight away but while you don't have it it's not there. And whilst there is no immediate threat you are not really thinking about it either."(Landholder K, 2008)

"Not a high priority. Our highest priorities are having enough feed for the horses. Even that's not a major issue as we only have two so can buy feed if necessary. Keeping pasture free of weeds."(Landholder L, 2008)

"It's part and parcel of farming. I don't think I'd rate it higher than anything else but all part and parcel of the farm."(Landholder Q, 2008)

5.3.5 Networks and sources of information

Networks operate at many levels and it is the informal social networks that are often difficult to trace but an important source of information for many.

Interviewer: *"Do you see that there are any common places or networks that people have here?"*

Interviewee: *"It's such a complex issue. It's very much focused on the informal networks."* (Landholder E, 2008)

When delving further into both the formal and informal networks in Yass we found that respondents had regular dealings with over 100 different networks across a mix of work-related, recreational, children's activities, social, community service groups, environmental

groups and specialist animal and plant groups. These networks were in addition to social gatherings of friends. In the interviews, when people were asked about how they accessed particular information, they made the following comments:

"We tend to get most of our information through people in the pony club or others around the district. Just through going to meetings or through associating with those people at other non-pony club events." (Landholder B, 2008)

Interviewer: "How did you first hear about EI?"

Interviewee: "A friend phoned because the lockdown happened on Saturday. I guess a lot of the information came through pony club and through friends." (Landholder B, 2008)

Interviewer: "Do you think some of your networks have been created around your children?"

Interviewee: "Yes. Well pony club. You know there's quite a strong network of friends with kids but also the adults tend to socialise....That's the other thing too, that people within their networks often email things on to other people, and I think probably the email route is the best way to get information to people because it spreads through the networks that way." (Landholder H, 2008)

Interviewer: "Where are you most likely to take advice from about the horses and where would you go for information?"

Interviewee: "Well I suppose the vet if it's something serious. Or we have our network of friends that are very knowledgeable on horses." (Landholder L, 2008)

"Well community is the important part. Community and communication and everything else will be covered if you get that sense of community. Because it's information getting out that's the problem. That's the hardest part." (Landholder F, 2008)

The groups with the strongest membership base were both community organisations – the Rural Fire Service with 40% nominating this as a group with which they had regular dealings and Landcare, nominated by 23%. It is noteworthy that three landholders interviewed expressed concern with the way Landcare was changing and two of these had left their respective Landcare groups with the third considering leaving.

"I think this is a big problem with Landcare too – everyone wants to formalise skills and you just can't. And the more you formalise it the more people get offside.If you get too formal you lose that community give and take and you have people say I'm not going to do that." (Landholder Q, 2008)

The adult riding clubs and pony clubs were nominated by 9% and 8% of the respondents as groups people had regular contact. Sports clubs (tennis, golf and rugby) were nominated by a small percentage of people (5-7%).

As well as sourcing information from informal networks we also investigated other channels that people were using to see if we could establish some commonalities amongst the information sources people access. Once again, responses were many and diverse. Over 60% of respondents said they access information via the internet when they have an issue on which they require information. Of these, 42% had at some point in time accessed the DPI website, 34% the RLPB website and 15% the DAFF website. Seventy-eight percent of respondents said they had received information about pests and diseases in the last two

years and when asked where from, 53% named the RLPB, with DPI and the Yass Valley Council as the next most frequently nominated source (24% and 15% respectively). The most commonly read newspaper was The Canberra Times with a 52% readership, followed by The Land at 43% and the Yass Tribune at 35%.

“You know I still find that a lot of people don’t read our local newspaper and I wonder how they find out anything. I work with a couple of people who live out this way and I was talking about the festival, we have an annual river festival in Yass in November, so I asked her if she was going to it and she said what festival. And I told her and she said I don’t get into town much and I said what do you mean into town you’re only one kilometre from the post office. She’s on the Canberra side of Yass and does her shopping in Canberra when she drives to work. And she does her shopping in Gungahlin on her way out and hardly does anything in her local community. I’m thinking why did you come here if you’re not going to be involved.” (Landholder C, 2008)

Fifty-eight different special interest magazines and newsletters were read by respondents on a regular basis. Meat and Livestock Australia’s (MLA) *Feedback*, *Beyond the Bale*, published by Australian Wool Innovation (AWI) and the Yass Area Network of Landcare Groups, *Landcare Newsletter* were the ones most often cited but only with 5% response for each.

The most common media regularly accessed was the ABC local radio station with 60% of respondents reporting that they listen to it on a regular basis. There was no correlation between this and landholding size. (See Appendix G for a further breakdown of communication accessed by respondents).

Interviewees suggested that any new communication should build on existing programs where possible. When asked about the appropriate channels and organisations for information dissemination, RLPB and DPI were the most commonly named.

Interviewer: *“You mentioned Council as maybe having a role in disseminating information. Who else do you see as may have key roles in this area in terms of biosecurity outcomes?”*

Interviewee: *“RLPB for sure as they have a rate base and essentially that is what they are there for. It’s maybe even why they were primarily set up. And the on-ground networks, and not just one, you need to look at them as a collective and say how are we going to get the information to these on-ground groups as not everyone is a part of every on-ground group so it’s being able to feed down into the networks. That may be council, the RLPB or DPI. It doesn’t matter who it is, they can then go to their members and friends and then disseminate the information.” (Stakeholder 8, 2008)*

“I think people quite often see the RLPB as supervisory and not advisory and so ... there was a bit of a reluctance to use them for advice because they were seen as more like the government or police, you know, compliance type people. But they’ve been changing, softening that to a much wider role in terms of advising so that’s really positive.” (Stakeholder 2, 2008)

We also asked some of the people currently working in biosecurity areas what they felt was lacking from communication materials.

“The spin with weeds says this is a terrible disease and it will take over your place in ten years. Well that’s the message but if you say you’ll lose \$5,000 this year and

\$6,000 the next then people might actually get it. It's a hard message but I think it needs to go with a little bit of economic rationalism." (Stakeholder 1, 2008)

"We have nasty things like Serrated Tussock and St John's Wort and I guess no-one talks about them because they haven't got any easy solutions. Even saying that is a good message I think. Say we haven't got any solutions so if you see them start to sneak in you should do something now rather than later." (Landholder N, 2008)

There was recognition by a number of people interviewed of the importance in engaging with the community about biosecurity issues and the need to step away from a top-down approach.

"It [OJD] certainly aged a lot of people and caused a lot of angst and there was no social or medical support. There was no support for it and there was very little thought given to, ok how can we help these people? I think one of the first issues if a situation like this arises with anything, foot and mouth or whatever, is to go to the farmer and say how can you see it affecting you as opposed to someone sitting in George Street in Sydney or Northbourne Avenue in Canberra. When you look at the social infrastructure and the network and all of that and how things work in the bush you get an understanding of how can you handle it and what you would suggest to put something in place." (Landholder T, 2008)

"You know, I think people generally want to help and do things. Once they know and know the reason for it they will. But you can't send them something and expect them to turn up. We need to do these things face to face. People just respond better. Human nature I guess." (Landholder F, 2008)

5.4 Mental Model Diagrams

The mental models diagrams were used to help elicit people's knowledge and understanding of biosecurity risks in their area and the basic parameters they are operating within in regard to these risks. These diagrams evolved over the course of the project. The first diagrams had more detail on establishment factors, many of which were to a great extent not controllable (Appendix C). As we were interested in understanding the awareness surrounding the more controllable factors, we decided to focus the diagrams on entry, spread and management variables. We also decided it was important to include attitude and awareness variables, as we acknowledged that these would influence people's management actions, even if they were aware of a specific pathway risk.

Figure 8 shows the pathways for animal diseases and the corresponding management actions, attitudes and awareness using a traffic light system to highlight areas of concern. The red boxes illustrate management practices that are not being followed and that therefore warrant attention particularly in a situation where there is an infectious disease outbreak. These all relate to hygiene awareness and practice. The data show a significant gap in knowledge around the risk of animal disease spread through both human movement and water. Whilst there is limited opportunity for management action with respect to spread of disease through water channels, the implementation of hygiene practices can minimise the risk of spread through human and vehicle movement.

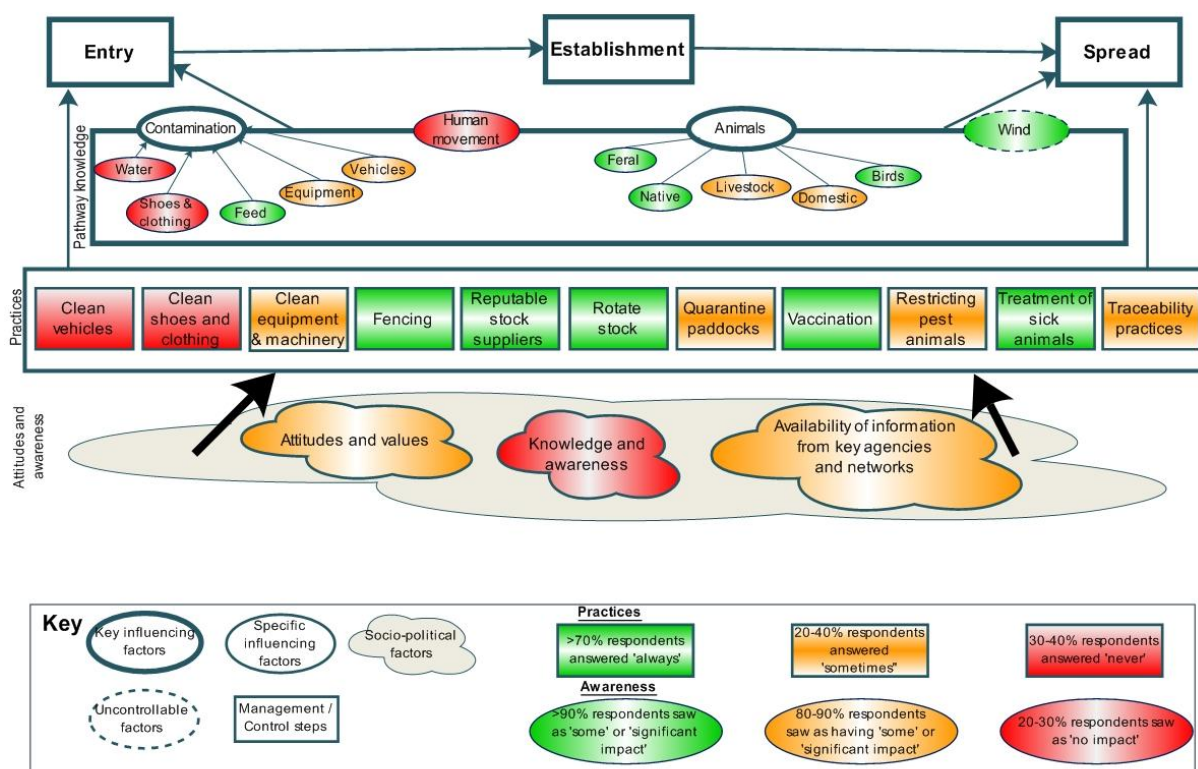


Figure 8. Animal diseases pathway diagram indicating landholder's knowledge, awareness and practice

Also related to hygiene practices is the cleaning of equipment and machinery. Although 83% of respondents recognised that moving equipment and machinery between properties had some or significant impact in the spread of pest and disease in the area, 29% said they never cleaned their equipment and machinery and only 23% answered they always did so. Even less people said they cleaned vehicles going between properties with 40% never cleaning them. Only 4% responded that it was a practice they always followed and 27% answered 'not applicable'. So, while there is awareness of disease spread risk in this way (and this would be relevant to a number of diseases such as OJD, strangles, foot and mouth disease, and had been directly experienced by horse owners in the recent equine influenza shutdown), people were not regularly taking these actions on a 'precautionary basis'.

'Attitudes and values' is shaded orange and was based on the survey question where respondents were asked to rate the significance level for the statement 'people don't see the spread of pests and diseases as a risk in this region'. Forty-six percent responded that this has a significant impact, that is almost half the respondents were concerned about the apparent complacency of their neighbours, with only 5% saying that this was not an issue. This was further corroborated in responses to the open-ended question about people's main land/animal/crop management concerns, where 12% answered neighbour's inaction.

'Knowledge and awareness' is shaded red and was based on a question where respondents were asked to name animal diseases they believed were significant or could become significant in the area. Thirty-four percent of respondents could not name any while only 13% were able to list five or more.

Although in the survey we did not ask people specifically about traceability practices, responses from the in-depth interviews indicate an awareness of the importance of traceability practices although it was noted there may be some issues with current procedures. Based on interview data only we have shaded this area orange.

The awareness and management action questions in the survey were generic and so similar issues are represented on the weeds influence diagram (Figure 9). However there is a significant difference in general knowledge and awareness. As detailed in Section 5.3.3 and illustrated in figures 5 and 6 people have more general awareness of weeds than animal diseases and this is reflected in the influence diagrams. In Figure 9, 'generic awareness' is shaded orange as 58% of respondents, when asked to name weeds they believed were or could become significant in the area, listed five or more weeds. Only 8% of respondents could not list any.

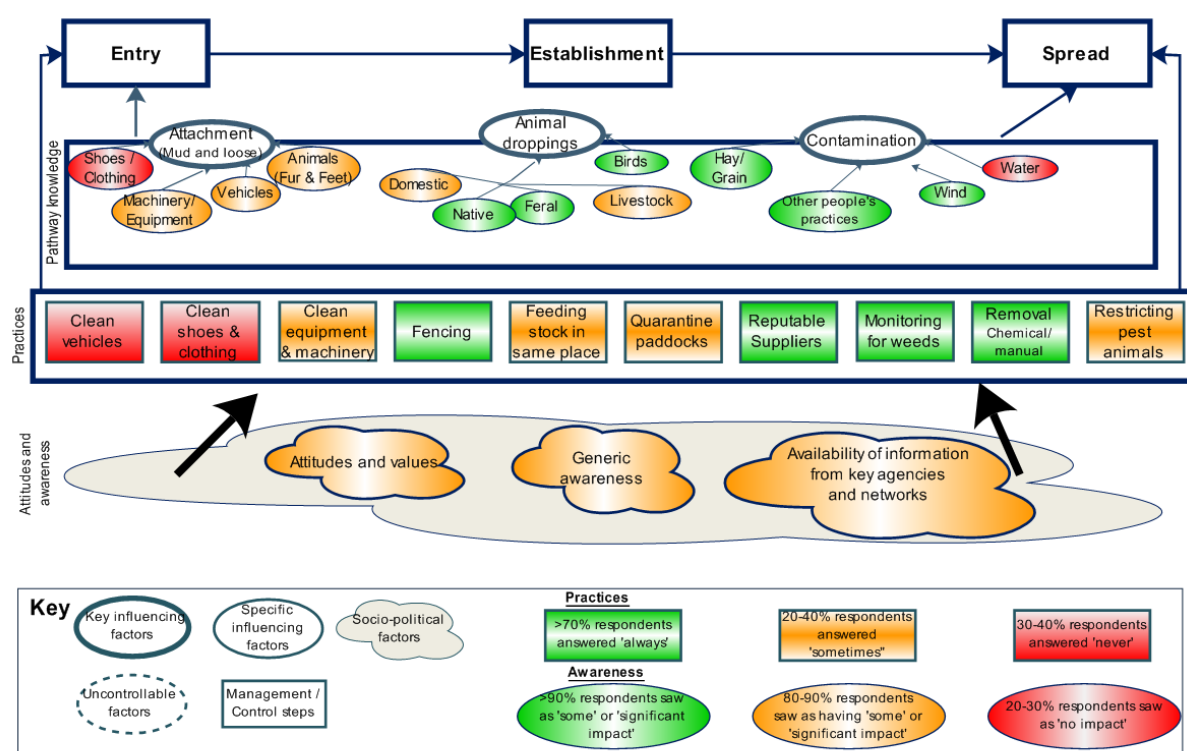


Figure 9. Weeds pathway diagram indicating landholder's knowledge, awareness and practices

The completed diagrams were presented at the final stakeholder meeting for comment. The initial reaction was that they were quite complex to understand. However, after working through them in detail, people became more comfortable with the content and this way of presenting it. There was general agreement that, if the only issues of major concern to emerge related to personal and vehicle hygiene, the situation was reasonably positive. Those present had some difficulty with the name of these diagrams and suggested that rather than calling them 'influence' diagrams, they be called 'pathway' diagrams. We have therefore renamed these in the interest of clarity and ease of communication.

6. Discussion and implications for the development of a communications strategy about biosecurity risk to peri-urban farmers.

In this section we review the findings in the light of their implications for the development of a communications strategy about biosecurity risk directed towards peri-urban farmers. We also reflect on the usefulness of the methodological approach taken in this research.

6.1 Gaps in understanding and practice among landholders

While 'biosecurity' is not a term with which landholders are particularly familiar, the data indicate that there is generally a high level of awareness of its relevance to landholders and of the specific pathways for the incursion and spread of weeds and animal diseases. Based on this awareness, good management practices are widely followed.

Contrary to what was expected and to the literature that suggests that smaller landholders are a disproportionate threat to biosecurity, we found that there is only a weak association between size of landholding and different levels of awareness and practice. This could be due to the fact that the demographic of this region is better educated and has better access to information than in other peri-urban areas and this may need to be taken into account in extrapolating these results more generally to peri-urban Australia. However, this research challenges the widely held assumption that commercial farmers on larger blocks are better informed and follow better practices than smaller landholders. We appreciate the insights of those stakeholders at our first consultation meeting when it was suggested that there was no reason to make such an assumption. A key learning from this for future research is the value of involving stakeholders early on in a project, and particularly in defining the scope of the research.

The research revealed a lack of awareness of specific animal diseases. Only 13% of respondents were able to name five or more animal diseases.

Wagner (2007) proposes that mental models of natural hazards rely in part on personal experience and information. People in the region have had relatively recent experience of both OJD (although this would only have affected some of them) and EI. Survey data also showed that people remembered receiving biosecurity information from the RLPB. The biosecurity information issued by the RLPB is focussed more on animal diseases than on weeds.

When these issues were raised at the stakeholder meeting, it was suggested that the word 'significant' in the survey question may have been interpreted differently from what had been intended. As OJD has been in the area for some time, people may no longer regard this disease as 'significant'. This however still does not explain the fact that, in spite of recent experience and the acknowledgment of recently received information, the data indicate lower levels of awareness of animal diseases than weeds.

Given other data from the survey we hypothesise that landholders see weeds as an active management issue, whereas animal diseases are intermittent and whilst they are very serious when they happen, they have low priority at other times.

This was one area where our research did reveal a difference between people on different landholding sizes. Fewer than 20% of people on smaller landholdings (0-40 ha) were able to name three or more animal diseases compared with 48% of people on landholdings of 100-500 hectares and 65% of people on landholdings over 500 hectares. This lack of knowledge may in part be due to lack of experience over time (27% of people on these smaller landholdings have been there for less than 5 years). However, given that EI had been an issue of recent high public exposure, it is noteworthy that only 20% of respondents named EI. The diseases with the highest recognition were OJD (35%) and Footrot (31%), both of which are more likely to be familiar to people on larger landholdings.

The fact that this is one area where those on larger holdings are better informed than those on smaller holdings suggests that communication about animal diseases through the traditional channels (DPI, RLPB and the industry groups) is not reaching the smaller landholders and a different strategy needs to be adopted.

The lack of awareness or understanding around the risks posed by specific pathways – specifically the movement of people, vehicles and equipment and hence the importance of hygiene practices – may indicate the need for specific attention, particularly in circumstances of a disease outbreak. It has been demonstrated that where people hold strongly to erroneous beliefs they are unlikely to consult other sources before making a decision (Fischhoff, Gonzalez, Small & Lerner 2003), leading to neither the belief nor the practice being challenged

We speculated that the lack of awareness around these pathways may be due to their lack of visibility. Wagner (2007) investigated mental models of flash floods and landslides and found that mental models regarding flash floods were better developed than those for landslides as the physical processes for flash floods are easier for the general public to understand. This could in part explain why there is less awareness around pathways such as water and people movement and also why people have more general awareness about weeds than about animal diseases. It is easier physically to identify the processes for weed spread than animal diseases, as it is easier to conceptualise animal disease spread through vectors other than water and people movement.

6.2 Developing a communications strategy aimed at improving understanding and practice

6.2.1 Making the message relevant

This research has confirmed that behaviour is informed by knowledge and awareness. Where there were lower levels of awareness of pathway risks, fewer landholders were implementing the practices relevant to the management of the risks posed by these pathways. Where awareness was high there were high levels of behavioural compliance (e.g. monitoring for and spraying weeds.) However, even where there appeared to be lower levels of awareness, e.g. around animal diseases, there were high levels of appropriate risk management behaviour (holding stock in quarantine paddocks and vaccinating), possibly suggesting that maintaining overall stock health is a higher motivation for action than concern about the risk posed by specific diseases.

Some studies suggest that communication about risk needs to address the different factors that motivate people. (Hjortso *et al.* 2005; Padmawati & Nichter 2008). Landholder adoption of practices depends on their expectation that it will allow them to better achieve their goals (Pannell *et al.* 2006) so communication needs to address their needs and values. This study revealed that landholders' motivations for managing weeds are good land management, pasture protection and good neighbourliness, although this latter understandably ranked hardly at all with those on the larger (over 500 ha) landholdings. Another motivation was keeping costs down. It is more expensive to deal with weeds if they get out of control. Where information assists people achieve their goals, they are more likely to implement recommended practices. Biosecurity risk communication therefore needs to make the connection between biosecurity risk and good farm management, stock health (particularly for those on smaller landholdings) and good neighbourliness, and address concerns about cost and cost-saving, in order to address landholder interests.

6.2.2 Using trusted agencies

The importance of trust in risk communication is documented (Bier (2001); Lofstedt 2008). Risk information from a trusted source is generally internalised whilst information from a less trusted source may be disregarded or even influence attitudes in a conflicting way to that intended (Frewer 2003). Pannell *et al.* (2006) suggest that it is trust that determines whether an adviser will only be the provider of information or will have a part in the decision-making of the landholders.

A number of insights with respect to the importance of trust emerged from the interviews. While there is generally a high level of trust in specialists such as veterinarians, there was also strong evidence that people would turn either to neighbours or friends for advice about issues with which they were not familiar before or instead of engaging a veterinarian.

Familiar networks, such as the Pony Club, were acknowledged as useful sources of information. Both in the stakeholder consultations and in the interviews, there was reference to a perceived bureaucratisation of Landcare, resulting in declining levels of acknowledgement of it as a trusted resource in the region. Nonetheless in an open-ended question about which organisations might best be able to influence biosecurity outcomes in the region, Landcare ranked second with 26% of people nominating it.

The highest ranked organisation was the Rural Lands Protection Board with 52% of respondents nominating it. The interviews indicated some lack of clarity around the RLPB's role – whether supervisory or advisory, suggesting a need for greater clarity of its role in order for it to build on its potential as a trusted source of information and advice within the region. At the beginning of 2009, the Rural Lands Protection Boards across NSW were dissolved and fourteen new Livestock Health and Pest Authorities established. The Yass RLPB has been subsumed into the Tablelands Livestock Health and Pest Authority, which will continue to be responsible for collection of a rates charge and for the provision of services, particularly related to pest animal and insect control. The new authority operates out of the offices previously occupied by the RLPB. There is a level of uncertainty and concern within the local community regarding these changes to the RLPB.

6.2.3 Using local networks

The data suggest that any communication strategy needs to draw on existing information networks. Consultation with stakeholders and survey and interview data confirmed the

number and diversity of formal and informal networks. Although these informal networks are difficult to analyse, comments from the interviews highlighted how these networks are effective information conduits beyond the formal networks.

The data from this research indicate that using local networks and agencies is essential for developing effective communication strategies for biosecurity and natural resource management risk. The influence/interest grids identify those agencies that are in a position to influence biosecurity outcomes. These are essentially the on-ground agencies and groups that currently have dealings with the landholders. Some of them (e.g. DPI, RLPB, veterinarians, Landcare, Greening Australia, Bookham Agricultural Bureau, the industry associations, the pony clubs and riding clubs) are already fulfilling this role to a greater or lesser extent. Others (e.g. the Murrumbateman Progress Association, rural suppliers, contractors, nurseries, garden clubs, Rural Fire Service) are not doing so. Looking at how these other agencies can become informed and involved should be an important part of the development of any communication strategy, as well as refining the messages to be delivered through the agencies that are already involved to a greater or lesser extent.

The RLPB and DPI were both identified as organisations that, through their on-ground local networks, are in a good position to influence outcomes. However, neither organisation targets the smaller landholders. (The RLPB currently does not service properties under 10 acres and DPI's focus is on commercial producers.) Other organisations that have been identified as having high or significant levels of influence – e.g. contractors, rural suppliers, riding clubs and pony clubs, as well as the peak industry bodies and growers' associations will be critical allies in the development of an integrated communication strategy. Organisations with established membership bases, such as Landcare and the rural fire service, are likewise, important potential partners.

6.2.4 Taking a whole-of landscape approach

In the second stakeholder meeting, the need for a whole of landscape approach, particularly to weed management, was emphasised by those present. There was discussion of the potential for weed spread along railway tracks and roadsides. Without the relevant management agencies taking action the efforts of individual landholders can be thwarted. As previously stated, the research findings identified responsibility to neighbours as a high motivator for weed management. Landholders acknowledge their responsibility to their neighbours. At the same time, they rated very highly the risk that other people's practices present to the spread of pests and disease in the area.

These findings, together with the additional local stakeholder insights, point to the ideal development of a whole of landscape communication strategy, which focuses on landholder responsibility within the landscape, and uses appropriate outreach channels to ensure that it reaches all landholders.

6.3 Reflections on methodology

From the outset, this research study was designed as an inclusive process, in which stakeholder consultation and engagement would be critical components. To this end, the first stakeholder meeting was convened in Yass at the beginning of the project, to seek input into the framing of the research study. This input was critical. It challenged the initial assumption – based on the literature - that the focus of the study should be exclusively oriented to

smaller landholders. It provided access to valuable local knowledge and helped build trust and support for the project.

As the study progressed, there was continuing consultation with stakeholders. One of the researchers was based in the region for three weeks when the interviews were being conducted. She was visible within the community, attending local events and markets and available to talk to people. There were articles in the local newspaper about the project, inviting input. Contact was made with many of the local organisations and groups, seeking their support for the study and their input. The survey questionnaire was piloted with local people before being distributed.

The feedback meeting with stakeholders towards the end of the project generated very positive responses. Sharing the study findings at this meeting provided an opportunity for further discussion and reflection from a local perspective. Those present were interested in to gain a better understanding of the tools used and to reflect on the relevance of the findings to their own work and to the networks they represented.

It is clear from this study that a continuing process of stakeholder consultation and involvement would be very productive for the ongoing management of biosecurity risk in the region. The process used in this study has built trust and fostered a genuine interest in the issue.

Both the stakeholder mapping and mental models diagrams proved to be effective tools for communicating and engaging with stakeholders and capturing their input in ways that can aid decision-making. The data from the interviews and survey responses allowed us to address the original research questions, with the exception that we did not specifically collect any data on how landholders view risk. Nor did we test any specific communication process in terms of its capacity to produce change as this was beyond the scope of this study. We have however made a number of inferences based on the data about landholders' attitudes to risk and have based our recommendations for the development of a communication strategy on the findings from the study.

6.4 Conclusion

The use of stakeholder mapping and mental modelling, together with a participatory approach to research design and implementation, facilitated an assessment of biosecurity awareness and practice across the region and provided a snapshot in time of the regional landscape.

The study demonstrated the need for communication strategies to be responsive to the local context. It further demonstrated that risk assessment is an ongoing and dynamic process that needs to be incorporated by landowners into their management decision-making processes. In order to facilitate this, it is critical to build a communication strategy that reflects local experience, connects with current issues and concerns and is disseminated through multiple networks.

This study identified a number of key issues which will usefully inform the future development of a specific biosecurity risk communication strategy in this region, some of which may have wider application.

- 'Biosecurity' is not a term that is particularly meaningful to landholders.

- There are no major differences either in terms of knowledge or awareness or in terms of practices, between people on different landholding sizes.
- There is a lack of awareness across all landholding sizes of notifiable animal diseases and limited knowledge of those weeds that are specifically identified as noxious in the region.
- Overall there is reasonable awareness of weed and animal disease pathways (with some exceptions) and a commitment to good practices (once again with some exceptions).
- Landholders are motivated by good land management and good neighbourliness. Communication strategies need to appeal to these values, as well as to those values that had specific relevance to people on different landholding sizes (economic considerations for those on larger landholdings; animal health for those on smaller landholdings).
- In spite of the considerable effort put into weed management by landholders, this is still their priority concern in the region. A whole of landscape approach is necessary for weed management as well as for pest and animal disease. Individual landholders can do their bit, but their efforts need to be supported by the efforts of neighbours and local authorities.
- Issues need to be addressed through local networks not through a top-down bureaucratic process. Trust needs to be maintained through these local networks and there needs to be sensitivity to local needs and concerns.
- Organisations can change over time in terms of their levels of influence and focus. An ongoing process of stakeholder consultation and engagement will ensure that information and networks remain relevant.

The use of stakeholder mapping processes and mental modelling provided a participatory framework for understanding the dynamics of local networks and for the emergence of a snapshot in time of local knowledge and practice. This study has demonstrated the practical value of these tools both for local agencies and community-based organisations, such as Landcare or Greening Australia. For all those responsible for working with landowners to manage biosecurity and natural resource management risk, the stakeholder mapping process offers transparency and invites participation of stakeholders to better inform decision making.

This study did not make any assumptions about the level of risk in this region. Although this region was assumed to be of low biosecurity risk by the science reference group, we did not 'test' this assumption.

The study has demonstrated the usefulness of the methods in successfully identifying all relevant stakeholders, identifying trusted sources of information within the region and local information networks, eliciting information about local knowledge, awareness and practices and providing a framework for the development of a communication strategy. These methods could usefully be applied to other risk situations.

6.5 Modelling the application of these methods to other risk situations

Modelling the application to an emergency risk response to the identification of avian flu in poultry farms in outer metropolitan Sydney.

Step 1: Undertake a comprehensive stakeholder mapping process to ensure that the full extent of the networks of individuals and agencies that are (or have the potential to be) involved has been identified. This would need to include local community networks as well as those related to poultry farming.

Step 2: Hold an initial consultation meeting with key stakeholders and local poultry-farmers to discuss the scope of the problem and the options available. Pay particular attention to the local knowledge and practices described by participants.

Step 3: Using DAFF and other expertise, draw up an influence (pathways) diagram showing all possible pathways for the disease. Incorporate the vectors contributed by local participants (colour code these if experts need to discriminate between origins).

Step 4: Due to the emergency nature of this issue, use a small number of one-on-one interviews and focus groups (rather than a survey) to gain an understanding of what is known about the disease, people's attitudes to it and what containment practices are currently being applied. At the same time, seek information on trusted sources of information and local information networks. Build a reference team that includes producers of all property sizes and community association representatives derived from Step 1.

Step 5: Use the information obtained from the interviews and focus groups to inform the development of a management strategy that takes account of the issues of concern to the poultry farmers as well as addressing the disease containment objectives. Test this strategy with the stakeholder consultation group before implementation. Use the reference team and the previously identified trusted local networks to deliver the communication.

There is a general assumption that stakeholder consultation is time-intensive and costly. We argue that a focussed approach to stakeholder engagement as suggested above can be conducted in an expeditious manner and will be extremely productive in terms of building trust, ensuring targeted communication and action, and sharing responsibility.

Modelling the application to community implementation of an awareness-raising strategy around a new weed infestation.

DAFF (or similar funding body) initiate a tender process, seeking expressions of interest from local organisations for the delivery of new biosecurity information (or integration of various messages) considered significant for the identified regions. Local organisations which need to be incorporated and to be able to demonstrate their legitimate role in their region are invited to tender to facilitate the development and communication of the message, using the following communication protocol.

Step 1: The local organisation selected in the tendering process (known as the 'lead organisation' (e.g. Greening Australia or the Noxious Plant Authority) consults with the communities and undertake an initial stakeholder mapping exercise.

Step 2: The 'lead organisation' then invites a representative group of stakeholders to a consultation meeting which they may choose to have facilitated by an independent person in order to allow full discussion of the issues. This meeting defines the scope of the problem, reviews the initial stakeholder map and begins the process of identifying those stakeholders who can play a central role in outreach and communication.

Step 3: An influence diagram is drawn up by local and government experts aware of the ecology of the weed and the local conditions.

Step 4: The 'lead organisation' coordinates a process using other local organisations or groups to outreach to their members and networks. A number of focus groups are held to begin the process of awareness-raising and to elicit an understanding of people's knowledge, awareness and practices.

Step 5: This information is then pooled to form the underpinnings for a continued program of awareness-raising using the same networks (and any new ones that have been identified through the process) to inform people about the weed and to work with them through a consultative process to develop effective eradication strategies. As weed management can be both an everyday practice and a high intensity campaign reflecting new incursions or seasonal opportunities, it is worthwhile including an ongoing training capacity within the funding model.*

This whole process could be conducted with limited intervention by anyone external to the local community, other than possibly a facilitator, who would work with the 'lead organisation' in the stakeholder meetings so that it could be an active contributor to the analysis and to the identification of solutions.*

*Working on a 'train the trainer' model for example, the 'lead organisation' that initiated the project in one location can facilitate the program in other locations. Local participants in the first location can also be trained to assist in the facilitation across the region. If one region has 4-5 centres, the experience of the project in one locality can be networked to the other centres creating increased awareness, a whole of landscape approach and communities of practice (CoP). The flow on effects of this type of local management of the issues can be monitored with indicators measuring both the weed management outcomes and the level of community engagement.

Incentives for participation by existing rural land management groups like Landcare can be incorporated into the communication strategy for the region.

Though initially slow to roll out, this sort of community based and activated program is desirable. Weeds are a perennial issue in the landscape and so a long term commitment to this kind of communication strategy is advocated. Moreover, given the likelihood of property turnover associated with transition landscapes such as the peri-urban, but also associated with land use change in general, a community managed strategy that keeps reinventing itself is needed. Critical to the success is assured funding to support an ongoing program.

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Appendix A: Reference group members and meetings

Dr R.(Bob) Biddle	General Manager, Animal and Plant Health Policy, PIAPH
Kathy Fife	Manager, Emergency Risk Management Unit, PIAPH
Dr Anna Carr	BRS, DAFF
Dr Gabriele Bammer	Professor, National Centre for Epidemiology and Population Health, ANU
Dr Debby Cousins	Director, Application and Linkage, Australian Biosecurity CRC for Emerging Infectious Diseases
Peter Parbery	Senior Social Researcher, Practice Change Unit, DPI Vic
Ian Roth	Deputy Chief Veterinary Officer, NSW DPI
Rod Shaw	A/g Executive Manager, Natural Resource Management, DAFF represented by
Barry Longstaff	Landcare and Sustainable Production Branch, NRM Division, DAFF (resigned Dec 08)
Dr Kate Brooks	Director, KAL Analysis; member, ACERA SAC
John Ive	Former CSIRO scientist; farmer in the Yass region
Sharne Gibbons	Manager, Web Communication, Emergency Risk Management Unit, PIAPH
Nancye Gannaway	Small landholder Information Service, WA Dep't Agriculture
Jen van den Tol	Communications Officer, PIAPH (resigned August 08)
Howard Conkey	Communications Manager, PIAPH (resigned August 08)
Peter Howden	Capacity Development Specialist, DPI Vic (resigned August 08, replaced by Peter Parbery)

Meetings held:

10 April 2008

22 August 2008

10 December 2008

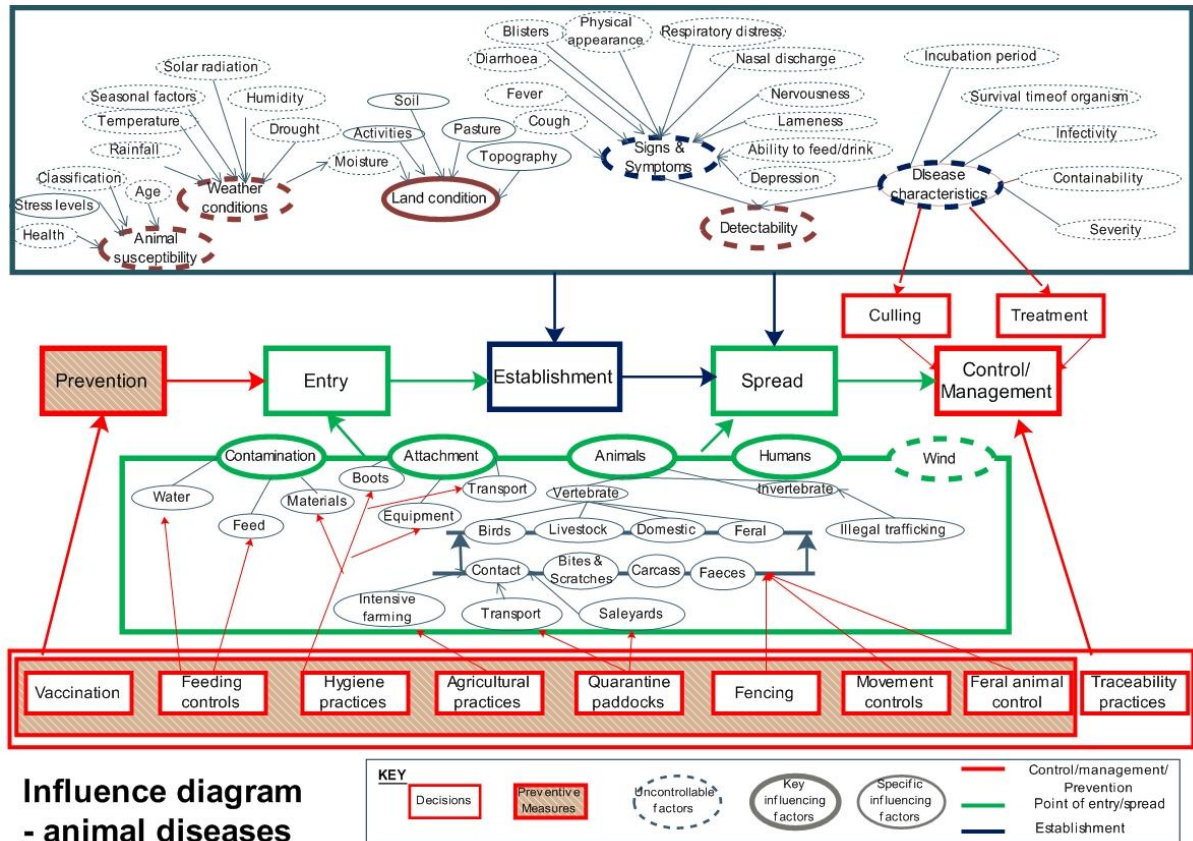
Appendix B: Participants in stakeholder meetings

Representatives of:

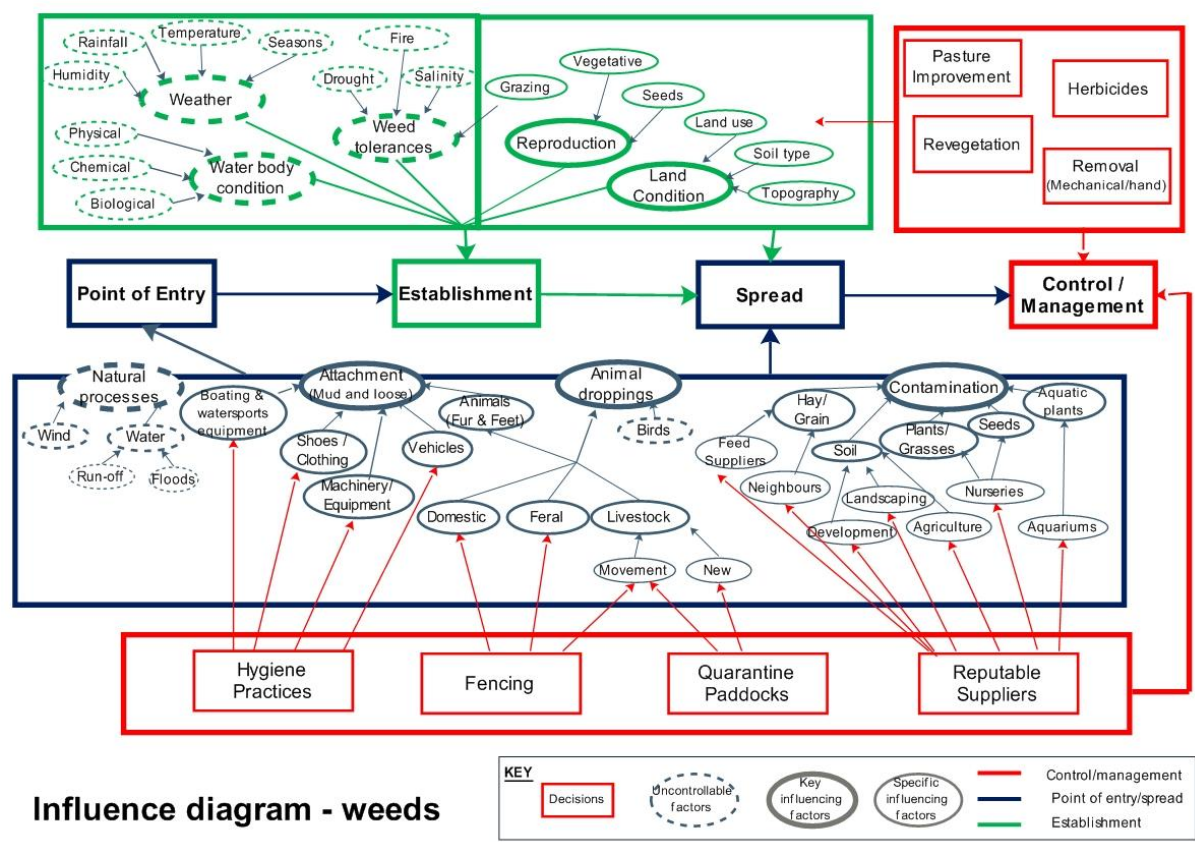
- Yass Valley Council,
- Yass Rural Lands Protection Board
- Department of Agriculture Fisheries and Forests
- NSW Department of Primary Industry (Yass)
- Local Landcare groups
- Local Pony Club
- Australian Superfine Woolgrowers Association
- Landholders in Yass area

Appendix C: Influence diagrams – version 1

Animal disease influence diagram



Weeds influence diagram



Appendix D: Semi-structured interview reference table

Stakeholder name	Landholding Size / Service area
Landholder A	0-2 hectares
Landholder B	0-2 hectares
Landholder C	0-2 hectares
Landholder D	0-2 hectares
Landholder E	2-40 hectares
Landholder F	2-40 hectares
Landholder G	2-40 hectares
Landholder H	2-40 hectares
Landholder I	2-40 hectares
Landholder J	2-40 hectares
Landholder K	2-40 hectares
Landholder L	2-40 hectares
Landholder M	40-100 hectares
Landholder N	40-100 hectares
Landholder O	40-100 hectares
Landholder P	40-100 hectares
Landholder Q	40-100 hectares
Landholder R	100-500 hectares
Landholder S	100-500 hectares
Landholder T	100-500 hectares
Landholder U	100-500 hectares
Landholder V	Over 500 hectares
Landholder W	Over 500 hectares
Landholder X	Over 500 hectares
Stakeholder 1	Agency
Stakeholder 2	Supplier
Stakeholder 3	NGO
Stakeholder 4	NGO
Stakeholder 5	Agency
Stakeholder 6	Supplier
Stakeholder 7	Supplier
Stakeholder 8	Agency
Stakeholder 9	Agency

Appendix E: Article in Yass Valley Council newsletter

Pests, Diseases and Weeds – How Can We Better Protect our Properties?

Researchers from the University of Melbourne met with a small group of people from the Yass region at the Rural Lands Protection Board on 29 May to talk about the concerns and issues of local landowners regarding biosecurity risks. The researchers are undertaking a study in the region to explore what landowners understand about biosecurity and how it affects them and the landscape.

Why biosecurity matters?

The recent equine flu outbreak, and concerns about avian flu incursion have heightened awareness of biosecurity issues. Keeping our agricultural production free from exotic diseases is a critical aspect of managing biosecurity risk. But biosecurity is also about how we manage the land to resist the spread of pests, diseases and weeds that are already in the landscape.

Why the Yass region

There has been a changing demographic in the Yass region in recent years. Many new landowners are moving into the area onto smaller landholdings, focusing on different agricultural production. At the same time, it is an area with a long established agricultural history. It is therefore representative of a process of change that is occurring in many regions across Australia. Understanding the issues and concerns in these changing social and production landscapes will be useful to everyone interested in better ways to communicate and manage biosecurity issues. The Department of Agriculture, Fisheries and Forestry has also identified the Yass region for the development of a pilot communication strategy.

How the research will happen

Over the next few months the research team will be conducting a number of interviews with a cross-section of people in the region to get an idea of their understanding of the issues. The results of these interviews will then be used to develop a survey that will be distributed to as many people as possible in order to make sure the research captures the range of ideas and issues that are important to people.

The results of the interviews and surveys will then be written up so that everyone involved can reflect on the issues and work together to achieve better outcomes for landholders and the protection of their properties from the spread of disease and pests.

Would you like to be involved?

If you would like to be involved or have any questions, please contact Tamara Sysak of The University of Melbourne on 0432 899 619 or by email tsysak@unimelb.edu.au

This study is being carried out by researchers from the University of Melbourne in association with the Product Integrity Animal and Plant Health Division of the Department of Agriculture, Fisheries and Forestry and funded by the Australian Centre of Excellence for Risk Analysis.

Involvement in this project is voluntary and participants are free to withdraw consent at any time, and to withdraw any unprocessed data previously supplied. This project has received clearance by the Human Research Ethics Committee - approval number 0827610.

Appendix F: Biosecurity practices by landholding size

		Never	Sometimes	Always
Fencing	0-2 ha	0%	0%	100%
	2-40ha	0%	15%	85%
	40-100ha	0%	14%	86%
	100-500ha	3%	11%	86%
	>500ha	0%	5%	95%
Holding stock	0-2ha	78%	7%	14%
	2-40ha	61%	15%	24%
	40-100ha	35%	39%	26%
	100-500ha	26%	46%	28%
	>500ha	6%	37%	53%
Vaccinating	0-2ha	8%	25%	67%
	2-40ha	8%	13%	79%
	40-100ha	12%	16%	72%
	100-500ha	11%	8%	81%
	>500ha	5%	5%	90%
Cleaning vehicles	0-2ha	78%	22%	0%
	2-40ha	62%	35%	3%
	40-100ha	53%	41%	6%
	100-500ha	70%	30%	0%
	>500ha	40%	45%	15%
Cleaning shoes	0-2ha	53%	20%	27%
	2-40ha	48%	30%	22%
	40-100ha	46%	41%	13%
	100-500ha	46%	46%	8%
	>500ha	37%	53%	10%
Cleaning machinery and equipment	0-2ha	50%	30%	20%
	2-40ha	33%	42%	25%
	40-100ha	19%	44%	38%
	100-500ha	32%	48%	20%
	>500ha	19%	69%	12%
Getting stock from known sources	0-2ha	10%	20%	70%
	2-40ha	0%	17%	83%
	40-100ha	0%	22%	78%
	100-500ha	0%	28%	72%
	>500ha	10%	24%	66%
Rotate stock	0-2ha	47%	33%	20%
	2-40ha	40%	13%	47%
	40-100ha	16%	4%	8%
	100-500ha	11%	24%	65%
	>500ha	5%	21%	74%
Feeding stock in same place	0-2ha	38%	12%	50%
	2-40ha	9%	18%	73%
	40-100ha	20%	40%	40%
	100-500ha	14%	34%	52%
	>500ha	4%	47%	47%

		Never	Sometimes	Always
Monitoring for weeds	0-2ha	7%	26%	67%
	2-40ha	0%	11%	89%
	40-100ha	0%	14%	86%
	100-500ha	0%	11%	89%
	>500ha	0%	14%	86%
Spraying weeds	0-2ha	7%	40%	53%
	2-40ha	0%	14%	86%
	40-100ha	0%	12%	88%
	100-500ha	0%	16%	84%
	>500ha	0%	14%	86%
Restricting wildlife	0-2ha	8%	33%	57%
	2-40ha	7%	38%	55%
	40-100ha	0%	38%	62%
	100-500ha	3%	29%	68%
	>500ha	0%	15%	85%

Appendix G: Communication responses

Percentage of respondents reading specified newspapers

Canberra Times	52%
The Land	43%
Yass Tribune	35%
Sydney Morning Herald	21%
The Australian	15%
Daily Telegraph	10%
Financial Review	6%
Weekly Times	3%
None	8%
Other	8%

Percentage of respondents listening to specified radio stations

ABC Local	60%
Radio National	32%
Canberra FM	30%
Yass Community Radio	10%
None	6%
Other (including Triple J, ABC Classic FM, 2CC)	17%

Percentage of respondents reading specified specialist magazines on a regular basis (Only noted if more than 3 respondents listed the same specialist magazine)

MLA - Feedback	6%
Yass Area Network of Landcare Groups - Newsletter	6%
AWI – Beyond the Bale	5%
Kondinin Group – Framing Ahead	4%
Guide for Graziers	4%
Gardening Australia	3%
Grains Research and Development – Groundcover	3%
Hoofbeats	3%
The Horse magazine	3%
Australian Farm Journal	3%
Prograzier	3%
Horse Deals	2%
Veterinary Practitioners Board of NSW -Boardtalk	2%

Appendix H: Biosecurity survey tool

Biosecurity: Pest plants and animals and diseases

We are undertaking a study to find out more about people living in the area around Yass, their understanding of biosecurity and how it affects them and their landscape. We would appreciate if you would complete the following survey as your responses are important to this study.

Completion of this survey is expected to take about 20 to 30 minutes. Please tick the appropriate responses or provide a brief answer on the space provided. You may omit any question you prefer not to answer. All information you provide will be considered confidential and all results of this study will be presented as a group with no individual participants being identified.

Please return the completed questionnaire in the self-addressed, reply paid envelope by 10 October. Include your name and address on the name card provided to go into a draw for a \$50 book or wine voucher. Name cards will be immediately separated from the surveys in order to maintain anonymity. If you have any questions about this study, or would like additional information, please contact Tamara Sysak on 0432 899 619 or by e-mail at tsysak@unimelb.edu.au.

Background information

1. ☐ Male ☐ Female
2. Age: ☐ 15-24 years ☐ 25-54 years ☐ 55-64 years ☐ 65 years and over
3. Household composition at your property:
Number of adults who have left school (including children) _____
Number of children of school age _____
Number of children below school age _____
4. Is English your first language?
☐ Yes ☐ No If no, what is your first language _____
5. Do any of the adults in the household have off-farm employment?
☐ Yes ☐ No If yes, how many hours per week? _____
If yes, which industries? _____
6. Tenure details:
☐ Property owned ☐ Property rented / leased ☐ Other
7. Permanent or part-time residency:
☐ Permanent ☐ Weekender ☐ Absentee owner (less than 4 visits a year)
☐ Other Please specify days per year _____
8. What is your property size?
☐ 0 – 2 ha ☐ 2 – 40 ha ☐ 40-100ha ☐ 100-500ha ☐ over 500 ha
9. How long have you lived on this property?
☐ Less than 1 year ☐ 1-5 years ☐ 5-10 years ☐ Over 10 years ☐ Grew up here

10. Have you previously lived on a rural property?
☐ Yes ☐ No If yes, where? _____
 Main activity? _____
11. How long do you plan to stay on this property?
☐ < 5 years ☐ 5-10 years ☐ indefinitely ☐ unknown
12. Have you always lived in the Yass local government area? ☐ Yes ☐ No
 If **no**, why did you move to this area? *(Please tick those that apply)*
☐ Rural lifestyle ☐ Rural pursuits ☐ Affordability
☐ Proximity to work ☐ Natural values ☐ Other _____
13. What are the sizes of the properties that adjoin yours?
☐ All small landholdings (less than 40ha) ☐ All large landholdings (greater than 40ha)
☐ Both small and large landholdings ☐ Unsure

Activity on your property

14. Do you have any animals? ☐ Yes ☐ No *(Go to Q. 16)*
 If yes, what animals do you have and how many of each?
 Sheep _____ Alpacas _____ Horses _____ Dogs _____ Cats _____
 Goats _____ Cattle _____ Poultry _____ Pigs _____
 Other _____
15. What is the primary purpose for having animals? *(Please tick those that apply)*
☐ Commercial ☐ Recreation ☐ Lawnmowers ☐ Pets ☐ Personal consumption
16. Do you grow crops on your property? ☐ Yes ☐ No *(Go to Q. 17)*
 If yes, what? _____
 For what purpose? *(Please tick those that apply)*
☐ Animal feed ☐ Commercial sale ☐ Other _____
17. Do you grow vegetables and/or fruit on your property? ☐ Yes ☐ No *(Go to Q. 18)*
 If yes, what? _____
 For what purpose? *(Please tick those that apply)*
☐ Personal consumption ☐ Commercial sale ☐ On-site wine production
☐ Other _____
18. On average over the last five years, what proportion of your household income has been derived from your property?
☐ 0 ☐ less than 10% ☐ 10-50% ☐ 51-80% ☐ 81-100%

Biosecurity

19. How familiar are you with the term biosecurity?
☐ Not familiar ☐ Somewhat familiar ☐ Very familiar

20. What do you understand the term biosecurity to mean?

21. Is biosecurity relevant to you?
☐ Not relevant ☐ Some relevance ☐ Very relevant ☐ Don't know

22. What do you think are the main factors that contribute to pest and disease spread in this region? *(Please tick the appropriate responses)*

	No impact	Some impact	Significant impact
Birds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Native and non-native animals coming onto properties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bringing feed from other areas onto properties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stock movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment and machinery moving between properties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other people's land management practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Movement of people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ineffective quarantine practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Failure to recognise disease symptoms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Failure to recognise weeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
People don't see the spread of pests and diseases as a risk in this region	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. List up to 5 weeds that you believe are significant in this district? _____

24. If you saw a plant on your property that you could not identify, what do you do? *(Please tick those that apply)*
☐ Nothing ☐ Ask a friend /neighbour ☐ Search for information myself
☐ Ask a specialist (e.g. agronomist) ☐ Other _____
25. What are your top 3 reasons for managing weeds on your land? *(Please rank from 1 to 3 in order of importance)*
 _____ Animal health _____ Pasture protection _____ More costly if not done early on
 _____ Maintain land value _____ Good land management _____ Aesthetics
 _____ Compliance _____ Responsibility to neighbours
 _____ Other *(please specify)* _____
26. List up to 5 animal diseases that you believe are significant in this district or could become significant?

27. If you noticed any unusual symptoms in an animal on your property, what would you do? *(Please tick those that apply)*
☐ Nothing ☐ Ask a friend/neighbour ☐ Search for the information myself
☐ Ask a specialist (e.g. vet) ☐ Other _____
 Further comments: _____
28. What steps do you take to keep your land free from pests and diseases? *(Please tick the appropriate responses)*
- | | Never | Sometimes | Always | Not Applicable |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| Maintain fencing | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Holding stock in quarantine paddocks | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Vaccinating | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cleaning vehicles going between properties | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cleaning shoes and clothing | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cleaning machinery and equipment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Getting stock and/or feed from trustworthy sources | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Rotate stock between paddocks | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Feeding stock in the same place | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Monitoring for weeds | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spraying / digging out weeds | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Restricting (to the extent possible) the incursion of pest animals | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other <i>(please specify)</i> _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
- Any other comments about any of the above: _____

29. What are your main land/animal/crop management concerns?

30. Which groups or organisations do you feel are best able to have an impact on biosecurity in this district?

Networks, travel patterns and communication

31. Please list all the local and regional networks that you are involved with (e.g. attend meetings, events, receive newsletters):

Work related	
Recreational/sporting	
Children's activities	
Social (e.g. bridge club, craft group)	
Community service groups (e.g. Rural Fire Service, CWA)	
Environmental groups	
Specialist animal/plant groups	
Other	

32. Why and where do you travel regularly?

<input type="checkbox"/> Work-related	If yes, where?	<hr/>
<input type="checkbox"/> Farm-related	If yes, where?	<hr/>
<input type="checkbox"/> Education	If yes, where?	<hr/>
<input type="checkbox"/> Recreation/sport	If yes, where?	<hr/>
<input type="checkbox"/> Meetings	If yes, where?	<hr/>
<input type="checkbox"/> Other	If yes, where?	<hr/>

33. Do you have regular access to reliable internet services?

☐ Yes ☐ No (*Go to Q. 35*)

If yes, how often do you access information related to land or stock management?

☐ Not at all ☐ Only for high attention issues (e.g. equine influenza)
☐ Whenever I have an issue on which I need information ☐ Regularly



34. Do you access any of these websites for information on weeds and animal/crop diseases? *(Please tick those that apply)*

- ☐ Rural Lands Protection Board www.rlpb.org.au
☐ DAFF www.daff.gov.au
☐ Department of Primary Industries www.dpi.nsw.gov.au
☐ Murrumbateman Progress Association www.murrumbateman.org.au
☐ Yass Valley Council www.yass.nsw.gov.au
☐ Specialist crop/animal association websites
☐ Other (please specify) _____

35. What newspapers do you read regularly?

- ☐ Canberra Times ☐ Yass Tribune ☐ Sydney Morning Herald ☐ The Land
☐ Weekly Times ☐ Daily Telegraph ☐ The Australian ☐ None
☐ Other _____

36. What radio stations do you listen to regularly?

- ☐ ABC Local ☐ Radio national ☐ Canberra FM ☐ Yass Community Radio
☐ None ☐ Other _____

37. What special interest (farming, animals, plants etc) magazines/newsletters do you read regularly?

38. Have you received information about pests, weeds or animal diseases in the past two years?

- ☐ Yes ☐ No ☐ Unsure

If yes, where from?

39. Other comments:

Thank you for taking the time to fill out this survey.

