Northland Regional Council's Regional Management Strategy for Vertebrate Pests – a Review

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Contents

Summary

Landcare Research was requested to provide advice to Northland Regional Council on the management strategies presented for all mammal and bird pests included in the current regional pest management strategy (RPMS) document for the region; and in particular, to evaluate the underlying arguments for the tactics and technical methods, both recommended and rejected, for each of the animal pest species identified. The documentation associated with these tactics and technical methods for each species was also scrutinised, and where apparent errors of logic or shortcomings in information were found, changes in the text are suggested for use in the next RPMS. Key references are included. Each strategy statement covering individual or groups of species is reviewed in the order presented in the parent document, but only subsections considered likely to benefit from changes or additions are detailed.

The project was funded by the Foundation for Research, Science and Technology's Envirolink programme for small advice grants (No. NLRC51).

1. Introduction

Northland Regional Council's (NRC) Pest Management Strategy (RPMS) was first developed in 1988 as a requirement of the Biosecurity Act. This strategy document was redrafted in 1998 and again in 2007.

Landcare Research was requested to provide advice to the NRC on the management strategies presented for all mammal and bird pests included in the current RPMS document. In particular, it was asked to evaluate the underlying arguments for the tactics and technical methods both recommended and rejected for each of the animal pest species identified. The documentation associated with these tactics and technical methods for each species was also scrutinised, and where apparent errors of logic or shortcomings in information were found, changes in the text are suggested for use in the next RPMS. Key references are included. Each strategy statement covering individual or groups of species was reviewed in the order presented in the parent document, but only subsections considered likely to benefit from changes or additions are detailed below.

The project was funded by the Foundation for Research, Science and Technology's Envirolink programme for small advice grants (No. NLRC51).

2. Feral Cats, Ferrets, Stoats, Weasels, and Rats

Problems Caused

The main justification for the control of feral cats, all three mustelids, and both introduced rat species present in Northland is to limit their impact on native fauna. Secondarily, rats eat and contaminate human and stock foods. All other impacts listed are, by comparison, of minor concern.

Impact Evaluation
Their current ecological impact should be listed as 'high', based on their impact on native fauna spelt out in 'Regional Effects'.

Regional Effects
Feral cats and mustelids are generally considered to be amplifier hosts of bovine tuberculosis (Tb), contracting Tb during predation, inspection, or scavenging of animal carcasses, and passing it on to other animals or species only when their own carcasses are scavenged. Thus, outbreaks of Tb in both cats and mustelids in Northland (where no Tb currently occurs in wildlife) would provide little reason to control them, provided the main wildlife host of the disease (possums) is controlled. In contrast, rats are not recognised as hosts of Tb in New Zealand (Coleman & Cooke 2001). The role of feral cats, mustelids, and rats in transmitting Tb to livestock in Northland is therefore overrated here.

While feral cats, mustelids, and rats carry a range of other diseases transmissible to livestock, the economic significance of most of them is unknown. Ferrets may transmit canine distemper to dogs, while cats transmit both toxoplasmosis and *Sarcocystis* to livestock; the latter, particularly, is considered to be economically damaging to livestock producers. Rats carry a wide range of diseases, some of which seriously affect livestock and humans, with *Leptospirosis* (*L. icterohemorrhagiae*) probably the most economically important of these.

Need to Intervene
Limiting regional control of feral cats, mustelids, and rats to areas under community control schemes appears to be at odds with the long-term goal spelt out in the RPMS for the management of these species across Northland, i.e. to minimise their adverse impacts on indigenous fauna and primary production.

Tactics and Technical Methods To Be Used
Education: No control tactics, methods, or targets are spelt out, presumably because control techniques for feral cats, mustelids and rats are poorly described and require concerted and ongoing efforts to have any real effect on their populations. Unless the control of each species is undertaken over a large area, any gains made will almost certainly be swamped within a year or two by immigrating animals from neighbouring uncontrolled areas. Kill trapping (and to a lesser degree, leg-hold trapping) is the method of choice for most regional councils for the control of feral cats, stoats, and ferrets (NPCA 2007a), and existing trapping protocols suitable for use by non-professional operators should be circulated to community pest control teams.

Services: The targeted 'agreed population levels' for these pests in designated Community Control Pest Areas (CCPAs) should be spelt out and justified, along with a protocol defining the population assessment methodology proposed. The RPMS does not clearly identify who will undertake such assessments, and who will cover the cost of them. Best practice for monitoring populations of feral cats, mustelids, and rodents has been recently reviewed (Coleman JD, Norbury G 2006. Envirolink medium advice grant ESRC205: Measurement of impacts of introduced pest animals on indigenous biodiversity values in Southland. Landcare Research Contract Report LC0607/061 (unpubl). 31 p.), and should be incorporated into publicity material developed for such control programmes.

Tactics and Technical Methods Rejected
Economic: Rejecting the provision of free or subsidised ammunition to community control teams to shoot feral cats, mustelids or rats seems sensible, as shooting is not widely used by professional operators to control the larger of these species (i.e. cats and ferrets) and is never used for controlling the smaller species. Trapping and poisoning are the preferred techniques for feral cats, all mustelids, and rodents, and provided NRC support in principle such pest control on CCPAs, a case exists for providing community teams with traps and poisons.

Services: The lack of any significant role by NRC in the management of feral cats, mustelids, and rats is confusing, given that they are argued to be 'a major threat to native species' (see Regional Effects),

control of them by community groups is supported, and significant benefits arising from their control are identified in the RPMS (see Effects of the Strategy). Surely, the latter support indicates some value in their long-term control, even when such pests occur throughout the region.

Effects of the Strategy
The belief that there are measurable enhanced returns to primary industries arising out of the control of feral cats, mustelids, or rats, lacks supporting evidence.

3. Feral Deer

Distribution of the Pest
The distribution of wild (not feral) deer in Northland appears to be overstated. The critical point omitted here is that wild deer are currently confirmed from only one very small area (Fraser KW 2005. Wild deer in Northland: modelling potential new populations and the extant Russell population. Landcare Research Contract Report LC0506/053 (unpubl). 22 p.). Of 28 wild deer location records identified in Northland in 1996, 27 of the sites were cleared of deer by 2005. Only the longer standing herd of sika deer established near Russell about 1988 is apparently still extant although likely to contain only a few tens of animals. While it is expected, and indeed rumoured, that more farm escapes and/or illegal releases of deer have occurred recently and provide potential for new herds, these have yet to be confirmed.

Problems Caused
The argument on the environmental effects of wild deer should be strengthened. I suggest the following insert – *Northland's forests are botanically diverse and contain a high number of threatened plants. If established, deer will degrade local forest understoreys (thus changing forest composition and structure), and impact indirectly and chronically on native animal populations frequenting the browse tier, thus reducing overall biodiversity.*

The value of wild deer as a recreational resource warrants mentioning here to provide 'balance' to the environmental costs listed.

Reference to the damage by wild deer to crops should be removed. Crop damage by wild deer is now minimal throughout New Zealand, if for no other reason than that recreational and commercial hunters have largely eliminated wild deer from cropped farmland.

Finally, the potential role of wild deer in the maintenance and spread of Tb should be noted but not overstated, because even if the disease was introduced into Northland in cattle, the likelihood of it establishing in the few wild deer present is negligible (Nugent G, Byrom A, Arthur T, Whitford J, Yockney I 2003. Risk of Tb persistence and spread: the role of deer, pigs, and ferrets. Landcare Research Contract Report LC03004/049 (unpubl). 67 p.). A greater risk exists if infected deer are introduced into Northland, and some of them escape or are subsequently released.

Parties Affected
The adverse affects identified are real. However, an additional sentence should be added to this paragraph to provide some balance to the 'cost' of wild deer herds establishing in Northland: *the benefits assumed include those of recreational hunting for deer stalkers, and of the passive pleasure of the general public in knowing deer are present.* The social costs arising from the presence of deer on conservation land should be identified and linked to the Department of Conservation's (DOC) role in managing conservation threats, as a 1994 survey in Northland indicated that the overall attitude of the public toward the presence of wild deer may be neutral (Sweetapple PJ 2006. Costs of deer in Northland. Unpublished Landcare Research Contract Report LC0607/060. 15 p.).

Regional Effects
Sentence 4 should be rephrased. The real cost arising from an outbreak of Tb in wild deer in Northland, should such deer exist, would come from controlling them and the associated possums (both vectors of Tb), rather than from lost farm production.

Tactics and Technical Methods To Be Used
Education: Public advice should emphasise the risk of wild deer becoming established in Northland, their rate of spread from liberation points, and the likely economic and environmental costs associated with an establishing/established deer herd. The significant costs and reasons for maintaining a local surveillance programme for deer should be spelt out, both about the remnant sika herd near Russell, and elsewhere where deer have occurred in the recent past (Fraser 2005 unpubl.).

Regulation: Agree. Rule 6.4.1.11 seems irrelevant under a strategy of eradication, and may lead to ineffectual non-professional hunters dispersing newly escaped deer.

Services: No tactics and methods for control are spelt out, but the use of the contracted control team (the Northland Deer Response Team; NDTR) to investigate all reported sightings and eliminate any deer discovered, without involving recreational hunters, seems sound. This tactic appears to accept the achievements of recreational hunters in annually removing c. 17% of the sika herd near Russell following its establishment (Fraser 2005 unpubl.), while recognising the inappropriateness of using such hunters to eliminate escapees and newly establishing deer herds. For the NDTR to be successful, landowners/public must be encouraged to promptly report any escapes or sightings of wild deer. New escapees are thought to remain near their fenced-in parent herd initially, but then disperse widely. Any use of dogs to capture such deer should be discouraged as dogs accentuate deer dispersal (G Nugent, Landcare Research, pers. comm.).

Tactics and Technical Methods Rejected
Economic: Agree. Bounty systems have been trialled against a range of mammal pests in New Zealand, including feral pigs, possums, feral goats, and wild deer. Unfortunately, the effectiveness of most bounty systems relates to the cost of catching the pest. Consequently, they rarely lead to the targeting of low-density, critical areas, and do little to reduce numbers let alone eradicate local populations (Warburton et al. 2000). All bounty systems established in New Zealand for use in the management of vertebrate pests have now been abandoned.

The provision of free or subsidised ammunition to deer hunters or pest controllers is most unlikely to assist NRC in its goal of eradication of any remaining wild deer. The cost of any ammunition used is a very minor cost associated with the hunting of scattered escapee or released deer, and subsidising ammunition will not increase hunting pressure.

Aerially sown poison bait and poison gels applied directly to tree foliage favoured by wild deer has been used to control them both to improve biodiversity and reduce Tb infection in their herds. Both techniques appear to be ill-suited for use against scattered individual deer in small areas of forest, because of the general abundance of natural feed (reducing the likelihood of animals eating artificial food) and because such areas are used frequently by the general public.

Effects of the Strategy
The initial statement is misleading. Control of the remaining few wild deer in the region and ensuring no further herds are established will directly protect indigenous flora, and only secondarily protect indigenous fauna.

Cost of Strategy
A concluding sentence is needed here – I suggest: *The current economic and environmental cost of deer in Northland is low, but is likely to increase significantly if new populations are allowed to establish and grow.*

Relationship of Strategy to Other Pest Management Strategies
The emphasis here should be on seeking a commitment from Auckland Regional Council to target any small herds or recent escapees in its area adjacent to Northland. Such herds currently exist and include both red and fallow deer.

4. Magpies and Mynas

Distribution of the Pest
The strong preference shown by magpies and mynas for pasture and their comparative rarity (particularly magpies) in forested land should be emphasised. Change sentence 2 to include: *and magpies at least, are rarely recorded in unmodified forest*. *In contrast, mynas, though most common in farm and urban areas, also occur throughout forests.*

Parties Affected
The case against magpies and mynas is greatly overstated. See 'Regional Effects' below.

Regional Effects
Sentences 2 and 3 overstate existing evidence of predation by both species (and reiterated under 'Problems Caused'. I suggest the following addition to the text: *Magpies vigorously attack (and often exclude) other birds entering their territory during the breeding season and may also attack humans. Such attacks then and also outside the breeding season occasionally result in the death and predation of small birds. Magpies also eat the eggs and nestlings of other birds and prey on native lizards. However, there is no clear evidence that they adversely affect biodiversity values or impact significantly on native bird populations (see Forsyth DM, Cowan PE, Veltman CJ, Tansell J 2002.Introduced birds as conservation pests in New Zealand: a discussion paper. Landcare Research Contract Report LC0102/083 (unpubl). 31 p.; Innes J, Morgan D, Spurr E, Wass J, Arnold G, Watts C 2004. Magpie impacts on other birds. Landcare Research Contract Report LC0304/067 (unpubl). 39 p.), and apart from their attacks on humans, there is little evidence to support their active management. In contrast, the case against mynas may be stronger. Removal of mynas from an inshore island has recently been shown to lead to increases in some native and introduced birds (Tindall 1996), and mynas have been reported to evict some native birds from their nests (e.g. kingfishers).*

Mynas show a preference for fruit over invertebrates, and during December to May may be significant pests of orchards (Tindall 1996). The reference to mynas taking 80% of grain crops should, however, be omitted, as this appears to be unsubstantiated and grossly exaggerated.

Goal (Long Term)
As the pest status of magpies particularly and mynas to a lesser degree remains in doubt, this goal needs to be rethought.

Tactics and Technical Methods To Be Used
Education: Advice to landowners should include a balanced statement of the likely impacts of both species, as well as advice on control options. Present comment in sections on 'Problems Caused' and 'Regional Effects' overstate the adverse environmental effects of both species.

No technical methods are provided, presumably because control of both magpies and mynas is not well documented or developed, and 'best practice' tactics and techniques have yet to be determined. Unless control of either species is undertaken over a large area, any reductions in numbers achieved will almost certainly be swamped within a year or two by incoming birds from neighbouring uncontrolled areas. Trapping appears to be the method of choice for most regional councils involved in the recent magpie control research programme (Innes J, Morgan D, Spurr E, Wass J, Arnold G,

Watts C 2004. Magpie impacts on other birds. Landcare Research Contract Report LC0304/067 (unpubl). 39 p.), and a trapping protocol should be developed and published from this work. Shooting has been used occasionally to eliminate rogue birds.

A review of options for the control of mynas (Parkes J 2006. Feasibility plan to eradicate common mynas (*Acridotheres tristis*) from Mangaia Island, Cook Islands. Landcare Research Contract Report LC0506/184 (unpubl). 28 p.) listed poisoning, shooting, netting and trapping, with poisoning with DRC-1339 (Starlicide®) argued to be the best way to achieve large kills and favoured over the only other avicide (alphachloralose) registered for use in New Zealand. Where numbers are low, shooting, though very time consuming, is suitable for use in rural areas, while trapping is suitable about human habitation and in urban parks. A poisoning and trapping protocol with associated costs for mynas should be developed as part of the education package available to concerned landowners, and the recommendation on the use of alphachloralose in NRC's brochure ('Animal Pests 8') on mynas altered to include DRC-1339 whenever 'official' control is undertaken.

In the light of the limited knowledge of any significant adverse impacts by these two species, the inclusion of a plan to 'monitor population (trends) and their effects and promote research on management' seems extremely worthwhile. Until this is undertaken, public concerns over possible impacts should not be allowed to drive NRC pest planning.

Services: A caveat is needed here, based on current belief of the impact of both species. Change sentence to 'Regional Council control service on a cost recovery basis, *only where there is clear evidence of the impact of both species on biodiversity or agricultural values'*.

Tactics and Technical Methods Rejected
Economic: Agree (see 'Tactics and Technical Methods Rejected' for deer above). Bounties have been tried for the control of several introduced and at least one native bird species in New Zealand and all have failed to resolve the concern arising from their activities. In addition, recent trial results have indicated magpie control is unlikely to be economically sustainable (Innes et al. 2004 unpubl.). As shooting is generally not the preferred control option for the wide-scale control of either species, subsidising ammunition is unlikely to increase the effectiveness on any control undertaken.

Services: Agree. Despite both species occurring widely in Northland, their conservation and economic impacts appear minor, and the need for their control marginal at best. Further, existing control techniques used in the control trials (reported in Innes et al. 2004 unpubl.) by five regional councils reduced populations on average by only c. 60% over 4 years, and unless undertaken over much larger areas (than the 900-ha blocks controlled in the reported trials), recovery to pre-control levels is likely to be very rapid.

Effects of the Strategy
Disagree. Again there is minimal evidence of any adverse impact by magpie on indigenous ecosystems and strong evidence of impact by mynas only on the avifauna of one island. Similarly, the beneficial effects arising from their predation of invertebrates affecting primary production is unproven and unlikely. As an example of such evaluated predation, starlings feeding in flocks of several hundred have been shown to have no significant effect on numbers of grass grubs in pasture (East & Pottinger 1975). As magpies and mynas feed in much smaller flocks, their impacts on most invertebrate populations are likely to be correspondingly less. Equally, there is minimal evidence of the success of control programmes against either species over anything other than very localised populations or small land masses where rates of reinvasion are likely to be low (Parkes 2006 unpubl.).

Cost of Strategy
At an estimated annual cost of $5,000, it is difficult to see what can be achieved other than providing advice on control to individual landowners when requested. Again there needs to be clearer evidence of damage to conservation or production values before any increase is made in the control budget for both species.

5. Possums

Problems Caused
The supposition that the transportation of livestock infected with Tb into Northland would result in the disease spreading 'quickly from these animals to possums' is misleading. While the risk is real, all evidence points to the establishment of infection in uninfected possum populations from another species being a rare event.

Goal (Long Term)
For this goal to be measurable, the target levels for possum populations under maintenance control need to be defined.

Objectives
The first objective needs to be further defined in terms of habitat benefits. An 80% reduction of high-density possum populations in indigenous forest is likely to achieve real if short-term benefits (i.e. reduced levels of possum browsing and predation) for both indigenous flora and fauna; a similar reduction of possum populations in pasture land may achieve nothing. Again, the target levels for populations under ongoing control need to be defined.

Tactics and Technical Methods To Be Used
Education: Methods approved for possum control by NRC are summarised in the 'Services Section' below, and are presumably the same as those recommended to community control teams via brochures and publicity campaigns. The techniques seem to include all those approved and/or registered for use against possums throughout New Zealand, but as many of them pose some risk to other wildlife and, in some instances, to humans, the identification of training seminars seems wise. In particular, kiwi in Northland (and elsewhere) are at real risk when using ground-set traps, and these should be set on raised sets when used in any kiwi habitat.

Research: This list of research options requires further explanation. Is NRC going to support such research or is the intention solely to pick up and use the results as they become available?

Regulations: Rule 6.4.1.11 requires landowners to maintain possum densities below a level set by NRC (apparently an RPI index value of 40%). This index used is not identified anywhere in this RPMS, and is apparently not a widely used one. If the RPI index is 'trap catch', then a catch of 40% equates to about 9 possums per hectare, and is easily achieved on most lands. If, as I believe, it is based on surveys using wax tags, latest results based on Bite Mark Indices (BMI) indicate a 40% score represents about 2 possums/ha (Thomas MD, Morgan DR, Maddigan F 2007. Accuracy of possum monitoring using wax tags. Pest Control Research Contract Report 7. 50 p.). Achieving and maintaining such a target long-term is likely to result in real gains in the biodiversity of both flora and fauna (Green 2004).

Services: NRC should be aware that the only standardised technique approved by the Animal Health Board, regional councils, and DOC for indexing possum population density is the 'Trap-Catch' method (RTCI; NPCA 2004), and this index remains the method of choice for most agencies involved in monitoring possum populations. Any deviation from using RTCIs to index possum populations will therefore limit the usefulness of the chosen technique, i.e. control results cannot be compared with similar operations outside Northland, and seems unwise.

Any use of biological control techniques remains a far-off prospect (but the clause should remain in the RPMS to allow managers to respond quickly should the technique become available).

Tactics and Technical Methods Rejected
Economic: Bounties have wisely been rejected for the reasons spelt out above (see related section on deer). Subsidies for skins and meat hunters and more general subsidies are variants on the bounty scheme, and presumably have been rejected for the same reasons.

Services: The commitment of NRC to undertake some possum control seems equitable, as the possum populations on many farms are being constantly reinforced by immigration from adjacent Crown lands. Private landowners are unlikely to be able to control such movement and settlement.

The assumption that many landowners may maintain possum densities above levels targeted by NRC so as to provide a harvestable resource seems unlikely, and should not be used as evidence of the inability of the bulk of landowners to satisfactorily control possums on their land.

Monitoring and Reporting
The selection of areas to be monitored following control (and spelt out in Rule 6.4.1.11) needs clarification to be useful (see Tactics and Technical Methods To Be Used, above). The section should include how many such operations are to be monitored each year, the monitoring technique used, and any follow-up action proposed where control targets are not achieved.

6. Feral Rabbits and Hares

Problems Caused
This section needs to be strengthened. Damage by hares should be expanded to emphasise their effect on production lands, including occasional heavy damage of vegetable crops and the debarking of fruit trees. Both rabbits and hares may also impact on biodiversity values, particularly in coastal dune country, by selectively grazing rare/endangered native herbs and grasses.

Parties Affected
Surely the general public should also be mentioned here, as their enjoyment of open lands is just as likely to be adversely affected by rabbits as their enjoyment of forests is adversely affected by browsing deer (identified in the RPMS Section on deer above). Conversely, public enjoyment may be enhanced by seeing such wildlife and in their shooting by recreational hunters.

Impact Evaluation
As both rabbits and hares have been present over most of Northland for many decades, their potential impact across the region should now be obvious. Clearly, neither species reaches high numbers on the heavier soils present throughout much of Northland (see section on Regional Effects in RPMS) and there, their impact is always likely to be low. Thus their overall potential regional impact should not be scored 'high'.

Goal (Long Term)
The goal statement should be broadened to include the threat posed by expanding rabbit populations. I suggest: 'are low enough that they no longer adversely affect *(or are likely to temporarily threaten through rapid population irruptions)'*… The one real threat arising from the presence of rabbits is a population eruption.

Objectives (Five Year)
Some confusion exists over the Modified McLean Scale values quoted here and further on in this strategy statement (covering rabbits and hares). Values of 4–6 are considered to indicate high-density populations of rabbits (and likely to lead to bigger problems in the future), <u>not</u> over 4 (NPCA 2006a). Similarly, the McLean Scale is not used for hares (although it is inferred here), apparently because of

their low numbers compared with rabbits and the inordinately long life of their faeces. Thus, a different population index should be used for hares when assessing changes in their populations following control. Instead of the Modified McLean Scale, night counts are recommended for use on open farmland where numbers are high, and cleared-plot surveys of faecal pellets where hare numbers are low (NPCA 2006b).

Tactics and Technical Methods To Be Used

Education: Advice to landowners – The tactics and methods that can be used are not detailed here or elsewhere in the RPMS but should be unless they are in the publicity material circulated. In particular, the 'do nothing' option suitable for use where rabbit populations are low and fairly static should be and presumably is the option used by many landowners in Northland. The applicability of other control strategies such as changes in farm management, exclusion, and local elimination should also be outlined.

Services: 'Best-practice' methods identified for rabbit control include shooting, poisoning, exclusion techniques (fencing and habitat manipulation), and the use of the biocontrol agent rabbit haemorrhagic disease (RHD; NPCA 2006a). Exclusion techniques and biocontrol need to be added to the RPMS statement. The tactics planned for use in rabbit control should be spelt out, as they are likely to provide different outcomes. Shooting and poison provide instant knockdown, but are likely to require a long-term commitment to keep numbers at low levels. Exclusion techniques are more likely to lead to slow or nil population recovery, while RHD may provide intermediate population responses. RHD currently persists in Northland and its geographic distribution could be enhanced by further releases by the NRC. While some immunity to RHD is likely in already infected populations, releases into uninfected high-density populations should result in a 30–90% immediate reduction, a prolonged dampening of current populations, and a reduction in rabbit impacts (J. Parkes, Landcare Research, pers. comm.).

'Best-practice' methods for hare control include night shooting and exclusion. Poisoning is not generally an option as hares are reluctant to take poison baits (NPCA 2006b). Shooting will achieve the second objective of the 5-year plan listed, and will effectively manage isolated populations of hares. The tactics of using repellents about at-risk crops and tree plantings should be spelt out as this technique provides real benefits against occasional and unpredictable attack by hares. Of the other tactics spelt out in the RPMS covering hares and rabbits, fumigation is not suitable as hares occupy open above-ground resting sites.

Regulation: Rule 6.4.1.11 The definition of 'pest' animal should be clarified here, as pet rabbits are clearly held and traded throughout Northland.

Tactics and Technical Methods Rejected

Economic: Agree. Bounties are not a satisfactory option for the control of most mammals, including rabbits and hares (see 'Tactics and Technical Methods Rejected, for deer' above. Similarly, provision of free ammunition to hunters seems unwise. While ammunition may be a significant cost when controlling rabbit and hare populations by shooting, and particularly where they are in high numbers, the likelihood of the use of subsidised ammunition in areas outside those targeted or against other species by non-official pest control operators must be real.

Regulation: The statement conflicts with the regulations spelt out in the 'Tactics and Technical Methods To Be Used for rabbits and hares' above. Clarification is needed.

Services: Because of the cost in both time and money of killing the last animals in local elimination programmes, and of the ongoing monitoring required, the involvement of Council staff in all attempts at local elimination of hares and rabbits appears unavoidable.

7. Rooks and Wallabies (Surveillance Animals)

Problems Caused
The impacts of rooks and wallabies should be further developed. I suggest replacing the existing text with: *Rooks show a strong preference for cereals at all stages of the crop, for emerging maize, pumpkins and potatoes, and for walnuts. While pasture invertebrates provide much of their food, rooks avoid pasture where they can in favour of the crops listed above. Because rooks feed communally and tend to return to the same field each day unless disturbed, their impact can be catastrophic (NPCA 2006c).*

Wallabies show a preference for forest and scrub edge habitats where they feed mainly by grazing on grasses and herbs and browsing on indigenous forest woody seedlings and saplings. They also damage new crops and trees by nipping the tops out of exotic tree seedlings.

Parties Affected
Paragraph 2 should be prefaced with the following cautionary note: *Graziers will incur significant pasture loss to wallabies about forest/scrub margins unless established and establishing populations are held at low levels and, where possible, eradicated*.

Impact Evaluation
As only tens of rooks exist in Northland and no wallabies (see Distribution of the Pest in the RPMS), 'Current Impact' scores should be zero for all classes listed.

Regional Effects
Sentence 2 should be extended to cover grazing of pasture, i.e. 'Wallabies pose a potential threat to indigenous vegetation, exotic forests, *and pasture'*.

Tactics and Technical Methods To Be Used
Education: A 'best practice' guideline for the monitoring and control of rooks has recently been published (NPCA 2006c). Where rook numbers are very small and colonising new areas, and where birds are free from past disturbance, the guidelines argue for shooting as the primary control tool. Where numbers are larger, and the birds more disturbed, baiting either with toxic bread feed laid on the ground adjacent to rookeries or toxic gel laid within the nest is recommended, along with the systematic monitoring of survivors. Managers are warned that indiscriminate or poorly managed control efforts will lead to the dispersion of surviving birds, and is likely to greatly increase the difficulty of local control or eradication. Thus, control of rooks should only be undertaken by professional pest managers.

A 'best practice' guideline for the monitoring and control of dama and Bennett's wallabies has also recently been published (NPCA 2007b). It recommends poisoning with 1080-loaded baits for initial knockdown of established populations. Alternative techniques more suitable for the eradication of establishing populations include night shooting and day shooting coupled with dogging.

The improved control of rooks is not under investigation in New Zealand. However, a multi-agency wallaby research plan is being trialled by Enviroment Bay of Plenty, Environment Waikato, and DOC, and a watching brief should be kept on this work. Further, a significant project to improve the management of wallabies in Tasmania for the protection of biodiversity, production forestry, and grazing lands is under investigation by the Department of Primary Industries and Water, Tasmania, and a monthly newsletter detailing progress is available to all interested parties (contact John.Dawson@dpiw.tas.gov.au). A watching brief should be kept on this work.

Regulation: Rule 6.4.1.11 clearly encourages landowners to undertake control of colonising rooks. This is contrary to the recommendations set out in the 'best practice' guideline (NPCA 2006c) for the management of this species, and the rule should therefore be removed.

Services: Agree, but the importance of immediacy of action following reporting of any incursions should be stressed.

Tactics and Technical Methods Rejected
NRC's emphasis must be on the successful and rapid elimination of any colonising rooks or wallabies. They should use any tactics and techniques that are likely to lead to successful local elimination and stop any dispersal of incoming birds. For rooks particularly, this means that landowners should be actively encouraged to report new invaders but discouraged from taking any control action themselves. Control of rooks should be left to professional pest managers.

8. Feral Goats

Problems Caused
This section should be expanded to better cover the impacts of goats. I suggest: *Goat impacts are most acute on preferred sites such as bluffs and other rocky substrates where few other animals can browse, and where their impacts can eventually lead to major changes in biodiversity through the gradual conversion of tall forest to grassland. Goats have a similar dietary range to deer (which they often exclude), but their impacts are likely to be greater as they are able to switch foods as the most palatable elements are eliminated. Wild goats may potentially be carriers of Tb, but the pathology of Tb lesions within them suggests goats are amplifier hosts only, contracting the disease during inspection of animal carcasses and passing it on when their own carcasses are scavenged. However, outbreaks of Tb in goats will provide little reason to control them, provided the main wildlife hosts of Tb (possums) are controlled.*

Parties Affected
Goats cause most damage on Conservation lands, so DOC should be at the top of the list of affected parties.

Impact Evaluation
No serious impact on human health has been identified in Northland, yet goats, along with most other wild animals, carry a range of diseases, with two waterborne parasites in particular – *Giardia* spp. and *Crytosporidium* spp. – commonly shed by goats. I think it unwise that such human health issues are ignored here for goats, and incidentally for rabbits and hares, particularly in a region where many farmers draw their drinking water directly from forest streams.

Need to Intervene
The final sentence ambiguously infers Community Pest Control Groups will control goats in areas of land being managed by them. Goat control is difficult, and in conservation areas managed by the community should be undertaken by professional hunters under NRC control.

Goal (Long Term)
Without some definition of the trigger level of unacceptable damage, this statement has limited value.

Tactics and Technical Methods To Be Used
Education: Advice to landowners should spell out the preferred strategies and tactics for goat control. While no 'best practice' guide for controlling goats exists, control strategies by DOC on Conservation lands has targeted eradication where possible (i.e. on offshore islands and in mainland areas where

immigration can be controlled), and sustained control only where eradication is currently impractical. The tactics used have been limited to ground hunting using dogs to bail animals, and while this technique has been variously modified by using packs of dogs, Judas goats, hunting from helicopters, and ground baiting, shooting with dogs remains the method of choice by professional control agents. Private landowners may seek to encourage recreational hunters to control goats on their land, but past experience elsewhere in New Zealand indicates this approach is unlikely to reduce and maintain goat populations at acceptable levels.

Regulation: As the eradication of new colonies of wild goats is a priority, and as goat farming is the primary source of new colonies, it is wise to remind farmers of their responsibilities within the regulations covering goat farming.

Services: Council should undertake control on low density populations, wherever eradication is deemed feasible, regardless of any requests from landowners. Goats have a potential reproductive rate higher than most mammals of a similar size, and their populations are capable of extremely rapid growth rates following establishment or control. The approach used by Environment Canterbury for the local elimination of goats on Banks Peninsula is worthy of investigation.

Tactics and Technical Methods Rejected
Services: As goat control may involve local elimination, and thus take populations to well below levels at which they adversely affect farmland, it appears reasonable that such control should be undertaken by NRC and DOC.

Cost of Strategy
The second sentence appears to be a sop to recreational hunters. Many remaining or new goat populations in Northland could be eradicated and in such situations good control equates with no goats. Eradication is very unlikely when the primary control method is casual recreational hunting. Targeted hunting using professional control staff appears to be a much more effective if more expensive option.

Management Agency
Again the programme seems to place undue emphasis on using recreational hunters to achieve local goat control.

9. References

Coleman JD, Cooke MM 2001.*Mycobacterium bovis* infection in wildlife in New Zealand. Tuberculosis 81: 191–202.

East R, Pottinger RP 1975. Starling (*Sturnus vulgaris* L.) predation on grass grub (*Costelytra zealandica* (White), Melolonthinae) populations in Canterbury. New Zealand Journal of Agricultural Research 18: 417–452.

Green WQ 2004. The use of 1080 for pest control: a discussion document. Wellington, Animal Health Board and Department of Conservation. 60 p.

NPCA 2004. Protocol for possum population monitoring using the trap-catch method. Wellington, National Possum Control Agencies. 30 p.

NPCA 2006a. Pest rabbits: monitoring and control. Wellington, National Possum Control Agencies. 43 p.

NPCA 2006b. Pest hares: monitoring and control. Wellington, National Possum Control Agencies. 24 p.

NPCA 2006c. Rooks: best practice guidelines for the control and monitoring of pest rook populations. Wellington, National Possum Control Agencies. 29 p.

NPCA 2007a. Mustelids: best practice guidelines for the control and monitoring of pest mustelids. Wellington, National Possum Control Agencies. 28 p.

NPCA 2007b. Wallabies: best practice guidelines for the control and monitoring of pest dama and Bennett's wallabies. Wellington, National Possum Control Agencies. 22 p.

Tindall SD 1996. Ecological impacts and management of the common myna *Acridotheres tristis*. Unpublished MSc thesis, University of Auckland. 109 p.

Warburton B, Tocher G, Allan N 2000. Possums as a resource. In: Montague TL ed. The brushtail possum: biology, impact and management of an introduced marsupial. Lincoln, Manaaki Whenua Press. Pp. 251–261.