

Public attitudes to pest control

A literature review

Anthony Fraser

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CONTENTS

Abstract	5
<hr/>	
1. Introduction	6
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1.1 Objectives	6
1.2 Methodology	7
1.3 Important notes concerning the studies reviewed	7
2. Perceptions of individual pest species	8
<hr/>	
2.1 Possums	8
2.2 Rabbits	9
2.3 Stoats	9
2.4 Pests and management actions	9
3. Attitudes to pest control technologies	11
<hr/>	
3.1 Manual methods	11
3.1.1 Demographic differences	12
3.2 Biological controls	12
3.2.1 Biological and biotechnological control	13
3.2.2 Biological control of possums	13
3.2.3 Biological control of rabbits	14
3.2.4 General attitudes	15
3.2.5 Demographic differences	15
3.3 Poisons	16
3.3.1 Public opinion of 1080	16
3.3.2 Specific concerns	17
3.3.3 Demographic differences	17
3.4 Pest control technologies	18
4. Wider influences on public attitudes to pest control	19
<hr/>	
4.1 Genetic engineering	19
4.2 Attitudes to science	20
4.3 Consultation and the role of agencies	21
5. International perceptions and attitudes towards pest control	22
<hr/>	
5.1 Control for conservation	23
5.2 Management of the wildlife/human interface	23
6. Summary of acceptability of pest controls	25
<hr/>	
7. Conclusions	27
<hr/>	
8. Recommendations	28
<hr/>	
8.1 Future research	28
8.1.1 Working with communities	29
8.1.2 Changing public attitudes over time	29
8.1.3 Current research gaps	30

9. Acknowledgements	31
10. References	32
Appendix 1	
Overview of key pieces of research	35

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ABSTRACT

This report reviews research concerning public attitudes to vertebrate pest control. The review was confined to attitudes towards introduced, vertebrate pest species and their control through manual, poison or biological control methods. Biological controls include those which occur naturally (i.e. viruses, parasites, predators), and biotechnological controls (i.e. those which involve aspects of genetic engineering). Findings suggest public attitudes concerning control methods can be characterised by three attributes: specificity, humaneness, and degrees of uncertainty. Overall, there is a clear preference for manual methods, considered to be the most humane and specific, while poisons (specifically 1080) fail to satisfy any of the three criteria and are the least acceptable of all methods reviewed. Biological controls, whilst viewed positively for their specificity and humaneness, do not receive total and unconditional support in pest control. Future research in this area needs to examine how the Department of Conservation engages and consults with communities about pest control issues and investigate changes in public attitudes over time. Consideration also needs to be given to demographic differences throughout New Zealand's increasingly culturally diverse population. Attitudes toward the use of biological controls, especially biotechnological, require further investigation.

Keywords: vertebrate pests, poison, biological control, possums, rabbits, stoats, public attitudes, literature, existing research, New Zealand

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1. Introduction

Pest control operations are an essential feature of the biodiversity work carried out by the Department of Conservation (referred to hereafter as the Department). Introduced vertebrate pests are causing substantial damage to New Zealand's native biota, and control of their numbers is crucial to the wider success of biodiversity protection. The extensive distribution of pests such as possums, rabbits, and stoats throughout native habitats means it is no longer possible to exclude these species from sensitive areas via non-invasive methods, and more lethal controls are a necessity.

Pest control operations are a public issue. Not only does the Department need to take into account public opinion in its day-to-day operations, but it must also recognise that the extermination of animals is a sensitive issue which can be related to matters beyond pest control. The introduction of pest management operations or a change in current practices therefore requires an understanding of public attitudes to different pest control measures. An increased awareness of public attitudes can help manage the potential level of conflict associated with invasive pest management, and identify ways in which the Department can better promote public awareness of specific management practices.

There have been claims from some staff within the Department that there is a lack of information on public attitudes toward pest control, and calls for a general survey of such attitudes have been made. Other staff believe that considerable information currently exists and further social research on attitudes is not needed.

To address this variance in opinion, this report reviews and evaluates the current level of information on public attitudes to pest control operations, and suggests certain research priorities in this area.

1.1 OBJECTIVES

The primary objective of this investigation was to review existing research on public attitudes to vertebrate pest control and pest control technologies. This involved investigating:

- The public's understanding of the need for pest management, with particular reference to possums, rabbits, and stoats. Attitudes to introduced wildlife in general were also examined.
- The acceptability of pest management techniques such as trapping, shooting, poisoning and biological controls. Biological controls include those which occur naturally (e.g. parasites and diseases) and those which include genetic engineering (e.g. immunocontraception).

1.2 METHODOLOGY

An extensive literature search was undertaken. The main reference source was the Department's library catalogue, which provided access to the most recent publications. These often referred to earlier pieces of research, and so, progressively, all New Zealand-based research was identified.

The information obtained from this literature search was supplemented by personal discussions with key Department staff, particularly those who were involved in the operational—and very public—side of pest control operations.

International literature was also reviewed. Overseas studies were focused more on wildlife management, with pest control mainly conducted due to the adverse effects of human-wildlife interactions. Although describing a different context from pest control, this literature provides a useful comparison with research conducted in New Zealand.

International research was mainly identified via Internet searches and collected through the Department's library.

Finally, a workshop involving key Department staff was held. The workshop discussed the reasons for collecting information on public opinion, the current state of that information, and the future information needs of the Department. These discussions identified key areas for future research in this area, forming part of the recommendations made in this report.

1.3 IMPORTANT NOTES CONCERNING THE STUDIES REVIEWED

The findings from key studies reviewed in this report come from a variety of sources which utilised different methodologies to obtain their results. Some have used surveys of large numbers of people which can be considered representative of the views of the general public. Others, however, have employed qualitative methods involving relatively small numbers of people. Such results are only indicative of general opinion, and cannot be regarded as being reflected of the public in its entirety. It is important to acknowledge these methodological differences in the interpretation of findings. To aid in this distinction, Appendix 1 provides a brief overview of the key studies featuring in this report.

Some of the research cited in this report is also dated and not representative of current public opinion. This holds especially true for opinions on technologies such as genetic engineering. Public attitudes towards these controversial technologies are very responsive to the wider environment. They are influenced by the media and both political and public discourse, and are susceptible to considerable change. Results must be considered within this context.

Within the individual survey instruments, different terminology has been used to gauge the acceptability of control methods. For example, some surveys ask which method is more 'suitable', while others ask which is more 'acceptable'. What is 'suitable' for a control may include aspects of efficiency and

effectiveness, but a suitable control can still be unacceptable (Fitzgerald et al. 1994). Such differences in the terms used affect the comparability of results. Readers must be careful in drawing conclusions based on such comparisons.

The term 'public' is often used in this report to refer to the sample of individuals randomly selected to participate in these investigations. Although these samples may reflect the 'general public', in many cases, they are only partial representations of New Zealand society. This needs to be considered in the interpretation of results.

2. Perceptions of individual pest species

Attitudes to pest control technologies need to be placed within the context of public perceptions of the need for pest control operations. In addition, attitudes to pest species will mediate to a degree the acceptability of controls. This section reviews work on public attitudes towards possums, rabbits, stoats and other wildlife and their perceived impacts.

2.1 POSSUMS

There are several coexisting perceptions of possums amongst New Zealanders:

- **Possoms as environmental threat**—Possums are perceived as a major pest, a destroyer of native forests and a threat to native birds and other biota (Fitzgerald et al. 1994, 1996b). People are, however, uncertain about the extent and severity of the problems that possums cause (PCE 2000). Biodiversity protection is seen as the principal reason for the control of possums.
- **Possoms as commercial threat**—Possums are perceived as a risk to the farming industry by being carriers of Bovine Tuberculosis (BTb) (Fitzgerald et al. 1994, 1996b). While national in scope, this is mainly perceived as an issue for the primary sector. This perception is more likely to be held by farmers and production workers (Fitzgerald et al. 1996b).

Regardless of the threats they pose, possums are considered as sentient beings and, therefore, deserving of humane treatment (Fitzgerald et al. 1994, 1996b).

Attitudes to the seriousness of the possum problem have remained fairly stable over the past decade. In 1990, 90% of people in a national survey of the general public considered possums to be a 'very serious' or 'serious' pest (Sheppard & Urquhart 1991). In 1994, 93% of people considered possums to be a problem in New Zealand and 95% considered them to be a threat to native bush (Fitzgerald et al. 1996b). It is important to note the differences in terminology used.

More males than females see possums as a serious pest (Sheppard & Urquhart 1991). Males are also less inclined to agree with possums being 'cute and furry' and 'basically harmless' (Fitzgerald et al. 1996b).

2.2 RABBITS

As with possums, the public carries both positive and negative views towards rabbits. On the one hand they are seen as 'cute and furry' and sometimes associated with cultural images such as the Easter Bunny (Wilkinson & Fitzgerald 1998; Fitzgerald et al. 1996a). On the other, they are widely recognised as a pest that causes land, soil and vegetation degradation and a threat to the economic viability of farmers (Wilkinson & Fitzgerald 1998; Fitzgerald et al. 1996a). In a national survey, 95% of people associated rabbits with both environmental **and** farm damage (Fitzgerald et al. 1996a).

Rabbits are primarily seen as a regional problem concentrated in the South Island. However, although neither Wilkinson & Fitzgerald (1998) nor Fitzgerald et al. (1996a) were able to find clear agreement on the extent of the rabbit problem, it was identified that the scale of the damage they cause warranted a national response.

Compared with possums, rabbits are seen as less of a personal concern and are more aesthetically appealing (Fitzgerald et al. 1996a).

2.3 STOATS

As part of the 5-year Stoa Research Programme, the Department has commissioned research into public attitudes to stoats and their control. The first phase of this research involved a qualitative investigation to identify the range of public attitudes. Focus group discussions revealed that very few participants had any direct personal experience of stoats (Fitzgerald et al. 2002). Negative reactions were the norm, however, with stoats being described as 'ferocious' and 'killers' (Fitzgerald et al. 2002).

These findings were later confirmed in a quantitative survey (Phase 2), which found the most common words used to describe stoats were: 'vicious', 'predator/predatory', and aggressive (Fitzgerald et al. 2005). The same study identified that the general public were well aware of the potential dangers of stoats to New Zealand's biodiversity, with 97% agreeing they posed a threat to New Zealand birdlife, and 91% considering they were a problem for New Zealand's environment (Fitzgerald et al. 2005).

2.4 PESTS AND MANAGEMENT ACTIONS

Possums and rabbits are considered by the public to be the most serious vertebrate animal pests. Ninety percent of respondents in Sheppard & Urquhart's (1991) national survey indicated that these two species present a

'serious' or 'very serious' threat to the environment. Rats featured third with 42%, while dogs, deer and goats were considered to be serious by 9.1%, 6.9% and 4.5% of respondents respectively.

Fraser (2001) corroborated this earlier survey. Figure 1 shows that possums and rabbits are seen by a distinct majority to be pests. It can also be seen that perceptions of an animal as a resource are skewed towards the larger species.

How animals are perceived influences what the public believes to be appropriate management actions (Fig. 2). Exterminating possums and rabbits, regarded as a pest and a significant threat to the environment, is regarded by most to be an appropriate management alternative. Further, as perception of the animal as a resource increases, approval of extermination as an appropriate control method diminishes.

Figure 1. Perceptions of introduced wildlife as pest or resource (Fraser 2001: 24).

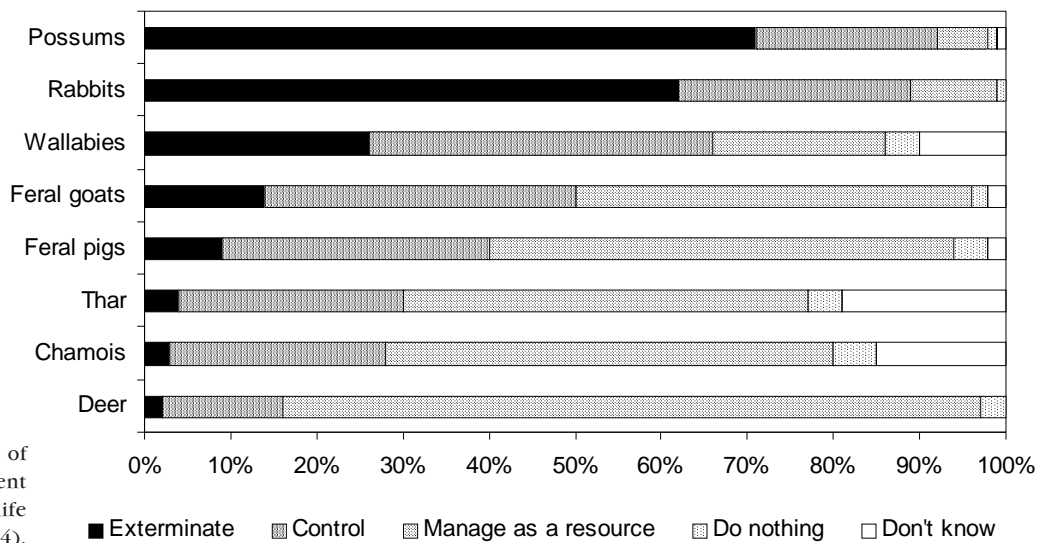
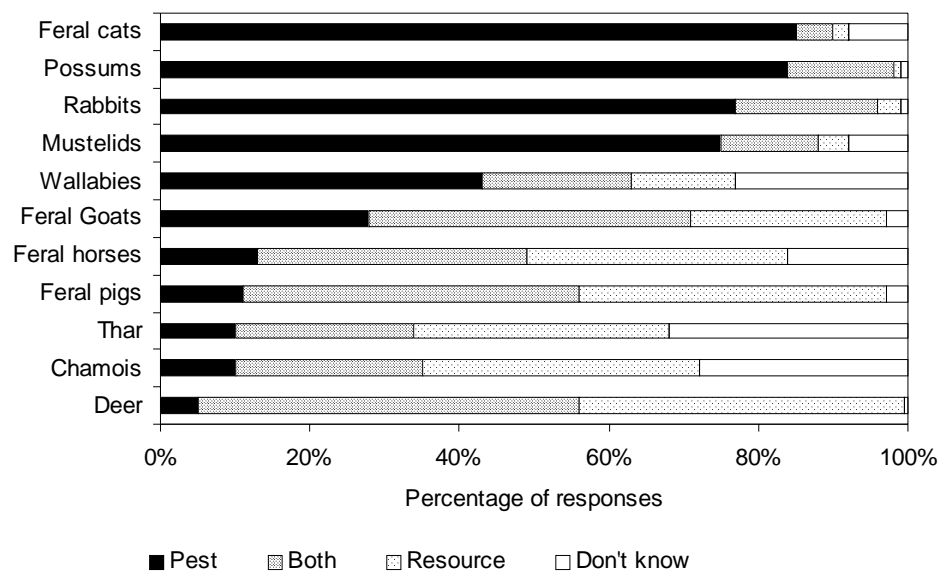


Figure 2. Views of appropriate management for introduced wildlife animals (Fraser 2001: 24).

Although larger animals may be viewed more favourably, the question structure may introduce elements of bias. Asking respondents to label each species as a 'pest' or 'resource' will invariably influence proposed management options and acceptability (Oogjes 1996). It is also well known and publicised that possums and rabbits are national pests that require urgent management to conserve conservation and economic values. This knowledge may bias respondents by leading them to the more permanent management options.

3. Attitudes to pest control technologies

Acceptance or disapproval of pest control methods can relate to both moral and ethical concerns, and perceptions of uncertainty. Moral and ethical concerns revolve around the two key concepts of specificity and humaneness. Specificity involves the control affecting only the target pest species. Humaneness refers to a control that delivers a 'quality' death, i.e. a quick, painless death that doesn't degrade the animal (Fitzgerald et al. 1996b).

Perceptions of uncertainty relate to the public's notion of risk. Generally, there is a high degree of uncertainty attached to all methods used to control vertebrate pests, with the exception of manual controls. As a consequence, these ambiguities manifest themselves as high perceptions of risk, low acknowledgement of benefits and, ultimately, a lack of public support. This risk is concentrated as fear of adverse effects to people, the environment and the economy.

Public attitudes towards each control method include reference to all of these concerns, the only difference being the degree of concern shown. This determines relative acceptability.

This section reviews research on three main methods of pest control: manual methods (shooting and trapping), biological controls, and poisons. Biological controls include naturally occurring organisms such as predators, diseases, etc., and also genetically modified organisms.

3.1 MANUAL METHODS

Trapping and shooting are widely regarded as the most acceptable methods of pest control, being considered the most humane and species specific (Fitzgerald et al. 1996a, b; Fraser 2001; Sheppard & Urquhart 1991; Fitzgerald et al. 2005). In addition, they are regarded as environmentally friendly (Fitzgerald et al. 1996b). Trapping, however, is less acceptable than shooting as it is seen as relatively less humane and specific.

While manual methods are the most accepted, the public acknowledges that they are neither the most effective nor efficient means of control. Fitzgerald et

al. (1996b) noted that most focus group participants realised that because of the high labour demands, shooting and trapping could not be used as the principal control method.

Some of the support for manual methods comes from their potential to create employment and other commercial opportunities. The public wishes to see productive gains from pest control. Fraser (2001) noted that 95% of respondents would prefer commercial use to be made of animals rather than 'killing to waste'.¹ Commercial opportunities are not thought to exist in using poisons and biological controls (Fitzgerald et al. 1996b).

3.1.1 Demographic differences

Fitzgerald et al. (1994) found those aged over 40 were significantly more accepting of trapping and shooting of rabbits than those under 40; males were significantly more accepting than females. This is in contrast to Sheppard & Urquhart's (1991) survey, which found significantly more women believed shooting 'suitable', than men. The different terminology used by Sheppard & Urquhart (1991) and Fitzgerald et al. (1996a) might be the source of these apparently contradictory results.

These trends in support were evident for possums, with males and those over 40 more accepting of manual controls than females and those under 40.

3.2 BIOLOGICAL CONTROLS

Biological control involves using biological means, as opposed to chemical and physical means, to control pest species (PCE 2000). Traditionally, biological controls have involved the introduction of an exotic species such as predators, parasites and diseases (Cowen 2000; PCE 2000). Advances in the technology of molecular biology and genetic engineering have recently broadened the field of biological control to include other alternatives. This technology is being developed to interrupt physiological processes and is almost entirely focused on fertility control (Cowen 2000; PCE 2000). It has been suggested that 'biotechnological control' is a term more appropriate for the latter types (Cowen 2000).

Although biologically based and biotechnological control methods are distinct, they are difficult to separate. While GE technology normally involves a toxin/protein that will affect fertility, the vector used for transmitting such toxins is likely to be bait or a naturally occurring organism like a flea. Hence there is a certain degree of overlap between the two. For the purposes of this review, both types of control will be discussed conjointly, while broader attitudes to genetic engineering will be identified in a separate section.

¹ This question is biased towards this outcome with use of the terms 'kill' and 'waste'. See section 3.3 for further explanation.

3.2.1 Biological and biotechnological control

Sheppard & Urquhart (1991) found variable attitudes to the application of diseases and natural predators to control vertebrate pests. Approximately 51% of the respondents were opposed to the notion of introducing a natural predator or disease. However, when specific reference was made to a pest species, and this species had a direct and identifiable impact on people, the resistance to such control techniques lessened. For example, over 30% of those generally opposed to the use of diseases and introduced predators were in favour of a virus or disease when possums and rabbits were named as the target species. In addition, when the disease or control agent was known, support for its use increased.² These results add credence to the conclusion drawn earlier (section 2.2) regarding the influence of individual characteristics of pest species on the perceptions and acceptability of proposed management actions.

3.2.2 Biological control of possums

Fitzgerald et al.'s (1996b) national survey provides a more detailed analysis of biologically based control methods. Respondents were asked to rate four potential control means that included naturally occurring and biotechnical methods. These control means were:

- An imported, naturally occurring possum-specific parasite
- An imported, naturally occurring possum-specific bacterium
- An imported, naturally occurring possum-specific virus
- A genetically engineered organism (GMO)

Only the use of a GMO was acceptable to a majority of the sample, and was considered to present the lowest risk to the environment, human health, and the economy (Fitzgerald et al. 1996b).

The remaining three controls were rated more unacceptable than acceptable. Other research using focus groups has identified a leading cause for the lack of support for the use of viruses is the perception they are unreliable, unstable and likely to mutate. This is seen to provide a threat to non-target species, including humans. Similar concerns were shown for the use of parasites (PCE 2000).

Overall, perceptions towards all four controls were characterised by a high proportion of uncertainty, and a marked difference in attitudes toward manual methods (Fitzgerald et al. 1996b).

Biological controls that cause fatalities achieve less support than preventative methods. Fitzgerald et al. (1996b) found 85% acceptability for controls incorporating immunocontraception/sterilisation. This compares with acceptability rates of 62% for immunising against BTb, 48% for killing young in the pouch, and 40% for making possums more susceptible to natural disease. Focus groups indicate that interference with lactation (causing death in the pouch) and making possums more susceptible to disease are viewed as inhumane (PCE 2000).

² Over 30% of those opposed to general diseases were in favour of the introduction of myxomatosis.

Species specificity is also a major concern for biotechnological controls. When asked to rate the relative importance of various safeguards, 97% of respondents indicated that not affecting humans was an essential feature. This was followed by 'not affecting other animals' (88%), 'unable to spread outside New Zealand' (81%), and humaneness (70%) (Fitzgerald et al. 1996b).

Wilkinson & Fitzgerald (2001) further explored public attitudes to fertility control. Preliminary results identified that the concept of fertility controls was well accepted.³ The manufacture and delivery of these controls was less acceptable, however, as both involved genetic engineering. The four potential delivery methods presented in the survey and their acceptability were:

- GM plant (43% found it acceptable)
- GM parasite worm (43%)
- GM bacterium (36%)
- GM virus (32%)

While more people found the GM plant and the GM worm acceptable than unacceptable, it can be seen that none of the methods obtained 50% acceptance. The dislike of the use of bacteria and viruses is similar to levels shown in previous surveys.

3.2.3 Biological control of rabbits

For rabbits, questions on the use of biological controls have focused on the use of RCD (rabbit calicivirus disease). Studies have found support for the introduction of RCD has centred on the need for an effective and affordable control (Fitzgerald et al. 1996a; Wilkinson & Fitzgerald 1998). Reasons for opposing its use include a lack of perceived specificity, a mistrust of using viruses in general, and a lack of research or information on RCD. Perceptions of the degree of humaneness of RCD were also found to be an important influence on the level of opposition/support shown.

Fitzgerald et al. (1996a) found a considerable proportion of people might change their attitudes towards employing RCD if they were given credible information concerning its risks, humaneness, and specificity. The provision of such information to the required level of public acceptability may be difficult to achieve, however. Focus groups have indicated that people are somewhat sceptical about the ability of science to cope with the complexities of nature (Wilkinson & Fitzgerald 1998). Studies also suggest that a 99.9% level of certainty or guarantee is required before the use of biological controls such as diseases will be accepted (Fitzgerald et al. 1996a).

A survey in 1998 identified that general feelings and support for the introduction of RCD had not changed markedly and confirmed previous findings (Wilkinson & Fitzgerald 1998). Again, high awareness of the disease was recorded, but actual knowledge of RCD was 'patchy', with most of those who had heard about it knowing little or nothing. A majority of respondents

³ Two methods of fertility control were investigated: 'interfering with fertilisation' and 'interfering with breeding hormones'. Both these alternatives were favoured by the sample, with 78% and 71% of respondents, respectively, finding these controls acceptable.

considered that New Zealand has a rabbit problem and that current methods aren't proving effective, but this didn't equate to acceptance of using RCD.

3.2.4 General attitudes

Public attitudes and perceptions towards genetically modified biological controls are characterised by high levels of uncertainty, not only in personal understandings, but also in perceptions of the extent of knowledge held by management authorities. The main areas of uncertainty relate to species specificity, stability and controllability of both the vector and the modified organism. Specificity is the most immediate and strongest concern and is associated with risks to humans as well as to non-target species (PCE 2000). The apprehension shown is a consequence of the possibility of the organism mutating and causing long-term and irreversible effects. This fear is clearly attached to the use of viruses. Focus group findings indicate that there is an overall fear of losing control over the release of such organisms and that they themselves will become a pest (Fitzgerald et al. 1994).

Overall, it is evident that the public approves of the idea of fertility controls. It is also evident that this support has remained relatively stable over the past 8 years (Fitzgerald et al. 1994; Wilkinson & Fitzgerald 2001). However, the use of GM organisms in the development and distribution of such controls is much less accepted.

All these concerns represent a general mistrust of the ability of management authorities and scientists to identify, evaluate and control all areas of potential risk concerning such introduction. This is not very surprising given the mistakes that have been made in the past (e.g. the introduction of stoats to control rabbits). This point was highlighted in focus group discussions (Fitzgerald et al. 2000).

3.2.5 Demographic differences

Age groups more able to explain biological controls to 'friends' were those under 20 and the 40-49 age brackets⁴ (Fitzgerald et al. 1994). Those over 60 were less able to explain the concept. More males had heard of (and were able to explain) biological controls than females. Rural residents were more aware and knowledgeable than urban residents (Fitzgerald et al. 1994).

For all surveys, males found the use of biological controls more acceptable than females (Fitzgerald et al. 1996a; Sheppard & Urquhart 1991; Wilkinson & Fitzgerald 2001). Rural residents were more accepting of all biological controls than urban residents (Fitzgerald et al. 1994). Animal welfare organisation members and conservation group members were significantly less accepting of all biologically based controls than non-members (Fitzgerald et al. 1994).

⁴ The ability to explain biological controls to a friend was used as an indicator of the respondents' knowledge of biological controls. This is a relatively crude reflection as it results in suggestions of perceived knowledge, not actual knowledge.

3.3 POISONS

While the focus of this section is on public attitudes to the use of poison, most of the discussion is centred on the application of 1080. Although there are other poisons currently in use for pest control, public awareness of these alternatives is not high. Consequently, research has focused on attitudes to the use of 1080.

This section will review these studies, but will not include references to anecdotal or implied support or opposition generated by the media or particular stakeholder groups.

3.3.1 Public opinion of 1080

There have been a number of reports on attitudes to the use, and different application, of 1080 and each has indicated a different level of public support.

- **Sheppard & Urquhart (1991)** found that 44–45% of respondents thought the use of 1080 to be suitable for the control of possums and rabbits. A majority (50%), however, thought it was not.
- **Fitzgerald et al. (1996b, 1994)** explored the difference between aerial application and ground baiting of 1080 and found that ground baiting was more acceptable. Only 37% offered their support for this method however. Aerial application was acceptable to 27%.
- **Fraser (2001)** found that 52% of people were in favour of the use of poisons, such as 1080, in pest control operations.

In a national survey of the general public conducted in November 2001, 52% supported the use of 1080 while 32% were opposed (UMR 2001a).⁵ In December of that same year support was relatively unchanged at 51%, but there was a 7% increase in those who opposed its use to 39%. This movement coincided with the showing of an ‘Assignment’ television programme on 1080. Although this cause and effect is not proven, the strength of media effects would benefit from future research.

The varying indications of support and opposition for the use of 1080 make it difficult to determine general opinion on the use of the poison. Different phrasing in each survey complicates any direct comparisons. For example, Sheppard & Urquhart’s (1991) survey asked respondents to assess the *suitability* of certain methods for *controlling* pests. Fitzgerald et al. (1994) asked people to rate control mechanisms in terms of *acceptability* in *killing* possums and rabbits. The UMR survey asked people whether they support or oppose the use of 1080 in *controlling* the impacts of possums. The italicised terms can elicit different responses from the general public.⁶

⁵ No distinction was made between ground baiting and aerial application.

⁶ Suitability may not be comparable to acceptability (see section 2.4). What is ‘suitable’ for a control may include aspects of efficiency and effectiveness. However, a suitable control can still be unacceptable (Fitzgerald et al. 1994). It has also been identified that people do not particularly like the term ‘kill’. Fitzgerald et al. (1996b) found that this word often elicits a negative response. Fitzgerald et al. recommended using the less harsh word ‘control’ in public awareness campaigns.

3.3.2 Specific concerns

Public concerns over the use of poisons can be generally characterised by uncertainty. This uncertainty relates to the specificity of the control, the effects of poisons on the surrounding environment and most importantly, how such environmental effects will impact on people.

Species specificity is a major public concern. A national UMR survey (UMR 2001a) found that 60% of respondents noted a lack of specificity as the basis for their opposition to 1080. In contrast, Fitzgerald et al. (1994, 1996b) found that a possum specific poison was acceptable to 69% of the public for possum control, placing it the second most accepted form of control of all those assessed. Evidently, public tolerance of poisons would significantly improve if non-target fatalities were eliminated.

The opposition to the use of poisons is also associated with concerns for human health, the environment and animal welfare. In their survey of attitudes to possum control, Fitzgerald et al. (1994, 1996b) noted that aerial use of 1080 was considered a 'high' risk to human health by 37% of the sample, the highest given to any control method. Similarly, the risk of 1080 to the environment and the economy was considered high by 33% and 26%.

Focus groups findings suggest that environmental and human health concerns are related. Fitzgerald et al. (1994, 1996a, 1996b) identified that perceived threats to human health lie with the leaching and contamination of waterways and the accumulation of toxins in animals and ecosystems. This could result in the poison being passed down the food chain. Compounding these concerns is the general lack of knowledge surrounding the environmental effects of poisons (Fitzgerald et al. 1994, 1996b; PCE 2000).

UMR (2001a) was able to provide a ranking of public concerns over the use of poisons. After the potential to harm non-targeted species (60%), the next most selected reason for opposition to the use of 1080 was the availability of alternatives (15.5%). Comments included that traps and hunters and more harmless methods could be used. Dislike for poisons in general was listed as a reason by 15.1% of those opposed. Impact on the environment (7.3%), impact on waterways (5.7%), and potential danger to humans (5.3%) were other reasons listed.

Opposition to 1080 doesn't appear to be related to the actual composition or attributes of the toxin itself, but to the fact it is a poison. Mode of dispersal is also important as concern over the risk to the environment and waterways suggests that people perceive little or no control over where the poison is positioned. Ground baiting of 1080 does not present the same risks and is therefore more acceptable. Even more acceptable is a poison that is specific to the target species.

3.3.3 Demographic differences

In contrast to the degree of support for, or opposition to, the use of 1080 and other poisons, demographic differences tend to be less variable between surveys. In general, females tend to consider 1080 more unacceptable than males. Acceptability tends to increase with age (Sheppard & Urquhart 1991;

Fitzgerald et al. 1994, 1996a, 1996b; UMR 2001b). Rural respondents tend to be more accepting than urban respondents (Fitzgerald et al. 1996a).

Members of animal welfare organisations find the use of poison to be more unacceptable than non-members (Fitzgerald et al. 1994). In contrast, members of conservation organisations are more supporting than non-members, especially of the use of 1080. This reflects their position that the preservation of native forests outweighs or takes priority over the effects of 1080.

3.4 PEST CONTROL TECHNOLOGIES

Of the different control methods reviewed, it is clear that manual methods are the distinct preference of the public. The specificity, humaneness and limited ecological impact of these methods ensure minimal perceived risk or concern. In addition, the potential for commercial opportunities is realistically available only to these controls, attending to public desires for productive gains out of such operations.

The application of biotechnology is seen as the next most accepted form of control. Techniques such as immunocontraception provide the capacity to control possum numbers via humane pathways, an essential component of any acceptable control method.

This does not mean that on the development of such technologies, the public will allow the release of biotechnological controls. Wilkinson & Fitzgerald (2001) identified that although fertility control was highly acceptable, the use of genetic modification in the manufacture and delivery of the control was not. Focus group findings also suggest that initial acceptance is conditional on a 99.9% guarantee that such technologies are species specific and stable. Science is unlikely to provide this level of certainty.

The inability to provide this degree of certainty seems to have been known intuitively by the public. While people find the concept of biotechnology to be very acceptable, in reality, they display a desire to retain already tried and tested methods, and wish to see existing technologies improved rather than new ones developed.⁷ However, existing technologies require significant improvement, as the use of poison and biologically based controls are the most unacceptable of all methods reviewed.

⁷ In the more recent national survey by Wilkinson & Fitzgerald (2001), 77% of respondents indicated that new forms of control are required to address the possum problem, whether this meant development of new controls or the improvement of existing controls, was not identified. The conclusion that the public desires the improvement of existing controls comes from survey data from earlier studies.

4. Wider influences on public attitudes to pest control

Public opinion towards vertebrate pest controls is influenced by factors far beyond the characteristics and the application of the controls themselves. These include the incorporation of biotechnology into pest control and society's wider perceptions and beliefs about genetic engineering. Although there is a high level of awareness of genetic engineering, indications are that actual knowledge is not very high and there is confusion over the different applications of such technology. Because of this, 'potential uses of this technology for such purposes as possum control will be inextricably interconnected with other questions, other information and other concerns from the wider genetic engineering debate.' (PCE 2000: 43). This section provides an overview of the wider influences on attitudes to pest control. It focuses primarily on the genetic engineering debate, with reference to other broader effects.

4.1 GENETIC ENGINEERING

There have been a number of investigations into public attitudes to genetic engineering in New Zealand. A survey completed in 1990 revealed that at that time 73% had heard of the term 'genetic engineering', but only very few (20%) felt that they could explain it to a friend (Couchman & Fink-Jensen 1990). Similar levels of awareness were recorded for the biological control of pests. Eighty-two percent of respondents were familiar with this term with 21% of those feeling they could explain it to a friend.

Couchman & Fink-Jensen (1990) found 86% of people believed that research and development into the biological control of pests was a worthwhile undertaking with identifiable benefits. This contrasts with genetic engineering, which only 57% of the sample thought was a worthwhile area of research.

The findings of the 1996 Eurobarometer (Macer et al. 1997) suggest that acceptance of genetic engineering in New Zealand has been steadily decreasing. In 1990, 57% of New Zealanders thought that GE would be worthwhile, with 20% extremely worried about it (Couchman & Fink-Jensen 1990). By 1993, these figures had changed to 41% believing the area was worthwhile for scientific research and 49% having concerns (Macer et al. 1997). Genetic engineering was again perceived to be of less benefit than biotechnology. Fifty-eight percent thought that biotechnology would improve the quality of life in the future while only 32% thought the same for GE. Alternatively, 39% thought that GE would negatively affect the quality of life compared with 17% for biotechnology.

It is evident that there is stronger support for the application of biotechnology to pest control than genetic engineering. The differences in perceptions

between the two technologies are surprising given that almost all biocontrol methods incorporate genetic engineering (PCE 2000).

A report by the Independent Biotechnology Advisory Council (IBAC 2000) may explain this difference. Results showed the terms 'genetic engineering', 'genetic modification', 'genetically modified organism' and 'biotechnology' were used interchangeably. This would imply that attitudes to the two technologies would be fairly similar, but this was not the case. A possible explanation could be that the specificity of the application of biotechnology to pest control may foster increased support because the area of concern is distinct and the benefits more identifiable. Broad reference to genetic engineering does not lend this specificity and so it would be difficult to identify the associated benefits. Although there may be a certain degree of confusion over what the technologies relate to, the specific reference and application of biotechnology to pest control suggest that it is one of the more acceptable in public opinion.

A recent investigation into public perceptions of transgenic plant products identified that public opposition to GE was focused on moral and ethical grounds, such as 'playing God', and concerns over human and environmental health effects (Gamble 2002). These concerns are identical to those identified for biological controls (Fitzgerald et al. 1996a, b, 2000). Gamble found that central to such unease were the unknown outcomes of the application of such technology. Two different streams of opinion were related to this. There were those who understood that such technology has the potential to accrue benefits, but the possibility of exposure to unknown risks is so great that it was unacceptable to incur them. Others were unaware or disbelieving of benefits, resulting in a disproportionate rating of risks.

Gamble suggests that the public is still making up its mind over GE and opinions are 'fluid and unformed', with the level of uncertainty still high. A number of those surveyed perceived a lack of objective information and insufficient regulation of the technologies. Even if these were present, Gamble believes a high level of trust would be necessary before such information would be believed. Similar findings were identified by Macer et al. (1997) where 52% disagreed that current regulations are sufficient to protect people from risks linked to modern biotechnology. This inherent mistrust of both the technology and those who produce and administer it poses one of the biggest hurdles in public acceptance of genetic engineering and biotechnology.

4.2 ATTITUDES TO SCIENCE

Aside from the genetic engineering debate, there appears to be a general mistrust of science and the development of technologies. It was noted in focus groups that expert reassurances about the safety of 1080 were not trusted (Wilkinson & Fitzgerald 1998). In an investigation into public perceptions of science and technology, there was consensus that scientists alone could not be trusted to make correct decisions and it was felt that the ordinary public was not being informed about what scientists were doing (Billington & Bibby 1991).

The study also noted that New Zealanders generally have a negative attitude towards science.

Probably the most significant finding from Billington & Bibby's (1991) investigation was that a majority of the public does not have the capacity to engage in scientific debates as they lack a basic level of understanding. Only 10% of survey respondents were considered to be 'scientifically literate', the threshold measure of minimal understanding of the processes, terms and social impact of science. This has been reinforced in a more recent study, which found that many New Zealanders have gaps in their understanding of 'basic science theory' (Hipkins et al. 2002).

While the public's understanding of science issues may not be extensive, there is a high level of interest in environmental science areas. In their investigation into people's beliefs and attitudes to science, Hipkins et al. (2002) noted very high levels of interest in 'saving endangered species' (81% interest). This was the second highest area of interest after new medical techniques and treatments (82% interest). The benefits to humanity of science in protecting endangered species were also considered highly tangible (79% agreement). In addition, it was believed that 'Science and technology are important for the preservation of New Zealand's environment' (82% agreement).

Although promising, the areas of science and technology measured above are only abstract concepts. While there appears to be support for science and technology for environmental purposes in general, this will not necessarily equate to acceptance of specific technologies, such as genetically modified organisms. In the same survey, 22% did not agree that the Government should keep a tight control on what scientists are allowed to do. This disagreement with government control was not in order to allow greater scientific freedom, but was mainly the result of a mistrust of the Government and its involvement. It was also perceived that politicians had neither the skill nor the understanding to develop appropriate controls.

4.3 CONSULTATION AND THE ROLE OF AGENCIES

Identification of the benefits, the costs, and the uncertainty surrounding lethal controls may not accurately encapsulate all public concerns. The manner in which pest control operations are approached and implemented by agencies will also affect public perceptions. Focus groups have shown that 'some of the opposition to technology-based methods or aerial poisoning was based on the perception that these methods were imposed on local communities by remote government agencies' (PCE 2000). Even more so, the attitudes towards the agencies themselves may compound the opposition to pest controls.

In recent research aimed at identifying how consultation processes can affect the way Māori deal with 1080 operations, perceived community control was identified as a key indicator of acceptance (Horn & Kilvington 2002). Control in this sense was the ability to directly affect outcomes in which one had an interest. Consultation and partnerships were avenues through which this control could be exercised.

The essence of good consultation was considered to be that which was based around a ‘mutually-agreed course of action’, and not on efforts to persuade or convince a community to accept one single approach. This distinction can also be defined by the intent to ‘inform’ and ‘persuade’ as opposed to ‘consult’ and ‘discuss’. Horn & Kilvington (2002) suggested that communities may often mirror the conduct of agencies they are in consultation with. Where agencies try to convince communities of a course of action without seemingly being prepared to make any changes, communities will subsequently display similar behaviour, unwilling to let go of their own terms and conditions. Findings suggested that where 1080 was successfully used in pest control operations, the communities affected felt that their concerns had been addressed.

While this research was focused on the Māori community, the underlying principles of community involvement and participation are universal. Engaging in consultation, and being seen to engage, would assist a community’s sense of control and remove feelings of remote government agencies enforcing their own set of values.

In addition, attitudes to pest control tools can be affected by attitudes to the agencies that use them. While this is related to how the agency engages communities, there are other, broader features that can impact on public perceptions. In terms of the Department, the conservation outcomes it is trying to achieve may impinge on the values of individual community groups. Such conflicts of interest have the potential to negatively impact on other areas of the Department’s operations, including the methods it employs to achieve its conservation goals. Other aspects include the trust and confidence people have in the Department (and the Government in general), where past actions and reputations will affect public perceptions. Such factors need to be acknowledged and factored into the Department’s strategies and consultation practices when engaging communities on public issues.

5. International perceptions and attitudes towards pest control

There are two contexts from which international literature on attitudes to pest control can be drawn.

- **Control for conservation**—Pest control is completed to ensure the existence of particular native species.
- **Management of wildlife**—Pest management is characterised by the interaction and conflict between people and wildlife. ‘Wildlife’ in such instances includes native and exotic, domestic and wild species (UDA 1995).

Unlike the ‘control for conservation’ context, control of the human/wildlife interface is primarily completed to ensure human health and safety, and the protection of property. From a management perspective, the pests are also

viewed differently. The main objective of control is to alleviate the damage problem and not necessarily to kill the pest (Reiter et al. 1999; UDA 1995).

It is necessary to understand attitudes towards pest control from both perspectives. As identified in sections 2 and 3, the characteristics of particular species were found to influence preferred management actions. Similarly, it is also important to find out whether attitudes towards particular pest control technologies change according to the motivation for control.

This section will predominantly focus on attitudes towards the control of pests at the human/wildlife interface. Although other countries face pressures on biodiversity similar to those in New Zealand, not much research appears to have been conducted on attitudes towards control for conservation purposes.

5.1 CONTROL FOR CONSERVATION

Findings from a general survey of the public in Victoria, Australia, identified similar types of issues relating to pest management as those identified in New Zealand (Johnston & Marks 1997). The specificity of the control is a concern. Forty-nine percent of respondents did not agree it was acceptable for a small number of non-target native wildlife species to die during control efforts.

Notwithstanding this, a significant proportion (39%) found non-target deaths acceptable. Although not directly comparable with New Zealand research, it can be suggested that the high value placed on specificity identified throughout section 3 indicates that New Zealanders are less tolerant of non-target effects.

Depending on the species, different forms of control were considered appropriate. Biological control was preferred for rabbits, and shooting for foxes. Poisoning was not a favoured technique for any pest. These results concur with Fraser's (2001) findings that the acceptability of control techniques is dependent on the animal in question. No single control method is seen as the most appropriate for all pest species.

There were no significant differences within any of the demographic variables tested. These included age, sex, and whether respondents lived in an urban, semi-rural, or rural environment. This is in direct contrast to findings generated in New Zealand surveys.

5.2 MANAGEMENT OF THE WILDLIFE/HUMAN INTERFACE

Wildlife can adversely interact with people in a number of ways. Some will be of more concern than others, with those having the potential to cause harm being viewed more seriously than those which impose lesser effects (e.g. property damage).

In the United States, there seems to be greater opposition to the use of trapping. In 1995, 62% of respondents in a Colorado survey indicated that they would ban trapping, as they believed this would eliminate a cruel activity (Manfredo et al.

1999). Results suggested varying resistance to trapping based on the reason for control. Trapping was acceptable to prevent disease and to protect livestock and property, but was not justified in obtaining money or for recreation.

Americans also appear unsupportive of lethal controls. In an investigation into general attitudes to wildlife damage management, nearly all lethal methods of control were rated as inhumane (Reiter et al. 1999). Respondents rated animal suffering as the second most important factor to be considered in management options, after human safety. Other factors, in order of decreasing importance, included: effectiveness, environmental impacts, severity of the problem, specificity, cost, and public opinion. All these options were rated highly important, with the exception of public opinion, which was located towards the 'non-important' end of the spectrum.

From these surveys, it is evident that Americans share similar concerns about control technologies as New Zealanders. These include human safety, specificity, humaneness, and effectiveness.

The low rating given to public opinion suggests that respondents, while having management preferences, think management authorities should be able to engage in actions they consider appropriate without being restricted by public opinion. The view that although the public should be involved in deciding policy, the nuts and bolts of management should be left up to professionals is supported by Sanborn & Schmidt (1995). It would be interesting to identify whether New Zealanders share a similar opinion.

Reiter et al. (1999) found that almost all lethal controls were considered inhumane.⁸ This may reflect wildlife management not necessarily requiring death, but merely transportation or relocation of the pest species. The only lethal control considered not to be inhumane was poisoned baits for rodents. This result is interesting as the type of animal should have no bearing on the degree of humaneness of a particular control. This corroborates findings of New Zealand research, where attitudes towards the animal in question influence perceptions of controls (section 3.3).

Research suggests that perceptions of the severity of impacts are a deciding factor in the public's perceptions of management options, not necessarily the type of concern (health and safety, nuisance, aesthetic or economic). Reiter et al. (1999) suggest that because of the influence of perceptions of severity, the general public may be inclined to accept lethal methods when particular circumstances necessitate their use. This is in contrast to current preferences for non-lethal controls. Support for this proposition comes from research linking increased concern for wildlife effects and acceptance of invasive methods of control (Loker et al. 1999). It has also been suggested that negative experiences or concerns will lead to support for management regardless of previous attitudes and beliefs (Loker et al. 1999).

Gender differences internationally are not unlike those found in New Zealand. Men were found to be more accepting of shooting and trapping (Sanborn & Schmidt 1995; Mankin et al. 1999). Sanborn & Schmidt found that women were more concerned with producing quick and minimally painful deaths. Both men

⁸ Methods included shooting, poisoning, snares, traps, and fumigation.

and women disagreed with the use of poison, but women disagreed much more strongly. Both perceived species specificity to be important. Non-lethal techniques were ethically acceptable to both, but more so to men.

There are marked distinctions between rural and urban residents in the United States. Urban residents are less supportive of hunting and trapping (Manfredo et al. 1999; Mankin et al. 1999). This may be related to the influence of direct experiences as urban residents have fewer encounters (Mankin et al. 1999). Similarly, it has been noted in Australia that increasing urbanisation may have resulted in less understanding for the practical decisions involved in environmental management, leading to less acceptance of these methods (Hart 2001).

6. Summary of acceptability of pest controls

Three areas have been identified that influence the acceptability of pest controls. These are species specificity, humaneness and the level of uncertainty (both actual and perceived). These concerns relate to ethical and moral beliefs and not the technical and practical implications of control.

Manual methods (trapping and shooting) are the clear preference for the control of possums and rabbits. They are considered to be the most humane and specific of all controls. Support for these controls has increased over the past decade, reflecting the increased desire for controls to provide productive gains and, perhaps, the growing uncertainty about poisons and biocontrols, and increasing disapproval of their use. The need for certainty is supported by the finding that the public is predisposed to methods that are known and tested. This seems unlikely to change in the near future, even with the advent of biotechnological controls.

Poisons (specifically 1080) are the least acceptable of all methods reviewed. They fail to satisfy any of the three criteria that influence acceptability. They are seen as inhumane, the specificity of their action is consistently and constantly questioned, and the potential (but yet unspecified) effects on human populations remove any notions of certainty about their safety. It is not surprising that the risks of applying poisons are seen to outweigh the benefits.

Species specificity is a major determinant of the acceptability of poisons. Although the use of aerial 1080 and 'other' poisons has been identified as the most unacceptable means of possum control, the support for a possum-specific poison indicates that a significant cause of opposition towards 1080 is the inability to kill only the target species. Secondary poisoning effects are related concerns.

The opposition to 1080 can be partially attributed to its mode of dispersal. The increased acceptance of ground baiting over aerial distribution indicates the public does not like the idea of mass aerial application of poison. The

opposition might also reflect a lack of confidence in the ability of management authorities to place the poison in the correct area to an accepted degree of accuracy.

Biological controls are viewed favourably by the public. The specificity and humaneness of their action, especially through immunocontraception, are defining features of their acceptability. It is clear, though, that this acceptability does not equate to unconditional support for their use. An equally important facet of public opinion is the uncertainty surrounding these controls. This uncertainty extends over many areas, from individual knowledge and understanding to perceptions of the ability of management authorities to have complete control over such introductions.

A number of researchers have noted that the level of certainty now required by the public for the release of such controls extends beyond that which science can provide. Although the public understands that the attainment of zero risk is near impossible, it still appears that many are unable to let go of the ideal (PCE 2000). This high level of concern is not unwarranted. Macer (1994: 17) states 'we may never be certain to have complete control over the effects of introducing new gene sequences'. Arguments against the development of such technologies are also prevalent (Herbert & Cooper 2001).

Acceptability for individual control options appears to be mediated by the attributes of the pest species in question. The degree of this influence is difficult to ascertain, but there are indications that animals that are viewed more favourably are seen as deserving of better treatment. A number of characteristics can affect perceptions. Size, enjoyment upon seeing, and whether the animal is seen as a resource all influence favourability. In general, physically appealing animals gain greater sympathy, which is reflected in attitudes towards their destruction. Although conducted in a different context, research in America and Australia has identified similar trends. Experience of the animal and the perceived severity of impacts have a notable influence on the acceptability of invasive methods or non-lethal controls. So great is this influence that it has been suggested that the public would be willing to accept a trade-off, compromising aspects of humaneness in favour of lethal controls in the event of a pest species posing a severe problem.

There are some general demographic trends evident in relation to pests and their control. Men tend to be more accepting of all invasive methods of control and the need for them. This may be related to the predisposition of men to view species like rabbits and possums as less 'cute and furry' and therefore to be less influenced by the mediating effects of these species. Conversely, women are more concerned with the ethical and moral aspects of control, such as producing a humane death and species specificity. In general, they are less accepting of controls than men.

Other demographics include age and place of residence. Older people are generally more accepting of controls. Rural residents are also more accepting of all forms of control than urban residents. This situation is similar, although less pronounced, to that found in the United States where urban residents are less supportive of invasive methods of control. Possible explanations include that urban residents tend to exhibit more empathy and moralistic attitudes towards animals than rural residents, whose relationships with animals are largely based on direct

uses or impacts (O’Keeffe & Walton 2000; MDNR 2000). This is then reflected in the lower level of support for lethal controls shown by urban residents.

There are wider influences on the support or opposition shown towards pest control and pest control technologies. For biotechnological controls, the current debate surrounding genetic engineering will have an undeniable influence. Related to both issues is the public’s level of knowledge and consequent ability to become actively engaged in debates. Broader influences include how the process of pest operations is conducted. It has been identified that communities dislike having actions imposed on them, and this is reflected in the acceptability of controls.

7. Conclusions

There are many elements that influence public support for, or opposition to, the use of particular controls in pest management operations. These include moral and ethical concerns, such as specificity and humaneness, and perceptions of risk and benefits. There are also indirect mediating effects, such as perceptions of the animal targeted. Other influences include related public issues (the wider genetic engineering debate for example), and such things as the process of engagement through the Department’s consultation with local communities. All these elements play a role in determining the acceptability of proposed pest management actions.

The research findings suggest the public lacks a fundamental understanding of both the need for control and the methods used to achieve it. As people generally have very little personal experience of the damage caused by pests, the benefits of control are not realised or are understated.

Risks, on the other hand, appear to be overestimated, either through uncertainty or misunderstanding, or in situations where concerns have been enduring and amplified (Fitzgerald et al. 1996a). The longstanding opposition to 1080 and the unknown consequences of biotechnological controls are testament to this. There is a clear correlation between risk and the acceptability of the various methods. The result is the perception of risks far outweighing benefits, a scenario in which public acceptance is unlikely to be achieved.

Management of risk communication is central to addressing the potential level of conflict associated with invasive pest control operations. Communicating benefits and risks is a more involved process than just relaying factual information. Public perceptions of risk are not calculated on the basis of objective information concerning the probability of a hazard of a specific magnitude occurring. The perception of risk is a subjective construct focused more on the potentially disastrous effects than on the chance of them eventuating. Such beliefs require different information approaches as the provision of purely technical information will not answer the moral and ethical questions that form the basis of people’s opposition.

Communication of the risks of poisons and biocontrols will need to be governed by a process driven partly by the public itself. Many people are admittedly ignorant of the effects of these controls, yet significant opposition exists. The public needs to be informed of these effects, but in ways it determines for itself. Otherwise, any information transferral may be distrusted and compromised. One issue is the need to provide a forum where the level of dialogue between the public and those proposing to introduce such technology is on a par. It has been noted that certain aspects of science have accelerated beyond the public's ability to understand its application⁹ (Billington & Bibby 1991; Fitzgerald et al. 1994). So, although an identified action is to increase the amount of information available to the public, this information has to be at a level that will be understood. It also has to specifically address the concerns of the public—not only discrepancies in the perceptions of risk, but also the ethical and moral issues that have been highlighted. Ultimately, it is how the public views the process of decision making that will affect the degree of acceptance/opposition towards the use of specific controls such as 1080 and biotechnological controls.

8. Recommendations

Ensuring that current and future methods are accepted requires the transferring of the relevant information via a process which is satisfactory to the public. The questions become what information do we have, what information do we need, and therefore, what information are we lacking? Possible areas for future research are discussed below.

8.1 FUTURE RESEARCH

The following proposed research directions are primarily based on the results of a workshop of key Department staff. The workshop discussed the findings from this research, reasons for collecting information on public opinion, the current state of information, and the future information needs of the Department. Consequently, these recommendations are made to provide the basis for future discussions within the Department.

Recommendations on future research can be divided into three streams:

- How the Department engages communities about issues such as pest control
- Changes in public attitudes over time
- Current research gaps

⁹ This statement is based on dated research. Future research needs to be completed to determine if this applies to today's public.

8.1.1 Working with communities

An influence on the acceptability of control methods is the process by which the Department consults and implements its operational plans. Research findings suggest that there are several aspects of the process which can negatively impact on the operation and the deployment of controls. One is the perception of 'remote' government agencies conducting pest operations without due consideration of the local community. Another is the level of trust in the Department, in terms of both its ability to conduct an error-free operation, and the motives behind entering into consultation with the community.

How the Department initiates, develops and implements its operational pest plans with local communities needs to be further investigated and evaluated. It was noted at the workshop that significant differences exist between the ability of different area offices to engage successfully with local communities.

This raises several questions. For example, what are the characteristics of areas that work effectively and successfully with local communities? What enables some areas to satisfy both biodiversity and social goals? What are the constraints on areas which cannot be more flexible—is it a question of capacity, or a fundamental difference in the way communities are engaged? Understanding and identifying a set of principles of best practice will not only help DOC staff improve social and biodiversity outcomes at the local level, but will also aid in providing support throughout the Department.

An aspect of this research could involve identifying what, how, and where people get their information on pest control. This could then be used to answer some of the questions surrounding how to transfer information to the public—questions such as: 'what is the Department's most effective communication tool?' Effective communication of the right information may alleviate public concerns and increase support.

The workshop identified that the process of adaptive management needs investigation. Adaptive management involves the ability to identify community concerns and incorporate them into management plans with a view to changing the Department's behaviour. The process of identifying concerns, and being seen to make adjustments to meet these concerns, will illustrate the commitment of the Department to both social and biodiversity goals. The Department's management planning and ways to incorporate adaptive management into planning need to be researched.

8.1.2 Changing public attitudes over time

There is a continuing need to record changes in public attitudes over time. One of the limitations of research is that it becomes dated very easily as the media and wider social/political environment has a marked influence on public attitudes. As public issues are subject to change, so too are attitudes. Research has to be ongoing to monitor these changes. Areas of research could include:

- Perceptions of, and attitudes towards, science and technology
- The level of trust in the Department
- The level of trust in Government departments in general

- Public support of, or opposition to, specific pest control technologies

Standardised testing procedures need to be in place before any research is initiated. Gauging changes based on current information is hazardous as the nature of the samples surveyed, and the terminology used to survey them, differ. Deciding on a standard practice for selecting samples and providing a consistent set of questions will enable more useful and comparable information to be collected.

8.1.3 Current research gaps

In addition to the research listed above, there are specific areas of research that need to be addressed. These can then be incorporated into the development of the ongoing research.

Biotechnological controls

Although numerous studies have identified the level of awareness and the concerns of the public towards biotechnology, very little is known about the actual level of understanding the public has of such controls. The level of knowledge and the level of misunderstanding need to be determined so that public awareness strategies can target these areas, enabling the public to make informed decisions about such technologies.

Aerial 1080

There are still a number of unknowns surrounding the opposition to 1080. It is unclear if the primary source of opposition is due to the individual attributes of 1080, or the fact that it is a poison. Findings suggest that it may be its individual characteristics that people are opposed to. This finding is somewhat confusing when it is considered that the actual characteristics of 1080 poison conform to most of the public's requirements. The opposition to 1080 needs to be clarified and compared with other poisons.

It would also be useful to further explore the degree of opposition to, or support for, 1080. As illustrated by Fitzgerald (1996a) with people's position on RCD, solely using 'support' and 'oppose' distinctions are crude reflections of public opinion. Drawing out whether an individual's support/opposition is conditional or unconditional may identify which sectors, groups, or demographics require more education, awareness, etc. This would lead to the more effective use of resources as those who are unconditionally opposed/supportive are not likely to change their opinion regardless of any amount of advocacy.

The major public concern relating to 1080 is species specificity. This especially relates to the effects of the poison on native bird and animal populations. To address this concern requires factual evidence of the benefits of 1080. Quantitative data on species recovery and benefits to bird populations, etc. needs to be collected, compiled, and made available to the public to illustrate the net benefits of using this poison.

Demographics

While the use of focus groups and national surveys has identified differences between certain demographic groups, there is little information on the attitudes of particular groups such as Māori and Pacific peoples. National demographic statistics suggest that New Zealand is trending towards a ethnically diverse population. It is predicted that fastest population growth will be experienced by the Pacific communities. Similarly, the Asian population is thought likely to continue to grow at a faster rate than the total population (Statistics New Zealand 2003). Future research will need to take into account the changing cultural and ethnic makeup of New Zealand.

The strength of media effects

National surveys conducted in November and December 2001 imply that an increase in the percentage opposed to the use of 1080 was the result of an 'Assignment' television documentary shown in that period. While it cannot be said with any certainty that the programme was the primary cause of this shift in opinion, it is not an unreasonable supposition.

Further research into the strength of media effects on public opinion towards pest control needs to be carried out. Having an understanding of likely effects will better equip external relations and operational staff to develop communication strategies to counter potentially damaging media reports or to help support favourable ones. This research will also help to identify the most effective ways of communicating with the public.

A useful opportunity for assessing how media reports affect public opinion is the upcoming reassessment of 1080 to be completed by the Environmental Risk Management Authority (ERMA). Conducting pre- and post-opinion surveys of the outcomes of the reassessment may prove valuable in identifying public reaction to both the results and the process.

Additionally, as the media is pivotal in informing and, perhaps, influencing public opinion, it would be useful to complete a content analysis of the media over the past decade to track changes in opinion.

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Appendix 1

OVERVIEW OF KEY PIECES OF RESEARCH

This section gives a brief overview of the key studies reviewed for this report. Some studies used both qualitative and quantitative methods, while others used only the latter. In order to place results in the appropriate contexts, it is useful to first describe the two methodologies and acknowledge the benefits and limitations of each.

Qualitative methods

The key qualitative research method used to canvass the views of the public on attitudes to pest control is the focus group. Focus groups are employed to explore the range of people's opinions, establish how people come to share these opinions, and identify the information that groups draw on to reach such understandings (Bloor et al. 2001). While focus groups can stand alone, they are extensively used to provide a contextual basis for survey design (Bloor et al. 2001).

It is important to note that focus groups provide in-depth information on the views and opinions of those who attend. The findings of such groups are therefore only indicative, and are not representative of all individuals who share similar demographic characteristics.

Quantitative methods

Quantitative methodologies seek to determine the extent to which the public holds certain views, and normally involve the sampling and surveying of large numbers of people.

Unlike a census survey, results based on samples are only approximations and there are limitations to the extent to which they reflect 'public' opinion. The margin of error in each study can vary as a function of the methodology or the number of people surveyed, and this variation affects the degree to which results between surveys can be compared. For each of the quantitative surveys described below, the maximum margin of error is included.

Studies reviewed

Couchman & Fink-Jensen (1990) Four surveys were carried out to determine public attitudes to genetic engineering. In addition to a general survey of 2000 people, the opinions of three groups of people (farmers, scientists and biology teachers) who could influence public opinion on genetic engineering in New Zealand were sought. The surveys were also used to provide information on public knowledge and perceptions of the different processes of genetic engineering and the risks and benefits associated with each.

The maximum margin of error associated with a total sample of 2000 people is 2.2% at the 95% confidence interval.

Fitzgerald et al. (1994) Eleven focus groups of stakeholders and the public (key groups canvassed—rural public, urban public and stakeholders) were set up to

explore a range of issues and perspectives related to possum and rabbit control. Results from these focus groups later assisted in and complemented the construction of a national telephone survey of a random sample of 1127 New Zealanders. The survey was carried out to determine the public's perceptions and experience of rabbits and possums along with attitudes to various control methods.

The maximum margin of error associated with a total sample of 1127 people is 2.9% at the 95% confidence interval.

Fraser (2001) A 12-page booklet was used to survey general knowledge of, and attitudes towards, introduced wildlife and its management in New Zealand. Eight hundred and fifty-nine people from the general public responded to a mail-out survey. The target population was adult (≥ 20 years old) residents of New Zealand. Data was collected in 1994, 7 years before the results were published.

The maximum margin of error associated with a total sample of 859 people is 3.3% at the 95% confidence interval.

Gamble et al. (2000) This study used both focus groups and a national mail-out survey to measure and explain New Zealanders' perceptions about genetic engineering, with specific reference to food production. Six focus groups were held and included three types of respondents: 'general consumers', those with an environmental affiliation and religious groups.

Of the 1600 surveys sent out to members of the general public, 908 were returned. The maximum margin of error associated with a total sample of 908 people is 3.3% at the 95% confidence interval.

Macer et al. (1997) As part of an international study of attitudes to biotechnology, 489 responses to telephone interviews with the general public were collected. This survey was used as a comparison with a similar survey conducted in Japan.

The maximum margin of error associated with a total sample of 489 people is 4.4% at the 95% confidence interval.

PCE (2000) Meetings with the general public (urban women, urban men, and those living in provincial areas) and interest groups were held to inform a discussion document concerning possum control options and genetic engineering. Results were also used to form the basis of a quantitative survey.

Sheppard & Urquhart (1991) A telephone survey of 1000 randomly selected adults (18 years and over) throughout New Zealand was conducted to identify public attitudes towards the use of biological control methods for pest control in New Zealand.

The maximum margin of error associated with a total sample of 1000 people is 3.1% at the 95% confidence interval.

Wilkinson & Fitzgerald (2001) A telephone survey of 1002 randomly selected New Zealanders over 18 was conducted. The survey was developed on the basis of previous surveys (Fitzgerald et al. 1994) and the focus group findings completed for the PCE inquiry (PCE 2000). The results from this survey have not yet been fully analysed and only preliminary results have been used in this review.

The maximum margin of error associated with a total sample of 1002 people is 3.1% at the 95% confidence interval.