

Status and conservation role of recreational hunting on conservation land

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ABSTRACT

Recreational deer hunting and impacts on the deer populations on conservation land administered by the Department of Conservation (DOC) are compared with commercial hunting. Recreational hunting effort is seldom exclusively directed at deer, so information on other species is included. About 50,000 active hunters in New Zealand are the dominant harvesters of deer (and other game animals), taking c. 54,000 deer annually. Possible conservation benefits from recreational hunting, and options for enhancing these benefits are explored. Regional conservancies administer recreational hunting differently, and the costs of this are assessed. Hunting effort varies widely between conservancies: most efforts reflect the game species (and population numbers) present, and the total area available for hunting. Recreational hunting pressure is considerably greater in the North Island (1 permit/0.52 km²) than in the South Island (1 permit/1.89 km²). Conservancy views vary widely on the value of recreational hunting, and on the potential for conservation benefits. With good access, valued game animals available, and little competition from commercial hunters, recreational hunting was typically seen as an important control tool. In other areas, it was considered to have limited or unknown benefits. Deer can dramatically modify the structure and composition of indigenous vegetation and compete with native fauna for habitat and food. They can severely inhibit or prevent regeneration of the most preferred plant species, causing significant changes. Without recreational hunting, deer densities in some places would be considerably higher, with presumably greater impacts on conservation values. Relatively small reductions in deer density generally protect only the least vulnerable plant species. Protection of the most preferred species requires almost the total removal of deer. The cost of issuing permits and other recreational hunting-related activities is in excess of \$705,000 annually. This is only a small fraction of what state-funded control would cost to remove a similar number of animals from the same areas. Closer communication between recreational hunting groups and DOC is one means of improving co-operation and maximising the effectiveness of recreational hunters as an animal control tool.

Keywords: recreational hunting, permits, red deer, sika, fallow, sambar, white-tail, wapiti, pigs, goats, thar, conservation, New Zealand

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1. Introduction

This report documents the amount and nature of recreational hunting in each DOC conservancy, and compares its impacts on animal populations with that of commercial hunting. It also describes the different approaches used by conservancies to administer recreational hunting and assesses the cost of such administration. The report also assesses conservation benefits that might come from recreational hunting and explores options for enhancing any benefits. This review is seen as a necessary step in the development of departmental policies for recreational (and other) hunting management, the development of national control plans for big-game species, and the definition of research directions and priorities.

2. Background

In recent years recreational and commercial hunting have represented the only significant control mechanisms for most large introduced mammal species (particularly deer) on DOC-administered conservation land. In the late 1980s, recreational hunters accounted for approximately 50% of the annual deer harvest (Nugent 1992a). Given recent fluctuations and changes in the wild animal recovery industry and some uncertainty about its future (e.g. as might result from a sustained drop in the price of wild venison or from the imposition of additional compliance measures with respect to pesticide residues), it is unclear whether present levels of commercial hunting pressure will be sustained in the longer term. Furthermore, funding constraints together with a wide range of other urgent conservation problems faced by DOC suggest that official expenditure for the control of deer (and other big-game animal) populations is unlikely to increase significantly in the short term. Therefore, for a considerable part of its estate (i.e. those areas not favoured by commercial hunters), recreational hunting may be the only long-term low-cost animal control mechanism available to DOC for big-game species.

Since 1994 the increased funding available for brushtail possum control has resulted in deer being killed incidentally during large-scale aerial 1080 (initial knockdown) poisoning operations (e.g. Fraser et al. 1995). If this level of funding is sustained, it will contribute in some way to the control of deer numbers in the areas targeted (principally where bovine tuberculosis is endemic). However, these areas are small in relation to the overall conservation land administered by DOC (Holloway 1995) and the effect may be only short term, as initial knockdown operations are typically followed by possum-specific maintenance control.

The role and effectiveness of recreational hunting have sometimes been questioned by conservation organisations. Although one recent study attempted to define the conservation benefits of recreational hunting within the Kaimanawa

Recreational Hunting Area (Fraser & Speedy 1997), there has been no overall assessment of whether any significant conservation benefits result or of the impact that recreational hunting has on animal populations nationally. However, since recreational hunters are the dominant harvesters of big-game species nationally (see Nugent 1992b, unpubl. Landcare Research contract report), they contribute to maintaining game animal populations below the ecological carrying capacity of the habitat, although this is unlikely to lead to widespread and significant recovery of vegetation communities to their former states.

2.1 HISTORY

New Zealand's 11 introduced big-game animals are the result of more than 250 liberations between 1769 and 1923 (see Appendix 1). Originally, hunting of the various big-game species was carried out under various restrictions (e.g. seasons, bag limits) designed to preserve the sporting resource. By the late 1920s the impacts that several big-game species were having upon our native forests and grasslands had become too severe for the government to ignore, and hunting restrictions were relaxed. Any management of recreational big-game hunting effectively lapsed when the control of wild animals was transferred to the Department of Internal Affairs in 1932 and game seasons, licences, bag limits, and other restrictions were abandoned. Recreational hunters alone could not control the big-game species which were continuing to disperse into many new areas and increase exponentially in ecosystems with plentiful food resources and no other large mammalian herbivores (Caughley 1983). Consequently, the government initiated state-funded control operations.

The Department of Internal Affairs employed deer cullers throughout the country in an effort to reduce deer numbers and slow their spread into new areas. In 1956 the control of wild animals transferred from the Department of Internal Affairs to the New Zealand Forest Service and by then the priority had changed from reducing densities *per se* to the protection of water and soil values (Caughley 1989). Official deer culling operations continued until the advent of commercial hunting from helicopters in the mid 1960s, which heralded a significant decline in official expenditure on deer control. Commercial hunting had an immediate and dramatic impact on deer numbers, particularly in those areas where extensive subalpine grasslands and unforested valley bottoms meant that many animals were vulnerable to helicopter-based operations. Deer populations declined by 75-95% in many areas, most noticeably in the South Island (Challies 1985).

During this time there was little if any acknowledgement of the role played by recreational hunters and they were often regarded as more of a hindrance than a help (Caughley 1983). Furthermore, dramatic declines in deer populations aroused concern from recreational hunters that their hunting opportunities were being severely restricted. This eventually led to the establishment between 1980 and 1986 of 10 Recreational Hunting Areas (RHAs) where commercial hunting of big game species was prohibited. Two of these areas (Waiotapu and north-west Nelson) no longer operate as RHAs. The total area of the remaining eight RHAs is about 178,000 ha, which is approximately 2% of the conservation land administered by DOC.

In 1987 the Conservation Act transferred responsibility for the management of deer (and other introduced mammals) to the Department of Conservation. DOC's responsibilities with respect to the control of animal pests (including deer and other big-game species) are derived primarily from the Wild Animal Control (WAC) Act 1977, but are also subject to certain provisions in the Conservation Act 1987, the National Parks Act 1980, and the Reserves Act 1977. As a land 'manager' (of c. 35% of terrestrial New Zealand), DOC is also affected by some provisions in the Resource Management Act 1991 and the Biosecurity Act 1993. Although the Conservation Act 1987 gives DOC the mandate to '**foster the use of natural and historic resources for recreation**', its principal objective is the '**preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values**'. Therefore, while recreation is an important activity for DOC to foster, any such recreational activities must be consistent with conservation protection objectives.

Some official recognition of recreational hunting as a legitimate pastime was given in the WAC Act 1977 which makes provision for the establishment and management of RHAs and notes that in relation to wild animal recovery licensing the Minister must have regard for '**the need to provide for recreational hunting**'. The rationale behind the establishment of RHAs was to provide areas where recreational hunters were protected from competition with commercial (particularly helicopter-based) hunters. RHAs can be established on '**any area of crown-owned land (other than National Park land . . .) . . . where hunting as a means of recreation is to be used to control (though not exclusively) the numbers of wild animals**'. Specific provisions in the WAC Act 1977 designed to protect the indigenous values in these areas are reflected in the criteria used for the selection and management of RHAs, although there has been little, if any, assessment of whether recreational hunting afforded the desired level of protection. Currently, the goals of management are defined by the Conservation Act 1987. However, with the exception of the Blue Mountains and Wakatipu RHAs, there is very little difference in the way recreational hunting is managed between RHAs and other parts of the conservation estate.

The Department of Conservation is currently developing a series of species control plans and it is expected that the effectiveness of recreational hunters in animal control and their future role will be considered in the preparation of these plans.

2.2 HUNTER DEMOGRAPHY

The hunting of wild animals has been a significant part of New Zealand's culture for more than 100 years. Recreational hunting is a male-dominated pastime, and a survey of leisure patterns and activities in New Zealand (Cushman et al. 1991) showed that 7% of male New Zealanders rated hunting and shooting as one of their favourite leisure activities. All age classes were represented, although involvement in hunting and shooting declined considerably above 45 years of age. These activities were markedly more popular with rural people (14% of

males) than with urban dwellers (3%). A specific survey of hunting in New Zealand in 1988 found that there were c. 50,000 active big-game hunters, including c. 40,000 deer hunters (Nugent 1992a).

While in the early years the motivations and goals of recreational hunters were principally related to trophy hunting, the opportunities for shooting good quality trophy stags on public lands (perhaps with the exception of sika deer) are now considerably less. Typically, the average hunter of today is motivated more by the opportunity to take home some venison and enjoyment of the outdoor experience (Fraser & Sweetapple 1992; Fraser 1993). However, despite the limited opportunities for taking good trophies, hunting during the roar traditionally remains an important part of many recreational hunters' activities and probably reflects the social aspect of hunting.

Changes in the age structure of recreational hunters suggest that recruitment of hunters into the sport may be declining (Fig. 1; Fraser & Batcheler 1989). This apparent decline in the popularity of hunting as a recreational pastime has been attributed to low deer numbers in many areas as a result of the commercial

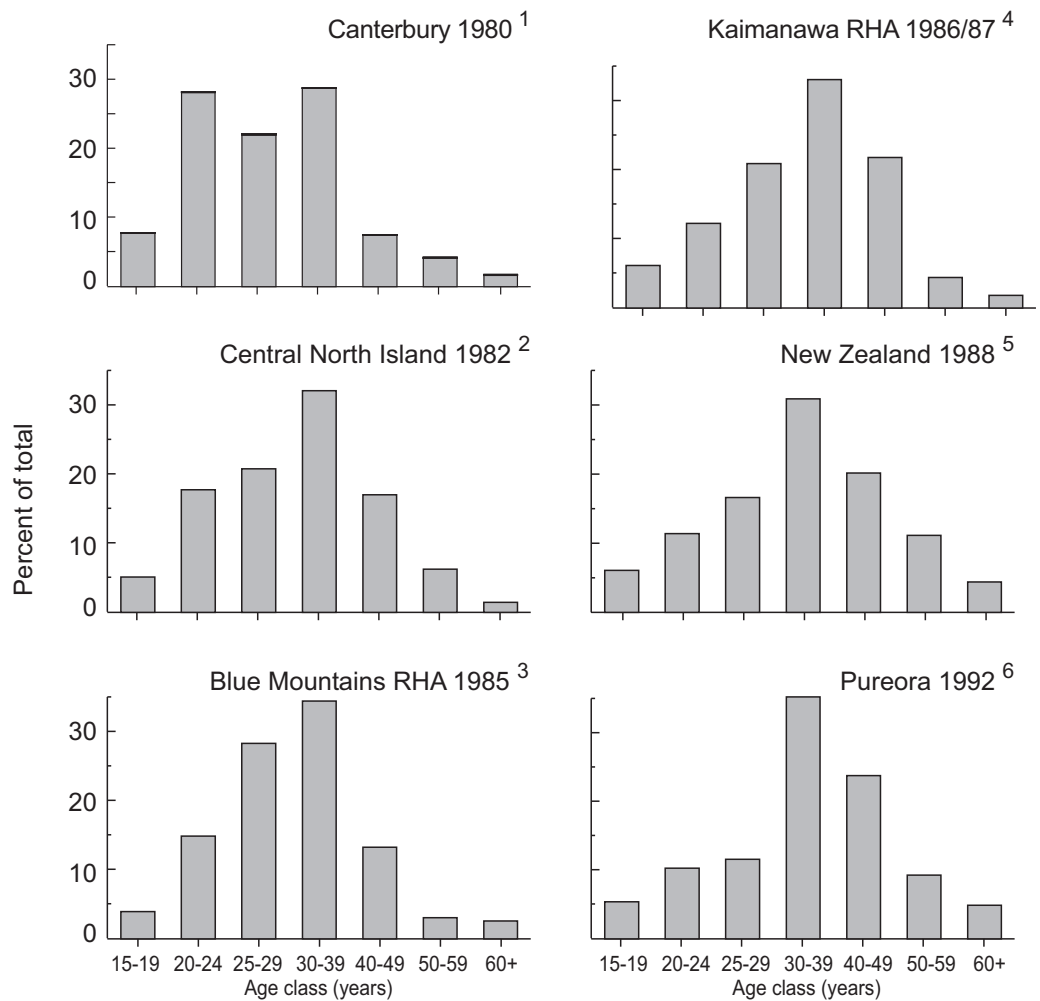


Figure 1. Age profiles from studies of recreational hunters since 1980. Sources = ¹ Simmonds & Devlin (1981); ² Groome et al. (1983); ³ Nugent & Mawhinney (1987); ⁴ Fraser & Sweetapple (1992); ⁵ Nugent (1989); and ⁶ Fraser (1993).

venison recovery industry. Low numbers of deer or other game animals make it difficult for young or inexperienced hunters to develop hunting skills, and low rates of hunting success give them little incentive to continue (Nugent & Mawhinney 1987). However, the decline may also reflect falling interest in hunting generally, as a result of increased urbanisation, public sentiment about blood sports, or other factors.

In recent years the use of helicopters for access to remote areas has markedly increased the amount of deer range easily accessible to recreational hunters. For example, Sheridan (1993) estimates that 30% of the current hunting effort in Kaweka Conservation Park results from helicopter access. This not only enables a wider cross-section of hunters (particularly older hunters) to gain access to the remote areas, but also enables DOC to manipulate hunting effort by facilitating access to areas where deer numbers are highest and pose the greatest conservation threats (i.e. by establishing helicopter landing sites in these areas, Speedy 1991).

3. Objectives

- To determine regional and national hunting effort, harvests, and administration costs, and the perceived value to conservancies of this type of hunting.
- To assess the likely role of recreational hunting in limiting animal impacts on conservation values.
- To evaluate DOC's options for animal control in relation to recreational hunting and to assess the options for hunting management where control is unnecessary.

4. Sources of information and coverage

All DOC conservancies were surveyed by postal questionnaire for a range of information related to recreational hunting in their conservancy in 1992, with some follow-up visits to particular conservancies or telephone interviews with key staff in wild animal management. 'Recreation managers' within DOC were also asked to provide information relevant to the review. Other information was obtained from the scientific literature, less formal publications, and unpublished reports. In addition, informal discussions were held with recreational hunting and conservation groups, and these organisations and selected individuals were invited to make formal written submissions relevant to the review.

This review applies principally to recreational hunting of deer species in New Zealand and therefore includes red deer, sika deer, fallow deer, rusa deer, sambar deer, white-tailed deer, and wapiti. While some of these species can be regarded as either of local or minor importance or as special cases (e.g. rusa deer, white-tailed deer), many of the findings and points made in this review are general and apply to most species. However, most of the available information relates to red deer and the findings are most applicable to this species. To some extent, many of the findings also apply to chamois, Himalayan thar, feral pigs, and feral goats.

5. Administration and costs of recreational hunting

The Department of Conservation has a legal responsibility to issue hunting permits (i.e. hunters require the permission of the landholder to legally take wild animals). The system currently used by DOC has changed little from that inherited from the former New Zealand Forest Service. With the exception of a few conservancies (e.g. Waikato, Canterbury) that have moved to computerised printing of hunting permits, the most notable change has been extensions of the period for which hunting permits are valid in some areas (see Appendix 2). This has usually been accompanied by a switch to a hunter diary system (in which all recreational hunting over 2-4 months is recorded) as the main format for hunting return data.

There is considerable variation between conservancies in permit issuing systems, the way recreational hunting information is collected, and the parameters that are recorded. This variation largely reflects differences in the ways various hunting areas are managed, particularly between areas with open unrestricted hunting and those where the number of hunters and the length of the permit period are limited by block systems. Although most of the information collected is standard between conservancies, there are a few exceptions. For example, while most conservancies use animal sighting and kill rates as the two indices of hunting success, some conservancies still use 'encounters' rather than sightings. This inconsistency limits the value of comparisons between different conservancies.

5.1 PERMIT ISSUE

The estimated costs associated with the administration of the hunting permit system were collected from conservancies (Table 1). These included the costs of permit issue, permit checking, and liaison with hunters. For some conservancies these costs also included running ballots for restricted hunting (e.g. sambar deer in the Wanganui Conservancy, wapiti in the Southland Conservancy). Not all respondents provided information in the standardised

format requested, and some of the information was unknown. The estimated costs provided did not always include a labour component or overheads, and in some cases they simply related to the costs of postage for hunting permits and other ancillary costs. Nevertheless, from the data provided it is clear that DOC staff spend in excess of 12,000 h annually in the actual issue of hunting permits. Assuming that the estimates provided are reasonably accurate and assuming an hourly rate (including overheads) of \$42 (pers. comm. B. Insull, DOC Head Office), the cost of permit issue to DOC is in excess of \$575,000 annually. This is considerably higher than Nugent's (1990a, unpubl. FRI contract report) previous estimate of c. \$300,000. While in some instances permit enquiries and issues are handled by receptionist staff, this is not generally the rule and many conservancies commented that permit issue and incidental liaison with hunters occupied a significant amount of time for the wild animal management staff involved. One strategy adopted by a number of conservancies (e.g. Waikato, Tongariro/Taupo, Otago) is to allow a small number of hunting shops or other hunting-related businesses to issue permits. Although this is not strictly legal under the WAC Act 1977 (permits must be issued by DOC employees with the appropriate delegation), it undoubtedly reduces the costs of permit issue and possibly increases compliance (greater convenience for hunters) by reducing the amount of unpermitted hunting.

5.2 LIAISON WITH HUNTERS

Other costs incurred as part of DOC's 'responsibility' for recreational hunting include the costs of collection and analysis of hunting return and jawbone data, liaison with hunting groups and landowners, publicity, organising or assisting with hunting competitions, production of hunter newsletters, and assistance with volunteer programmes. These activities occupy DOC staff for at least 2000 h annually at an estimated cost of c. \$84,000 and have relatively high associated costs likely to be in excess of \$45,000 (Table 1). The very high estimate for Tongariro/Taupo Conservancy relates mainly to the production of *Target Taupo*, a magazine for hunters and anglers.

5.3 TOTAL COSTS

The total cost of hunting permit issue and related administration is c. \$700,000, the bulk of this being directly related to permit issue. This fulfils DOC's statutory responsibilities as a 'landowner' for granting permission to hunt on its land, but probably does not affect or direct hunting effort in any way. Unless DOC changes the way it grants this permission (e.g. by moving to an annual licence or by registering hunters), this cost is unavoidable (although it could be reduced somewhat by implementing more efficient systems) and should not be seen as a cost of wild animal control.

The extra costs of gathering and using recreational hunter information, liaison, and publicity are avoidable and therefore can be seen as a wild animal control

cost. Against the estimated cost of c. \$130,000 for this component, the actual or perceived benefits are:

- Information is obtained on trends in hunting effort, deer density, and deer demography (that often provide the only insight to what is happening on conservation lands).
- Rates of hunting permit issue and diary return are improved and harvests increased due to better dissemination of wild animal population information.
- Communication between DOC and recreational hunters and hunting organisations is improved.

TABLE 1. NUMBER OF ISSUING LOCATIONS AND ADMINISTRATION AND OTHER RELATED COSTS OF HUNTING PERMITS BY DOC CONSERVANCY (N.A. = NOT AVAILABLE). NOTE THAT THE \$ COSTS ARE ADDITIONAL TO THE ESTIMATED HOURS.

CONSERVANCY	NO. OF ISSUING LOCATIONS	PERMIT ISSUE		HUNTING RETURNS AND OTHER RELATED COSTS	
		LABOUR (hours)	OTHER COSTS (\$)	LABOUR (hours)	OTHER COSTS (\$)
Northland	7	50	\$100	20	\$500
Auckland	5	90	\$250	175	\$200
Waikato	8	3934	\$7,300	n.a.	\$2,250
Bay of Plenty	5	500	n.a.	n.a.	n.a.
East Coast	7	474	\$1,400	28	\$560
Tongariro/Taupo	8	n.a.	\$10,000	n.a.	\$15,000
Hawke's Bay	9	500	\$15,000	100	\$8,750
Wanganui	7	640	\$650	230	\$3,300
Wellington	5	n.a.	n.a.	24	n.a.
Nelson/Marlborough	9	400	\$100	210	\$670
West Coast	8	636	\$9,000	n.a.	\$7,650
Canterbury	6	1853	\$28,636	192	\$5,300
Otago	6	755	\$1,500	130	n.a.
Southland	5	2014	\$4,300	898	\$200
Totals	95	11846	\$78,236	2007	\$44,380
\$ costs of labour component *		\$497,532		\$84,294	

* Assuming an hourly rate of \$42.

6. Perceived value of recreational hunting

Perceptions of the value of recreational hunting as a wild animal control tool producing conservation benefits varied considerably between conservancies, as did perceptions of the potential to enhance or manipulate recreational hunting for conservation benefits.

Northland Conservancy considers that recreational hunting provides a significant level of feral pig control on conservation lands, although there are also concerns over the potential impact of pig dogs on kiwi populations. The effect of recreational hunting on feral goat populations was unknown, but thought to be insignificant. Nevertheless, conservancy staff do attempt to direct hunters to high-value habitats, although hunter interest was generally low.

Several field centres within the **Auckland Conservancy** felt that recreational hunters provided an adequate level of control for feral pig populations and some control for feral goats. They actively managed hunting pressure to achieve conservation aims by directing hunters to areas where animal populations were thought to be increasing or already too high, and occasionally by asking hunters to target other problem species (e.g. feral cats).

Within the **Waikato Conservancy**, recreational hunters were seen as being of mixed effectiveness. Within small reserves, significant vegetation recovery has resulted from encouraging recreational hunters to hunt these areas. However, in the main hunting area within this conservancy, Pureora Conservation Park, recreational hunters were able to no more than maintain animal numbers at stable levels. For part of this area, recreational hunting effort is augmented by commercial hunting, and it was felt that even with efforts to increase and manipulate recreational hunting effort there was a limit to its conservation value.

Bay of Plenty Conservancy was unsure of the impacts of recreational hunters and the potential for manipulating hunting pressure to achieve conservation benefits. The very low hunting return rates for this conservancy probably contribute substantially to this lack of understanding. Nevertheless, field centre staff continued to actively encourage recreational hunters to target areas where conservation values are high.

The **East Coast Conservancy** viewed both recreational hunting and commercial hunting as essential to animal control in their area. The perceived value of each varied between species, with recreational and commercial hunters having a similar effect on deer numbers, but with recreational hunters providing the only control mechanism for feral pig populations. For feral goats, official control was still the main method of control and the impact of recreational hunters was thought to be low. Conservancy staff considered that they lacked sufficient resources to establish systems to fully capitalise on the potential benefits of recreational hunting.

In recent years **Tongariro/Taupo Conservancy** has actively manipulated recreational hunting pressure to target areas with high deer numbers. This has mainly been through increasing helicopter access to particular areas during the roar, but also through attempts to redirect hunting effort through publicity. Results from limited vegetation surveys in specific areas (e.g. Fraser & Speedy 1997) suggest that some recovery has resulted, although it is unclear whether this will produce long-term benefits. The value of this type of manipulation was thought to be limited because hunters continued to target stags. To increase the hind harvest, increased helicopter access has now been extended to the spring period. Regular organised feral goat hunts within the conservancy were seen as useful for targeting this species in problem areas and also for fostering better co-operation between DOC and recreational hunters. Similarly, the instigation of an annual sika trophy competition was seen as a useful communication exercise as well as raising the profile of hunting opportunities within the conservancy generally.

Increasing aerial access to remote areas and informing hunters about areas where deer numbers are high (mainly through newsletters) have also been used by the **Hawke's Bay Conservancy**. Again, while this has initially resulted in increased harvests, conservancy staff are unsure whether any long-term benefits will result. Within the conservancy the costs associated with hut and track maintenance directly related to recreational hunting (which constitutes c. 50% of back country usage in this area) was seen as relatively high, particularly when the value of this hunting effort in conservation terms had not been quantified. Nevertheless, there were other areas in which recreational hunters provided a valuable contribution through voluntary work. This included *Pinus contorta* control, kiwi surveys, and assistance with hut and track maintenance.

Recreational hunters were seen as of mixed value within the **Wanganui Conservancy**. They provided a significant level of control on sambar deer and fallow deer populations. However, for feral goat control they were only effective in specific areas where their efforts were targeted, principally using competitions, and in major forest areas recreational hunters were thought to have little impact on feral goat populations. Similarly, they were seen as having little effect on slowing the rate of spread of red deer within the conservancy and, in fact, were thought to be responsible for the establishment of some new populations.

While the **Wellington Conservancy** acknowledged that recreational hunters provided a moderate level of control over deer numbers, particularly in accessible areas, the benefits of this control were unclear. Nevertheless, this conservancy recognises hunting as an important recreational pursuit in the area and continues to actively encourage hunting effort through publicity and support for hunting competitions.

Within the **Nelson/Marlborough Conservancy**, recreational hunters were considered useful for controlling deer where access was good. However, their value in less accessible areas and for feral goat control was questioned. Recreational hunting was also considered ineffective in maintaining feral pig populations at the low levels required in some areas for protection of native snails. While the conservancy has attempted to manipulate hunting effort through using recreational hunters in conjunction with official control,

involving hunting clubs in specific control programmes, and assisting with hunting competitions there was thought to be considerable scope for increasing these types of manipulation.

Recreational and commercial hunting were seen as complementary within the **West Coast Conservancy**. For deer, the bulk of the recreational harvest tended to come from the more accessible front country, while commercial operators took most of their harvest from more remote subalpine areas. The size this conservancy and relative inaccessibility of much of it, was seen as a real limitation to the potential for greater impact by recreational hunters on deer populations. However, recreational hunting was seen as an essential element in the implementation of the Himalayan Thar Control Plan.

A similar situation exists in the **Canterbury Conservancy**, where recreational hunters are believed to be able to maintain animal populations at stable levels in easily accessible areas, but where a similar level of control over more difficult and inaccessible country is reliant on commercial hunting. Increased effort was being made through hunter liaison groups to better target problem areas and to educate hunters about specific management objectives (e.g. the need to shoot female Himalayan thar to maintain populations below intervention densities).

Within the **Otago Conservancy** the impact of recreational hunters on red deer, chamois, and feral goat numbers is thought to be insignificant. Nevertheless, conservancy staff do attempt to direct hunting effort to areas where populations are known to be high, particularly for chamois. Recreational hunters are successfully maintaining fallow deer populations at stable levels in the Otago Conservancy.

In the **Southland Conservancy** recreational hunting provides a major contribution to red deer and feral pig control in localised areas. However, over much of the conservancy (including Fiordland) commercial hunting provides the only viable and effective control mechanism for red deer. While recreational hunters provide a major contribution to the control of fallow deer and white-tailed deer populations, they are thought to have little or no effect on feral goat populations. Increasing hunter awareness of areas where animal numbers are high, both through informal liaison and also press releases, has been used successfully to redirect hunting effort to problem areas.

In summary, conservancy perceptions of the value of recreational hunting as a control tool appear to be influenced by several factors including the wild animal species present, the accessibility of various areas to hunters, and the level of competition from commercial hunting within the conservancy. Recreational hunting is seen as an important wild animal control tool in many conservancies (especially for pigs), particularly where hunters have easy access to the main hunting areas and the species available are keenly sought after. In some areas (particularly in the North Island) there appears to be some potential for increasing the benefits from recreational hunting, while in other areas recreational hunting is likely to always be of limited benefit. However, nearly all conservancies acknowledged that recreational hunters provided useful ancillary information on wildlife sightings and reports on the state of tracks, huts, and other facilities.

7. Recreational hunting effort and harvests

Approximately 63,500 permits for recreational hunting are issued annually throughout New Zealand, from which about 20,200 (c. 32%) hunting returns are received. The number of permits issued varies widely between conservancies (Table 2), reflecting the wild animal species present and the size of the areas available for hunting (rather than the human population base within the conservancy). Auckland Conservancy (with the largest population base) issues the smallest number of permits per annum, while the East Coast and Southland Conservancies (with relatively small population bases) issue the most. The total number of permits issued by each conservancy also depends on the time-and-area specificity of permits (see Appendix 2). For example, the high number of permits issued in Canterbury and Southland reflects the restricted-block systems that operate for several areas within these conservancies (e.g. Oxford RHA, Blue Mountains RHA, parts of Stewart Island).

Most conservancies routinely collect recreational hunting returns, but conservancies vary considerably in the extent to which they use the data. At one extreme, the Waikato, Tongariro/Taupo, and Canterbury Conservancies use

TABLE 2. SIZE OF DOC CONSERVANCIES AND DETAILS OF BIG-GAME SPECIES PRESENT AND PERMIT ISSUES AND RETURNS (OVER A 12-MONTH PERIOD).

CONSERVANCY	APPROX. AREA (km ²)	BIG-GAME SPECIES PRESENT*	NO. OF PERMITS ISSUED†	NO. OF PERMITS PER km ²	NO. OF RETURNS RECEIVED	RETURN RATE (%)
Northland	1500	Re‡, Fa, Si, Pi, Go	386	0.26	147	38
Auckland	420	Re, Fa, Pi, Go	253	0.60	109	43
Waikato	2690	Re, Fa, Si, Pi, Go	6420	2.39	3674	57
Bay of Plenty	5000	Re, Fa, Si, Ru, Sa, Pi, Go	c. 4000	0.80	c. 400	10
East Coast	1810	Re, Fa, Ru, Sa, Pi, Go	5725	3.16	984	17
Tongariro/Taupo	1850	Re, Fa, Si, Sa, Pi, Go	6344	3.43	1682	27
Hawke's Bay	1700	Re, Si, Pi, Go	c. 6200	3.65	c. 1300	21
Wanganui	2800	Re, Fa, Si, Sa, Pi, Go	5161	1.84	238	5
Wellington	1760	Re, Si, Pi, Go	1972	1.12	385	20
Nelson/Marlborough	9960	Re, Fa, Ch, Pi, Go	5985	0.60	836	14
West Coast	7710	Re, Fa, Ch, Th, Pi, Go	3818	0.50	1135	30
Canterbury	18470	Re, Fa, Ch, Th, Pi, Go	8604	0.47	4327	50
Otago	3900	Re, Fa, Wt, Ch, Th, Pi, Go	2243	0.58	1149	51
Southland	18020	Re, Fa, Wt, Wa, Ch, Pi, Go	6366	0.35	3821	60
Totals			c. 63,500		c. 20,200	c. 32

* Re = red deer, Fa = fallow deer, Si = sika deer, Wt = white-tailed deer, Ru = rusa deer, Sa = sambar deer, Wa = wapiti, Ch = chamois, Th = Himalayan thar, Pi = feral pig, Go = feral goat.

† The 12-month periods varied between conservancies: most data are for the 1993 calendar year but some conservancies used data from either 1992 or a 12-month period over 1992/93.

‡ Red deer, fallow deer and sika deer have only recently established in Northland, mostly as a result of farm escapes or illegal liberations.

computerised databases for collating and summarising hunting returns, and typically these conservancies make the resulting data available to hunters through newsletters or magazines. At the other extreme, some conservancies (particularly those with historically poor hunting return rates, e.g. Bay of Plenty, Wanganui, Nelson/Marlborough) do very little or nothing with hunting return information. Apart from a few conservancies that use recreational hunting statistics to monitor basic patterns in hunting pressure and overall harvest rates, there was no evidence to suggest that these data are being used to prompt management changes.

The return rate for hunting permits or hunter diaries varies considerably, from relatively poor levels of up to 10% in the Bay of Plenty and Wanganui Conservancies to at least 50% in the Waikato, Canterbury, Otago, and Southland Conservancies. Return rates tended to be highest for those conservancies where follow-up reminder letters were used or where restricted block systems operated in some areas.

There are no systematic checks that all hunters do obtain a permit, but occasional checking during chance encounters in the field suggests compliance levels of 50–90+%. Compliance is thought to be particularly poor in the large, relatively remote, and predominantly rural conservancies of East Coast and West Coast. DOC staff who responded to the survey considered that locals and adjoining landholders were often unlikely to obtain permits, particularly if they hunted reserves or other small forest areas. In general, compliance was thought to be higher for deer hunters than pig and goat hunters, and better in the larger forest areas (i.e. National Parks and Conservation Parks) although there were exceptions to this (e.g. Urewera National Park).

The reported number of days hunted typically exceeds the total number of permits issued by a factor of 2–3 times (Nugent 1990b; Fraser 1996a). Allowing for 25% of hunters not obtaining a permit and approximately 3 days hunting per permit, the 63,500 permits issued equates to c. 250,000 days of hunting annually on conservation lands by recreational hunters. This is considerably less than Nugent's (1989) estimate of c. 776,000 days of hunting annually for all big-game species by ground-based hunters. Even allowing for up to half the national hunting effort occurring outside conservation lands, this discrepancy suggests that Nugent's (1989) estimate was biased high (as were his reported harvest estimates). Irrespective of the actual total, the annual recreational hunting effort (which is likely to be somewhere between our two estimated values) is undoubtedly substantial. Nugent's (1989) survey suggests that >50% of this effort related to deer, with the remainder covering the other big-game species (principally feral pigs).

Nugent (1992b) estimated that about 73% of wild deer range on conservation land lies in the South Island. Assuming that the number of permits issued for any given area provides an approximate index of hunting pressure, it is apparent that recreational hunting pressure on conservation land administered by DOC is considerably greater in the North Island (1 permit/0.52 km²) than the South Island (1 permit/1.89 km²; Table 2).

Nugent & Fraser (1993) estimated the New Zealand wild deer breeding population size at approximately 250,000, from which an annual harvest of about 80,000 animals is taken (c. 77% of these are red deer, c. 13% sika deer,

c. 7% fallow deer, c. 3% white-tailed deer; Nugent 1992a). Rusa deer, sambar deer, and wapiti constitute only a small fraction of the estimated total harvest. While recreational hunters target all seven deer species, commercial hunters take red deer almost exclusively (with only small numbers of sika deer, fallow deer, and wapiti-red deer hybrids also taken). The recreational harvest data from hunting returns to DOC (Table 3) are in general agreement with Nugent's (1992a) more comprehensive estimates, although for most species they only represent a small proportion of the estimated total annual harvest. The extremely low tally for feral pigs and the lack of data for rusa deer and wapiti highlight some of the problems associated with hunting returns as they are currently collected. Although most of the feral pig harvest is from private land rather than conservation land administered by DOC, the total reported harvest (1725 feral pigs) is extremely low compared with Nugent's (1992a) estimate of 99,267 feral pigs taken by hunters in 1988. Clearly, this suggests that pig hunters are less likely to obtain hunting permits and/or seldom report their kills.

TABLE 3. REPORTED HARVESTS OF BIG-GAME SPECIES BY RECREATIONAL HUNTERS FOR DOC CONSERVANCIES OVER A 12-MONTH PERIOD*.

CONSERVANCY	DEER SPECIES						CHAM- OIS	THAR	FERAL PIGS	FERAL GOATS
	RED	FALLOW	SIKA	WHITE- TAILED	RUSA	SAM- BAR				
Northland	n.a.	n.a.	n.a.					242	101	
Auckland	n.a.	5						85	299	
Waikato	1119	49	n.a.					415	3219	
Bay of Plenty	n.a.	n.a.	n.a.		n.a.	n.a.		n.a.	n.a.	
East Coast	599	n.a.			n.a.	n.a.		110		
Tongariro/Taupo	679	n.a.	682			n.a.		43	126	
Hawke's Bay	503		483					30	22	
Wanganui†	10	8	n.a.			27		14	605	
Wellington	257		n.a.					45	261	
Nelson/Marlborough‡	97	35					1	224	234	
West Coast	500	n.a.					160	100	95	
Canterbury	857	2					752	777	45	
Otago	243	49		8			19	n.a.	175	
Southland	884	455		645			21		303	
Totals	5748	603	1165	653		27	953	877	1725	5224

n.a. = not available.

* The 12-month periods varied between conservancies: most data is for the 1993 calendar year but some conservancies used data from either 1992 or a 12-month period over 1992/93.

† Data from conservancy office and sambar ballot only, number of permits issued = 1118.

‡ Data from conservancy office only, number of permits issued = 2542 (return rate = 33%).

8. Conservation role of recreational hunting

The conservation benefits provided by recreational hunting ensue primarily from the reduced browsing pressure that results from the lowering of deer (or other species) population densities. With the exception of one recent study (Fraser & Speedy 1997), there is no published information that directly links recreational hunting pressure with conservation benefits. Therefore, any conservation benefits must be inferred largely from what is known of the relationships between deer density and the nature and intensity of their impacts, and recreational hunting pressure and deer density.

8.1 DEER IMPACTS AND DEER DENSITY

The 'deer problem' (in conservation terms) has been summarised in an earlier review of the conservation role of commercial deer hunting (Nugent 1992b, unpubl. FRI contract report). Briefly, wild deer occupy approximately two-thirds of New Zealand, but their densities have been reduced by over 75% since the 1950s, primarily by commercial hunting from helicopter (Challies 1990) but also to some extent by ground-based commercial and recreational hunting (Nugent 1992a). Extreme vulnerability of deer to helicopter-based hunting in unforested habitats above the timber line and in other open areas means that most deer now occur within the area (c. 59 000 km²) of tall forest where the canopy provides adequate cover. Deer population densities within forested areas are strongly linked to the adequacy of that cover (Nugent & Sweetapple 1989). Less than 10% of conservation land is outside wild deer range, and about two-thirds of deer range on conservation land is forested, with most (73%) of this in the South Island (Nugent 1992b, unpubl. FRI contract report). The estimated breeding population size of about 250 000 deer in 1988 (Nugent & Fraser 1993) suggests an average national density of about 4 deer/km² of forest.

The nature of deer impacts on conservation values is complex and determined by a number of factors, most importantly deer population density and the vulnerability of the particular values at risk. Deer can modify the structure and composition of the indigenous vegetation, compete directly or indirectly with the native fauna for habitat and food, and possibly affect soil and water values. Because the Department of Conservation aims "to preserve and protect" New Zealand's indigenous biota, these deer-induced changes are viewed as undesirable conservation 'costs' that should be minimised. Consequently, DOC aims to manage deer numbers at 'the lowest level that can be practically achieved and maintained given the management tools and financial resources available' for the entire conservation estate (Holloway 1989).

The most common deer species present in New Zealand (red, sika, and fallow) appear to have similar food preferences (e.g. Wardle 1984; Nugent 1990c; Fraser 1991; Nugent et al. 1997). In general, they are opportunistic and highly

adaptable feeders that both browse and graze, although studies of digestive morphophysiology indicate that both sika deer and fallow deer can cope with greater quantities of roughage than red deer (e.g. Hofmann 1985; Fraser 1996b). The composition of the diet of these three species is largely determined by what is locally available, and this is dependent on the vegetation type and its history of modification.

The following description of deer impacts on native species is largely restricted to the vegetation, because that is where their impacts appear greatest and also because relatively little is known about deer impacts on the native fauna and on soil and water values. Even in the absence of hunting, deer impacts on the native vegetation vary between areas because of differences in vegetation composition.

In forests, deer prefer most of the broad-leaved hardwood tree species (typically in the subcanopy tier) such as various *Pseudopanax* spp., pate (*Schefflera digitata*), and broadleaf (*Griselinia littoralis*), and some ferns such as hen and chicken fern (*Asplenium bulbiferum*). The beech and podocarp canopy species, and the remaining subcanopy trees, shrubs, ferns, herbs, and grasses are generally edible but less preferred. A few species, such as pepperwood (*Pseudowintera colorata*) and crown fern (*Blechnum discolor*), are almost never browsed, or only in very small quantities. Deer-preferred species were typically abundant in the understorey before colonisation but were virtually eliminated from this tier as deer numbers increased. Subsequently, they were replaced to some extent by a smaller number of less palatable species. This sometimes resulted in localised forest dieback in areas where the canopy was dominated by short-lived deer-preferred species. In areas where possums are also present, canopy dieback can be far more immediate and severe because possums can kill established trees and deer may then prevent any replacement. Overall, the main impact of deer has been to substantially change forest composition. For shrubs, ferns, herbs, and grasses, the effect was 'immediate', but for most tree species the decline in abundance has been more gradual, resulting primarily from limited regeneration.

In tussock grasslands, the overall pattern of deer impacts has been similar to that in forests, with selective removal of preferred foods such as the large-leaved herbaceous species and some tussocks including *Chionochloa pallens* and *C. flavescens* (Mills & Mark 1977; Rose & Platt 1987).

The level of control required to protect a particular plant species depends largely on its vulnerability to deer. In the absence of hunting, deer numbers increase to and remain near the ecological carrying capacity of the habitat; the biomass of plants which are eaten by deer is reduced and maintained at low levels. Harvesting the population reduces deer density and browsing pressure, resulting in some increase in the biomass of the plant species which are eaten by deer. The scale of that increase or 'recovery' depends on the extent of the reduction in deer density. Furthermore, unless this reduction is sustained, the deer population tends to return to carrying capacity, that tendency growing stronger as the level of control (i.e. the reduction below carrying capacity) increases (Caughley 1980).

The virtual elimination of deer from unforested areas by helicopter-based hunters during the 1970s resulted in vegetation recovery in some areas. Just

over a decade after commercial hunting began in eastern Fiordland, substantial tussock regrowth had occurred, there was prolific establishment of snow tussock seedlings, and large herbs were becoming abundant (Rose & Platt 1987). In forested areas, exclosure studies (e.g. Jane & Pracy 1974; Allen et al. 1984; New Zealand Forest Service 1987; Stewart 1988, unpubl. FRI contract report; Speedy 1991, unpubl. DOC report) show that a similarly dramatic response would also occur if deer could be completely removed, but to date this has not been achieved outside exclosures. Nevertheless, in areas such as South Westland and Fiordland where commercial hunting has had its greatest impact, deer-preferred species are becoming more common within the browse tier (Stewart et al. 1987).

Although it is convenient to assume that any reduction in deer density results in a proportional reduction in impacts, there is now clear evidence that this view is overly simplistic (Nugent et al. 1997). Once a forest understorey has been depleted, only a small number of deer are needed to prevent its recovery (Wardle 1984). This is because in New Zealand forests the biomass of seedling foliage produced annually by deer-preferred species is relatively small and, since it is preferred to litterfall, which provides a large part of the forage requirements for deer populations, the browsing pressure on such species is essentially independent of deer density (Fig. 2). For more browse-resistant or less palatable species the relationship is more linear, and the least preferred species are affected only at high deer densities or not at all (Fig. 3).

To summarise, it appears that relatively small reductions in deer density from carrying capacity will protect the least vulnerable species (which include the beeches and most podocarps). There will always be some additional increase in regeneration with any further decrease in deer density, but over a wide range of deer density the response is likely to be negligible (Fraser & Speedy 1997). Protection of the most highly preferred species requires the almost total removal of deer (Fig. 4).

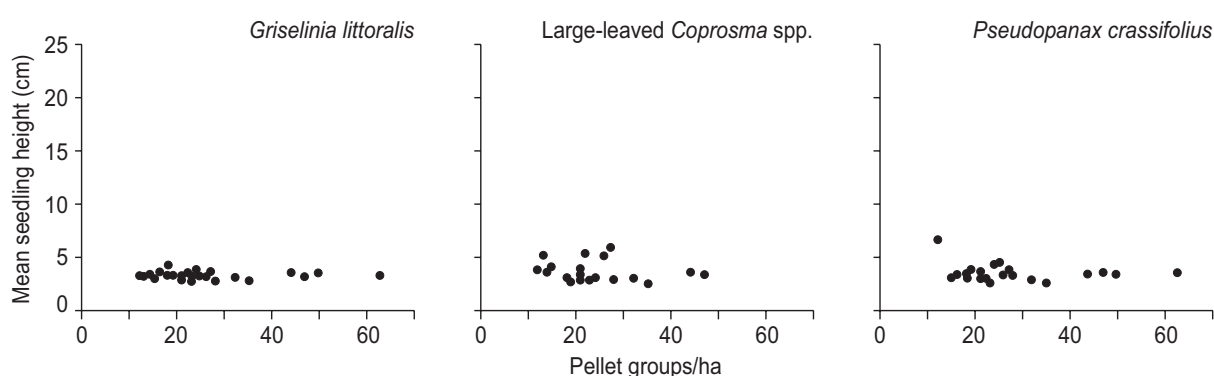


Figure 2. Relationship between relative deer density and mean seedling height in the 0–45 cm tier for deer-preferred species in a podocarp-hardwood forest (from Nugent et al. 1997).

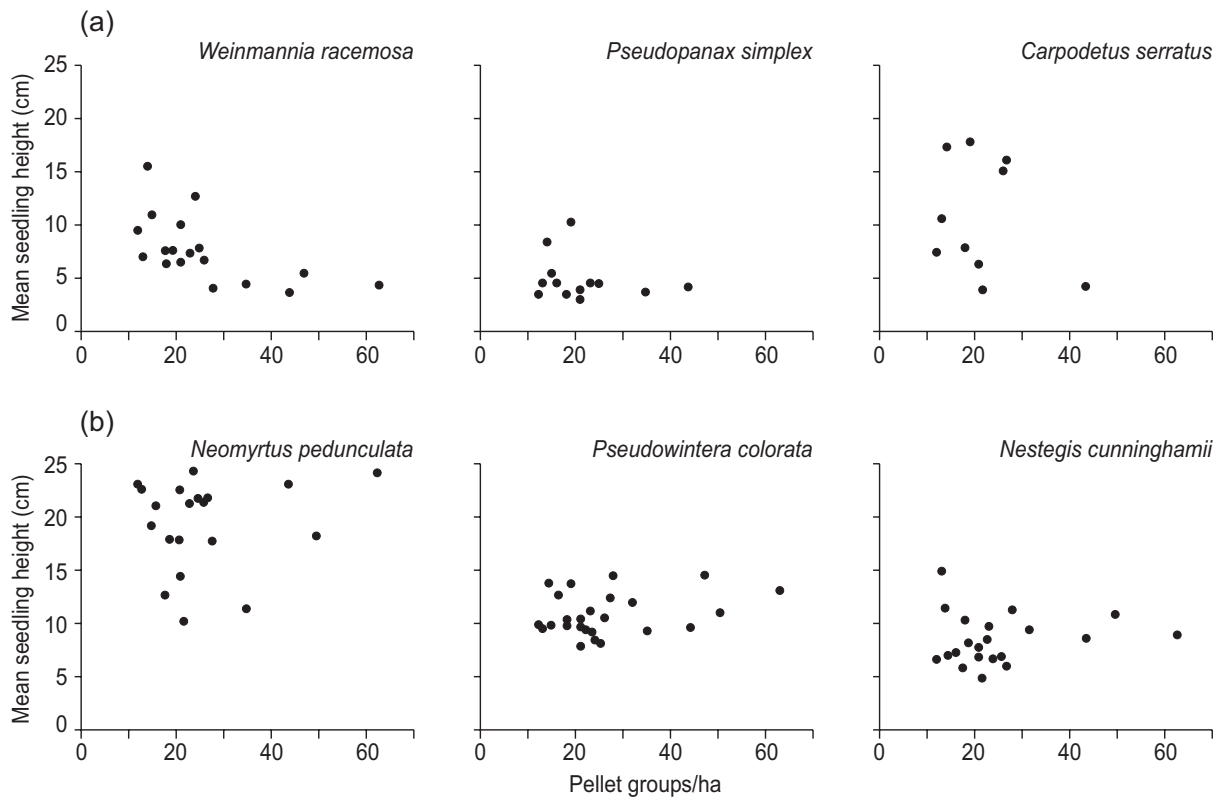


Figure 3. Relationship between relative deer density and mean seedling height in the 0–45 cm tier for (a) moderately palatable and (b) least preferred species in a podocarp-hardwood forest (from Nugent et al. 1997).

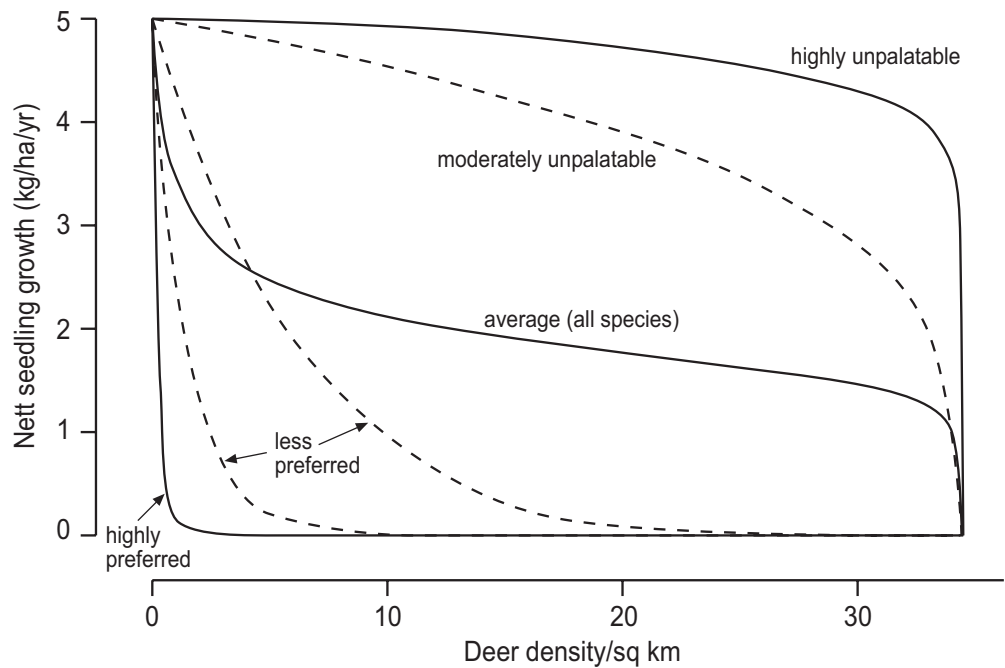


Figure 4. Relationship between deer density and seedling biomass for several generalised plant species palatability classes.

8.2 COMPARISONS WITH OTHER INTRODUCED HERBIVORES

Feral goats have similar dietary preferences to deer, but can also eat species poisonous to other ungulates (Rudge 1989). Their preference for open sites and their gregarious habit means that their impacts are often concentrated on seral vegetation associations and may be more noticeable than those of deer. Furthermore, in some areas feral goat populations reach very high densities rapidly (their fecundity is higher than that of deer) requiring substantial official control to protect conservation values.

Himalayan thar and chamois differ from deer in that their impacts occur mainly in alpine and subalpine habitats. Their diets consist mainly of snow tussocks, alpine and subalpine herbs, and some subalpine shrubs (Clarke 1986, 1990; Tustin & Parkes 1988; Tustin 1990). Like feral goats, both these species are gregarious (for at least part of the year) and tend to concentrate their feeding activities. This has led to conspicuous and substantial impacts, particularly in alpine and subalpine herb fields, including the local elimination of some plant species. However, commercial hunting from the 1970s resulted in sudden and dramatic decreases in populations of these two species (particularly Himalayan thar), and some improvement and recovery of the vegetation has been noted (Clarke 1990; Tustin 1990). Chamois also utilise forest ecosystems, where their diet and impacts are thought to be similar to those of red deer in the same areas (pers. comm. J. Parkes, Landcare Research).

Feral pigs are omnivorous opportunistic feeders and differ markedly from other introduced ungulate species in their feeding habits (McIlroy 1990). In podocarp-hardwood forest in the Urewera Ranges, Thomson & Challies (1988) found that 62% of the feral pigs' food was obtained by foraging on the ground, 31% by rooting, and the balance by browsing and grazing. Approximately 70% of the diet comprised plant material, with animal carrion, earthworms, and insects making up the remainder. There were strong seasonal changes in diet in the Urewera Ranges which mainly reflected the availability of tawa and hinau fruit (Thomson & Challies 1988). The impacts of feral pigs on native vegetation have not been studied.

In general, possums eat much the same range of plant species as deer, with the exception of broadleaf (e.g. Fitzgerald 1976; Leathwick et al. 1983; Coleman et al. 1985), although their preferences differ markedly (Nugent et al. 1997). Furthermore, there appears to be more regional variation in possum diet (Cowan 1990). The most important difference between deer and possums is the latter's arboreal habit, which means that they have access to and can potentially impact upon all the vegetation in an area. Deer and other ungulate species only affect the vegetation up to a height of c. 2 m. The sustained selective browsing of possums has led to considerable dieback of a number of shrub-hardwood and canopy species (e.g. tree fuchsia, rata, five-finger, pohutukawa), although other factors may sometimes predispose particular species to damage by possums (Stewart 1989). While the impacts of possums are more immediate and visible, and appear more devastating, the impacts of deer and other ungulate species (particularly feral goats) may take much longer to become apparent. With the exception of a few species such as tree fuchsia and the mistletoes, possums

generally have a relatively minor effect on regeneration (Nugent et al. 1997). In contrast, deer affect the fundamental nature of regeneration processes in most New Zealand forests (see above).

8.3 INDIRECT IMPACTS ON NATIVE FAUNA

Little is known about deer impacts on New Zealand's native fauna. However, through their modification of the forest understorey and their inhibition of natural regeneration processes, they undoubtedly contribute to a decline in habitat diversity and quality for native birds and invertebrates. Whether this modification of habitat is the key factor leading to the decline of some threatened bird species is questionable; possums and introduced predators probably have a more immediate and dramatic impact. Nevertheless, the gradual elimination of many hardwood tree species by deer will eventually deprive some native bird species of key food sources (Wardle 1984). Feral pigs are thought to have a serious impact on remnant populations of the native land snail (*Powelliphanta* spp.) through habitat destruction and predation (Meads et al. 1984).

8.4 IMPACT OF RECREATIONAL HUNTING ON DEER DENSITY

A wide variety of factors influence recreational hunting pressure and its effect on deer density. These include the social and economic factors that determine overall levels of interest in hunting on a national scale, but within that many other factors combine to determine local outcomes. Recreational hunting pressure is higher in the North Island than in the South Island (see section 7), reflecting the greater human population and smaller area of deer range. Proximity to large urban centres and accessibility are important (but not exclusive) determinants of recreational hunting pressure. The proportion of the human population choosing to hunt in a particular area declines markedly with increasing distance from that area and is largely a consequence of the increased time and transport costs (Nugent 1990b, unpubl. FRI contract report; Henderson & Nugent 1989, unpubl. FRI contract report). For example, recreational hunting pressure is relatively high in the Blue Mountains RHA, about 1½ hours from Dunedin (Nugent 1988), and in Pureora Conservation Park, about 2 hours from Auckland (Fraser 1996a). In comparison, it is very low in areas such as western Fiordland (Nugent et al. 1987) and the Arawhata Valley in south Westland (Fraser 1992, unpubl. FRI contract report). However, in recent years the increased use of helicopters for transport into remote areas has reduced the differences between areas, particularly during the roar.

Hunting pressure also tends to be concentrated near access points, whether they are road ends (Nugent 1988), entry points for catchments (Fraser & Sweetapple 1992), or helicopter landing sites. In the Blue Mountains RHA, deer densities were 3–4 times higher in areas more than 3 km from an access point than in areas immediately adjacent to access points (Nugent 1988). Similarly,

within the Jap Creek hunting block in the Kaimanawa RHA, hunting pressure was clearly related to access routes into the catchment and access times and difficulty of terrain (i.e. lower hunting pressure at higher altitudes and with increasing distance from the valley bottom where travel was easiest) with an inverse relationship between hunting pressure and deer density (Fraser & Sweetapple 1992).

As with helicopter-based hunters, the extent and nature of cover also determines recreational hunter effectiveness. Deer are highly vulnerable in open habitats and therefore make little use of, or are quickly removed from, unforested areas such as in the Oxford RHA (Henderson & Nugent 1989, unpubl. FRI contract report) and the Oamaru River flats in the Kaimanawa RHA (Fraser & Leathwick 1990, unpubl. FRI contract report) despite historically high use of these areas by deer. Similarly, deer seldom survive long in open farmland unless protected by the landowner.

Hunting effort also varies with deer density since hunters tend to focus their efforts where deer numbers (and therefore the prospects of success) are greatest. When deer numbers drop below the level required for hunter satisfaction, most hunters either cease hunting or move to other areas (Nugent & Mawhinney 1987). Aerial-1080 poisoning of possums and deer over much of the Hauhungaroa Range in 1994 apparently resulted in a subsequent 15% increase in the demand for hunting permits in the nearby Kaimanawa Range (pers. comm. C. Speedy, Tongariro/Taupo Conservancy). Other factors being equal, recreational hunting pressure is greatest in areas with highest deer densities and is likely to have a proportionately greater influence on deer density in such areas.

Hunting effort can be influenced by incentives. Hunting competitions with prizes can encourage hunters to target species and areas they would not normally hunt. However, it is unclear whether such incentives actually increase the overall hunting effort or merely redirect it. A DOC-organised feral goat hunting competition in the Wanganui Conservancy in 1991-92 in which prizes were offered to hunters who killed tagged goats resulted in 135 feral goats being killed. Although that competition was considered to be a success, it has not been repeated. One of the critical problems with competitions is ensuring that hunting effort is targeted at the desired area. Therefore, there needs to be some way of verifying where animals were shot. Although using tagged animals helps to achieve this, the costs and other difficulties associated with such an exercise are not insignificant and add considerably to the costs of prizes or other incentives offered for the competition.

In summary, recreational hunting has a greater impact on deer densities in the North Island than in the South Island. Furthermore, it is most effective in areas closest to major population centres, in areas in which most of the area is within a few kilometres of an access point, and in areas with little cover for deer.

8.5 COMPARISON WITH COMMERCIAL AND STATE-FUNDED HUNTING

In 1988, two-thirds of the wild deer harvest in New Zealand (c. 55,000 animals, all species) was taken by ground hunters (Nugent 1992b, unpubl. Landcare Research contract report). However, about 7000 of these deer were captured alive and about 7500 were shot and sold to game depots. The network of collection depots for wild game has decreased since then and there is very little live capture occurring at present. Therefore, this component of the ground-based harvest is likely to have declined markedly. Between 1986 and 1994 the helicopter-based commercial harvest fluctuated from about 13,000 to about 29,000 deer annually (Parkes et al. 1996), these changes largely reflecting fluctuations in the price of venison.

While recreational hunters operate in all 14 DOC conservancies, commercial hunters are presently active in only 11 of these. Despite the numerically greater total deer harvest by recreational hunters, the relative importance of recreational and commercial hunting varies between conservancies (Table 4). There are several conservancies (East Coast, West Coast, Southland) where commercial hunters are the dominant harvesters of wild deer (and in some cases other big-game species). This is especially true for subalpine grassland areas where commercial hunting has significantly reduced deer use of this habitat (Challies 1990).

TABLE 4. COMPARISON OF THE REPORTED AND ESTIMATED HARVESTS BY RECREATIONAL HUNTERS OF RED DEER AND OTHER SPECIES WITH THOSE FOR COMMERCIAL HUNTERS (OVER A 12-MONTH PERIOD^{*}).

CONSERVANCY	RECREATIONAL HARVEST				COMMERCIAL HARVEST		
	REPORTED		ESTIMATED [†]				
	RED DEER	OTHER SPECIES	RED DEER	OTHER LICENSES	NO. OF SPECIES	RED DEER	OTHER SPECIES
Northland	-	343	-	903	0	-	-
Auckland	-	38	-	905	0	-	-
Waikato	1119	3683	1963	6461	4	929	707
Bay of Plenty	n.a.	n.a.	n.a.	n.a.	11	- [‡]	- [‡]
East Coast	599	110	3524	647	12	5515	2132
Tongariro/Taupo	679	718	2515	2659	1	60	-
Hawke's Bay	503	535	2395	2548	2	620	-
Wanganui	10	654	200	13080	0	-	-
Wellington	257	306	1285	1530	1	322	2
Nelson/Marlborough	97	494	693	3529	6	290	393
West Coast	500	389	1667	1297	20	5050	1000
Canterbury	857	1598	1714	3196	15	795	1269
Otago	243	409	476	802	4	n.a.	n.a.
Southland	884	1364	1473	2273	7	3592	-
Totals	5748	10992	17905	39830	-	17173	5503

^{*} The 12-month periods varied between conservancies: most data are for the 1993 calendar year but some conservancies used data from either 1992 or a 12-month period over 1992/93.

[†] Calculated by dividing the reported values by the hunting permit or hunter diary return rate.

[‡] Data included in East Coast Conservancy returns.

There is some evidence from Pureora Conservation Park in the central North Island that on a 'per kill basis', the conservation value of commercial kills is greater than that for recreational kills because commercial hunters kill more young animals and a higher proportion of hinds (i.e. they have a greater impact on the productivity of the deer population; Fraser 1996a). The average age of deer taken by recreational hunters in Pureora Conservation Park was almost 4 years (for both sexes), whereas deer shot in the same area by commercial hunters were considerably younger (2.3 years for stags, 2.9 years for hinds). These are the only available data for a comparison of recreational and commercial harvests from the same area. In contrast, Nugent (1992b, unpubl. Landcare Research contract report) found that at a national level commercial hunters generally took more stags than hinds (sometimes up to 57% stags), the proportion varying with the price of venison. The prices paid for antler velvet are also likely to influence selectivity by commercial hunters.

While recreational hunting appears to be less effective on a 'per kill basis', it is presumably more stable than commercial hunting because there are many more people involved and economic considerations (e.g. the price for venison) are relatively unimportant. While recreational hunting pressure is largely confined to areas with easy access and close to relatively large population centres, commercial hunting pressure is largely determined by economic considerations and the density of deer in the areas available for hunting.

With the advent of commercial hunting in the early 1960s, state-funded deer control efforts substantially declined and effectively ceased in 1988, although small numbers of deer are shot incidentally during feral goat control campaigns. However, in recent years (1994 to the present) some aerial-1080 operations against possums for the control of bovine Tb have also targeted deer (with increased toxic loadings and/or increased bait sowing rates).

The most recent information on the relative costs of recreational and state-funded hunting relates to feral goat control. The DOC-organised hunting competition in the Wanganui Conservancy in 1991-92 which resulted in recreational hunters taking 135 feral goats cost DOC \$7600. Based on figures for DOC hunters who killed approximately 750 feral goats at a cost of \$132,000 in the same year in the Wanganui Conservancy, it is likely that it would have cost DOC about \$24,000 to kill a similar number of feral goats using its own staff (Boardman 1992, unpubl. DOC report).

However, information relating to deer indicates that recreational hunters are less efficient than state-funded hunters in terms of hunting effort per kill (Nugent 1988). This partly reflects selectivity by some recreational hunters who pass up opportunities to shoot fawns and/or hinds in favour of stags (Nugent 1990b, unpubl. FRI contract report; Fraser & Speedy 1997), presumably in an effort to conserve the deer population but also partly due to the considerable concentration of recreational hunting effort during the roar. The lower hunting efficiency for recreational hunters also reflects the wide variation in levels of experience and motivation. For example, many hunters only hunt once or twice a year while others hunt at every available opportunity (Nugent 1992a). Furthermore, recreational hunters hunt for a variety of reasons including taking home some venison, trophies, the outdoor experience, and comradeship (Fraser & Sweetapple 1992; Fraser 1996a). As a consequence, recreational hunters take

considerably fewer animals per hour hunted than full-time professional (commercial or state-funded) hunters. For example, on Mt Egmont, DOC hunters (using dogs) killed 5.5 feral goats/day in 1991/92 whereas recreational hunters killed only 1.2 feral goats/day (Boardman 1992, unpubl. DOC report).

The relatively low kill-per-unit-effort efficiency of recreational hunters is obviously offset by their low cost to DOC. Essentially, the only fixed costs incurred are those authorising hunters to hunt on the conservation estate (because wild animals can be taken legally only with the landowner's permission) and the costs of hunter liaison. However, these can be significant, with estimates for the annual cost of permit issue alone as high as \$576,000. A key question, therefore, is whether greater conservation benefits might result by spending that money actually controlling deer (and other wild animals) rather than simply accepting whatever level of control is achieved by recreational (and commercial) hunters. One possible option is to find ways of reducing the costs of hunting permit issue without reducing recreational hunting pressure. However, because permit issue is often undertaken by DOC staff with a wide range of other administrative duties, it is unlikely that any substantial reductions in staff time (and therefore the cost of permit issue) would automatically flow through to increased expenditure on deer control.

9. Options for conservation-oriented management of recreational hunting

The Department of Conservation's options for deer control can be expressed in broadest terms as follows. At one extreme, DOC could do nothing regardless of the severity of deer impacts (i.e. even if all private hunting ceased). However, that option is clearly untenable given the legislation that DOC operates under and its present actions against largely un hunted species such as feral goats. At the other extreme, DOC could attempt to eradicate deer. However, that is not a viable option for several reasons, particularly because deer farming now provides a continual source of reinfestation that would ensure any eradication attempt failed. Furthermore, from the large number of illegal liberations that have occurred over the past decade (Fraser et al. 1996, unpubl. Landcare Research contract report), it is apparent that any eradication policy would result in a spate of new illegal liberations by hunters attempting to preserve their recreational and commercial hunting opportunities. Therefore, DOC is left with having to manage deer populations in a way that minimises their impacts on conservation values.

At present, DOC achieves this goal using a *laissez-faire* approach that minimises the constraints on recreational (and commercial) hunters (typically, no limits on access or on the number or sex of deer that can be taken), but otherwise does little to actively increase hunting pressure. Although DOC spends c.

\$700,000 annually on administration of recreational hunting, it is arguable that the bulk of this expenditure is necessary to fulfil DOC's legislative obligation and is not a cost of deer control. DOC could, for example, simply decide that hunters did not need a permit (by instigating some other system for granting permission to hunt) as is the case for most other recreational users of conservation land. Such a change would be unlikely to affect the amount of hunting done.

Recreational hunting results in a large number of deer kills (Nugent 1992a), and these add to the more unpredictable commercial harvest to hold deer numbers well below carrying capacity in most areas. Therefore, this must reduce the rate of deer-induced change in indigenous ecosystems to some degree. However, the magnitude of the conservation benefits and the degree to which recreational (rather than commercial) hunting contributes to their achievement is unclear. The key consideration is whether the benefits can be cost-effectively increased by deliberately manipulating or increasing recreational hunting pressure. The utility of enhanced recreational hunting as a control tool needs to be considered both at the national and the local level, and is perhaps best illustrated by a theoretical comparison with commercial and state-funded hunting.

If increased deer control is required to achieve a conservation goal in a particular area, DOC could choose to achieve that by subsidising additional commercial hunting (an approach long-used in the Murchison Mountains to maintain low deer densities for takahe protection; pers. comm. J. von Tunzelman, Southland Conservancy). Alternatively, it could encourage additional recreational hunting pressure, or control deer itself, or some combination of these three options. The applicability of each of these options depends on several factors. The level and costs of additional control required will reflect the difference between present deer densities and the target density below which the deer population must be reduced to adequately protect the desired conservation value(s). For example, the severity or importance of the threat will (presumably) determine the financial resources available to ameliorate that threat and the size of area will determine how carefully targeted the additional control needs to be. The need for careful targeting is greatest where the threats are most severe and the area small.

9.1 ENHANCED RECREATIONAL HUNTING

Perhaps the single most important advantage of enhanced recreational hunting is its public acceptability. In general, public preference is for control methods that are ground-based, do not rely on toxins, and which make use of the animals killed (Fraser 1995). Therefore, all else being equal, managers should favour enhanced recreational hunting if it can achieve the desired goal. The fact that social, aesthetic, and other dimensions of hunting are more important to many recreational hunters' satisfaction than actual hunting success or killing game (Fraser & Sweetapple 1992; Fraser 1993), suggests that there is considerable scope for enhancing the impact and contribution of recreational hunters to animal control.

Enhanced recreational hunting will be most cost-effective where the enhancement can be achieved through a few time-limited actions such as the provision of more access (e.g. roads, tracks, legal rights-of-way across private land). The most suitable approach for any one area will vary, depending upon a number of factors:

- Severity of the threat posed by deer and the size of the area in which additional control is needed
- Level of additional control required
- Location and accessibility of the area in relation to the distances from major population centres and/or processing plants
- Availability and nature of other hunting opportunities in the same area
- Availability of hunters

Recreational hunters are likely to be the most difficult to target to specific areas, unless there are area-specific incentives. Identifying for hunters areas with higher than average deer densities and providing or improving access (including helicopter landing sites) are examples of such area-specific tools, as is the use of incentives such as prizes for shooting tagged animals.

9.2 SUBSIDISING COMMERCIAL HUNTING

While the effects of past commercial hunting have generally been good, these have been governed primarily by economics and have not been subject to any specific requirements or constraints imposed by DOC for the purposes of increasing the conservation value of the commercial harvest. While the venison recovery industry remains viable, the cost to DOC of maintaining the present (largely undirected) commercial hunting effort is low. However, the long-term stability of the industry is by no means assured and its manageability under the present system can at best be described as moderate.

Targeting commercial hunting would be difficult, unless all hunting was directly supervised by DOC staff (which would incur additional costs). If direct supervision is not affordable, a system for accurate targeting is unlikely to be possible.

9.3 STATE-FUNDED CONTROL

In general terms, state-funded hunting is clearly the most easily targeted and is therefore ideal in terms of focussing control in areas where it is most needed for the protection of conservation values. However, the costs of such an option would be significant, irrespective of the actual control technique adopted (e.g. poisoning, search and destroy).

9.4 COMPARISON OF CONTROL OPTIONS

Selection of a control option will be influenced by the vulnerability of the deer population (i.e. the species concerned, and the nature of the habitat and the amount of cover it provides). For example, the most cost-effective method for reducing a high-density population to very low levels in dense forest will differ markedly from that needed to prevent occasional use of subalpine grasslands by deer. Public acceptability is also likely to influence DOC's choice in selecting deer control tools.

Where forest regeneration requires only a moderate reduction in deer numbers, enhancement of recreational hunting could be effective. It will also be best suited for use in small areas with good road access and which are close to main population centres where hunters have few other opportunities for hunting. Conversely, for large parts of the South Island (where access is difficult and recreational hunting pressure is low) subsidised commercial hunting and/or state-funded control are more realistic options.

Recreational hunting is arguably the most stable control tool available to DOC because it involves a large number of individuals (Nugent 1992a) whose motivations and participation levels seem unlikely to change quickly. In contrast, commercial hunting pressure fluctuates widely in relation to changes in venison prices and, historically, state-funded deer control has not been sustained at consistent levels (Caughley 1983).

10. Discussion

While the primary goal of the Department of Conservation is the protection of conservation values, it has a secondary goal of enhancing the recreational opportunities (including hunting) on the conservation estate. However, to formally define such a secondary goal would require greater recognition that the wild animals are a resource. Some conservation organisations would undoubtedly oppose such moves, although in reality the changes are largely semantic since such a situation exists already in many areas by default, including those areas currently designated as RHAs.

The presence of introduced species and the role and place of recreational hunting in the management or control of these species has involved many conflicts in the past which continue to influence present attitudes. The main issues and positions held by key interest groups and other stakeholders have been summarised in Appendix 3. With any changes to the administration and management of recreational hunting in New Zealand, or even if the status quo is preserved, there is a need to minimise conflict between all interest groups. In particular, there is a need to promote understanding and co-operation between managers and hunters. For example, managers could enlist the support of hunters where it is practical and cost-effective for them to be part of the management system for a particular area. Any positive moves towards management of recreational hunting (even if just publicising harvest targets)

are likely to reduce the conflicts between hunters and DOC. However, such moves would probably meet with firm opposition from conservation organisations (see Appendix 3) who seem reluctant to support any official measures to increase the 'legitimacy' or profile of recreational hunting. In the past a great deal of resources have been wasted on the conflicts between hunters and conservationists, and consideration needs to be given to fostering greater awareness and co-operation between all the interest groups.

If DOC chooses to move towards a more positive attitude to recreational hunting, there are a number of impediments that need to be addressed. For example, charging recreational hunters for hut use acts as a disincentive. In addition, when a person has to pay, their perspective changes and it is likely that any efforts to foster greater co-operation with recreational hunters would meet with some resistance, since under a user-pays system they may expect some degree of 'ownership' and input into the management of what they consider is a resource they are paying for access to. To a large extent, hunters' attitudes towards the provision of facilities such as tracks and huts stem from the fact that most of these facilities were originally established by the NZFS for use in government-funded animal control. Given that some level of animal control is now being performed by recreational hunters at little or no cost to DOC, hunters may feel aggrieved that they incur hut charges.

Recently, DOC has examined the necessity and rationale for issuing hunting permits. Although consideration of the need for hunting permits is not directly part of this review, any significant changes in the way the permit system is administered could have ramifications for related issues (e.g. the collection of recreational hunting data in many conservancies has been integrated as part of the permit system) and could possibly affect overall hunting effort. Therefore, the issue of hunting permits should not be considered in isolation. Unless there are legislative changes (which are unlikely), the issuing of permits for recreational hunters will remain a legal responsibility of DOC. New monitoring systems for deer and other game species would need to be developed if there were significant changes to the issuing of hunting permits and diaries (a system hunters are already familiar with). One alternative would be to move towards regular postal or telephone surveys, as is done for game birds (Barker 1988). However, it is likely that the costs associated with establishing and validating such a new system for monitoring hunter activity and animal population trends would be substantial, with few real benefits in terms of DOC's primary responsibilities (i.e. protection of conservation values).

If DOC chose to establish charges for hunting permits, it would need to clearly define the basis for this (e.g. purely as a cost-recovery exercise). Furthermore, charging for permits is likely to reduce hunter satisfaction and therefore is likely to act as a disincentive to animal management for conservation purposes (i.e. recreational hunters are likely to be less inclined to co-operate with DOC animal control strategies).

A small number of recent incidents involving multiple fatalities caused by firearms has raised public concern about the ownership and use of firearms. To some extent, there is now a stigma attached to firearms ownership which could act to discourage at least some potential hunters from entering the sport. Similarly, while animal welfare and animal rights groups are not as active in New

Zealand as overseas, they are present and have a negative impact on the image of hunting.

If we accept that recreational hunting provides some conservation benefits at little or no cost to DOC, then the apparent decline in hunter recruitment over the past two decades highlights a need for better hunter education with the aim of improving recreational hunter retention and satisfaction, and increasing the recruitment of recreational hunters into the sport. This should largely be the responsibility of hunting organisations and individual hunters, although as DOC benefits from the actions of recreational hunters it could choose to support any such moves and be seen as an advocate for such values. Any efforts towards better hunter education should be designed to ensure that the attitudes and behaviour of hunters project a positive image to the wider public (through high ethical standards, consideration of the rights of other recreational users, appreciation and support for conservation, firearms safety, animal welfare, and outdoors survival). Positive education aimed at changing hunters' perceptions of success may also increase retention. This would include promoting other benefits such as the social dimension of hunting, the outdoors experience, and the elements of exercise and survival in a challenging environment. While hunting organisations, principally the New Zealand Deerstalkers Association (NZDA), already play a role in this area there is much scope for improvement. Some of the largest gains to be made in projecting a better image of recreational hunters are likely to come from education designed to provide a better understanding of wild animal management and control in the New Zealand context (including aspects of animal ecology—especially population dynamics, concepts of habitat quality and conservation values, and the importance of monitoring).

While hunter training schemes (such as that undertaken by the NZDA) will go some way to addressing the declines in the size and skill base of the recreational hunting population, there is no substitute for hunting experience. While the high deer densities of the past are no longer present and the opportunities for novice hunters to acquire skills are less readily available, there is always the option of gaining hunting skills on less elusive animals. Feral goat populations in many areas fill this role well. However, there may need to be some concessions by DOC whereby feral goat numbers in some areas (where conservation values are not threatened) were permitted to increase or remain at densities higher than they might otherwise be. Such areas could conceivably become training grounds for less experienced hunters. In many cases, simple promotion and redirection of novice hunting effort into areas where feral goat numbers are already reasonably high would suffice. Inevitably, as young hunters acquired stalking skills and sought greater challenges, they would transfer their efforts to other big-game species and other areas. Therefore, by trading off some less valued areas, DOC could encourage an increase in the overall base and impact of recreational hunters which, in the final analysis, would result in a more effective recreational hunting effort nationally.

As a public relations/liaison exercise with recreational hunters, DOC conservancies could organise or support regular hunting competitions. This would raise the profile of recreational hunting, and foster co-operation between DOC and hunters, as well as going some way towards achieving wild animal control objectives within the conservancy (feral goats may be an ideal target species in some areas).

If DOC is committed to actively managing and maintaining a stable base of recreational hunters to sustain conservation gains in particular areas, then there is a need for further investigation of the factors influencing the level of participation in recreational hunting. Conventional monitoring using recreational hunting returns will provide much of the baseline information required to show broad trends in this area, although more detailed surveys would probably be needed to determine any factors responsible for changes in established patterns.

The impacts of deer and other introduced herbivores on native fauna (particularly bird species) need to be studied further. More comprehensive and comparative quantitative data on the relative impacts of deer (and other big-game species), possums, and predators would enable their importance in terms of the threats they pose to the conservation of native fauna to be put into perspective.

Most of our introduced wild animal species are resources (sometimes commercial as well as recreational) as well as pests (Nugent & Fraser 1993). Public attitudes to introduced mammals vary widely, but in general deer and some of the other big-game species are seen more commonly as resources than pests (Fraser 1996a). Given that all of our introduced big-game species are now a permanent part of many New Zealand ecosystems and that widespread extermination is neither possible nor practical, conservation organisations that hold to an eradication philosophy may miss the opportunity to contribute in a constructive way to the future management of wild animal populations. A balanced outcome (while still keeping DOC's primary goals to the fore) should include some acknowledgement of the 'rights' of recreational hunters, the role they have played in the past and can play in the future, and incorporating them into wild animal control strategies where practical.

In the early 1960s few people would have predicted the events that have occurred in the field of wild animal control in New Zealand. Looking 20–30 years into the future is equally speculative. The Department of Conservation needs to ensure that ecological, financial, and political realities are, together with its primary legal responsibility of protection of indigenous resources, taken into account when determining future policy for the management of recreational hunting in New Zealand.

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Appendix 1

LIBERATION DETAILS FOR BIG-GAME SPECIES PRESENT IN NEW ZEALAND

SPECIES	NO. OF SUCCESSFUL LIBERATIONS	DATE(S) OF LIBERATION(S)	APPROX. NO. OF ANIMALS LIBERATED
Red deer ¹	>220	1851-1923	>800
Fallow deer ²	13	1864-1900	>50
Sika deer ²	1	1905	6
Sambar deer ²	3	1875-1920	19
Rusa deer ²	1	1907	8
White-tailed deer ²	2	1905	18
Wapiti ²	1	1905	18
Chamois ²	2	1889-1913	>10
Himalayan thar ²	2	1904, 1909	13
Feral pig ³	numerous	1769- ?	unknown
Feral goat ³	numerous	1773- ?	unknown

Sources: ¹ Logan & Harris 1967; ² Wodzicki 1950; ³ Thomson 1922.

Appendix 2

VARIATION BETWEEN CONSERVANCIES IN PERMIT PERIODS AND COVERAGE

CONSERVANCY	FIXED PERMIT PERIOD?	PERMIT PERIOD(S) AND COVERAGE	MAIN EXCEPTIONS
Northland	No	1 month (from date of issue, specific to area)	
Auckland	No	usually 2 weeks (from date of issue)	Many parts of conservancy closed to hunting over public holidays and other high-use periods
Waikato	Yes	4 months (ONDJ, FMAM, JJAS)	2-day permits for some scenic reserves
Bay of Plenty	Yes	3 months (MAM, JJA, SON, DJF)	
East Coast	No	1 month (from date of issue)	
Tongariro/Taupo	Yes	4 months (FMAM, JJAS, ONDJ)	
Hawke's Bay	Yes	2-4 months (FMA, MJ, JAS, ONDJ)	1 week permits for Tarawera block and some scenic reserves
Wanganui	No	3 months (from date of issue)	1 week permits for fallow deer blocks, ballot system for sambar deer
Wellington	No	6 months (from date of issue)	Permit period for reserves <1000 ha tailored in relation to demand
Nelson/Marlborough	No	2 months (from date of issue)	10 days for Cobb Valley, numerous closures during public holidays
West Coast	No	1 month (from date of issue)	Block system and 7-day permits during the roar in some areas
Canterbury	No	2 months (from date of issue)	Numerous variations (dependent on area and particularly during the roar)
Otago	No	7-14 days (from date of issue)	Numerous variations (dependent on area and particularly during the roar)
Southland	No	3 months (from date of issue)	2-5 days for Blue Mountains RHA, 10 days for Stewart Island, 2 weeks for wapiti bugle

Appendix 3

ATTITUDES OF INTEREST GROUPS AND STAKEHOLDERS TO RECREATIONAL HUNTING

Hunting organisations

Submissions were received from the New Zealand Deerstalkers Association (NZDA) and the Safari Club International (SCI). These hunting groups believe that recreational hunters do provide significant conservation benefits because they kill the most big game on DOC-administered conservation land. Furthermore, they see that fact as an obvious rebuttal of suggestions that they do not provide any benefit. The main hunting organisation, NZDA, stated that their main goal was not the maximisation of conservation benefits, but rather the effective organisation of hunting for hunter benefits (cf. Nugent & Fraser 1993). However, they stressed that this should not be seen as incompatible with government policies for the protection of conservation values. This comment, which was also reflected in the SCI submission, was made in the context of what the NZDA termed a 'pragmatic view' of introduced game species in New Zealand, (i.e. the animals are here to stay and how do we best manage their populations for minimal impact) rather than what they felt was the present archaic and unrealistic legislative framework.

Hunting groups were also concerned about increasing pressure from animal-rights and anti-firearm groups to limit or stop hunting, and felt that the lack of official recognition and support for recreational hunting from DOC further weakened their position, (i.e. as a legitimate recreational activity and an integral part of wild animal control in New Zealand). Furthermore, they felt the place of hunting in the New Zealand culture was important, not only historically but also in relation to some present social problems (recognising potential for recreational hunting, together with other outdoor pursuits, to contribute to the development of desirable personal characteristics such as independence and an appreciation of the environment).

Most hunting organisations desired a greater role in the organisation of their sport and felt that unless this happened, any attempt by DOC to charge for hunting permits or implement other forms of cost recovery would receive little support. However, submissions from both the NZDA and SCI acknowledged that hunters are, in general, individualists and that the organisation of hunters into groups is difficult. The lack of an effective and united hunting lobby was also seen as a reason why their contribution has been underrated in the past.

Recreational hunting groups also made the point that whereas the wild animal recovery industry would continue only while it was profitable, recreational hunters were a permanent feature of deer (and other wild animal) control in New Zealand. They felt that adoption of a longer-term view by DOC would help in understanding the current (and potential future) contribution that recreational hunters make to animal control, which was neither fully realised or recorded at present. While acknowledging that in some areas commercial or official hunting would be the primary means of animal control, the increasing

population and the increased accessibility of many areas was seen as an opportunity for recreational hunters to play a greater and more effective role in future wild animal control. Recreational hunting groups also believe that the fostering and encouragement of a viable recreational hunting fraternity is fundamental to effectively utilising recreational hunters as a low-cost animal control tool. The efforts of some conservancies to actively encourage hunter participation was seen as a positive way of building up trust and co-operation between DOC and hunters, and would naturally lead to a more effective direction of hunter effort.

Hunting organisations also felt that pressures from conservation groups for DOC to attempt unrealistic animal control goals was detrimental to the development of realistic, consultatively based, and effective long-term animal control policies. In contrast, the Himalayan Thar Control Plan was seen as a positive step, and hunting organisations felt that the concepts of acceptable population levels and intervention densities were ideas understood by most hunters. The SCI felt that the Himalayan Thar Control Plan was a good model in that it recognised the unique biology of the species; they thought that this model could be extended to all big-game species in New Zealand. As well as addressing the issue of access, hunter education and publicity (prior to the implementation of any species management plans) were seen as essential prerequisites for the success of such plans. While the usefulness of specific policies was acknowledged, the consensus among hunting organisations was that the most urgent need was the fostering of greater co-operation between DOC and recreational hunters. This would involve constructive moves by DOC enabling recreational hunters to have an assurance that their sport will continue, while at the same time providing a positive basis for enabling hunters to become a more effective control tool. The SCI felt that such a role need not compromise DOC's role as caretaker of conservation lands, but could signal a more active approach towards setting desirable animal densities and monitoring their impacts on conservation values.

The SCI saw a clear distinction between managing hunters and managing the wild animals present on conservation land, and questioned the Department of Conservation's ability and willingness to do the former. However, they also acknowledged the difficulties faced by DOC in gaining acceptance, both within DOC and by conservation groups, of any potential devolution of control of hunters to hunting organisations. They acknowledged that DOC's role is complex and difficult since it is inextricably linked to other issues such as access, which ultimately affect the ability of recreational hunters to function as an effective management tool. The possibility of the formation of a statutory authority for game management was also raised by the SCI. While there would be advantages in extending the role of the present Fish & Game Councils to include such functions, a prior review by an independent body was seen as desirable before any changes were made.

In summary, a number of clear and consistent points were made by the two main recreational hunting organisations.

- Recreational hunters sought some formal acknowledgement from DOC of their role in the maintenance of wild animal populations at stable or near stable levels in some areas.

- They felt that DOC should formally recognise that many of the introduced mammal species in New Zealand have other than pest status among a wide section of the community and that these intrinsic values be recognised in DOC policies.
- Wherever possible, recreational hunting organisations sought the utilisation of recreational hunting as a priority management tool for the sustainable control of wild animal populations below set intervention densities which would be based on a clear definition of the conservation values of an area.
- There was general agreement on the need for the establishment of a mechanism for better and more effective communication between DOC and hunters (similar to the former National Recreational Hunting Advisory Committee).
- Hunting organisations sought the implementation of common-sense, practical, and co-operative management initiatives based on existing knowledge of hunting pressure, harvest levels, and herd population dynamics. They felt this should take place as soon as possible, because the potential to establish and fine-tune such systems would be overtaken by more urgent priorities, if there was any significant decline in the wild animal recovery industry in the near future.

Conservation organisations

Despite several approaches to the two key conservation organisations in New Zealand (the Royal Forest & Bird Society and the Maruia Society), for their official position on recreational hunting, no submissions were received. Nevertheless, the views of the former can be gauged through editorials and articles in their magazine and occasional press releases (e.g. Royal Forest and Bird Society 1995). The Forest & Bird Society believes that deer are a serious threat to the survival of many of New Zealand's native forests. While they acknowledge that deer could not be eradicated from New Zealand, they believe that in some localised areas eradication is a real option. The Society would like to see deer numbers urgently reduced to levels that allow forest regeneration to occur and, while they 'supported' recreational hunting generally, they did not believe that recreational hunters were capable of reducing deer numbers to the levels required for indigenous vegetation to recover.

Further, the Forest & Bird Society is particularly concerned about potential changes in the organisation and management of recreational hunting in New Zealand, particularly if Fish & Game Councils become involved. Under the current legislation, their statutory functions include the enhancing of 'sports fish and game resources' and this would clearly conflict with DOC's goals (Jackson 1995). The Society has suggested that if Fish & Game Councils do assume a greater role in the future management of recreational hunting, their activities should be restricted to hunter education, defining ethical standards, promoting hunting, and highlighting situations where there is potential to increase the effectiveness of recreational hunters. Because the requirement for protection of native plants and animals on the conservation estate is paramount, the Society believes that any shift of recreational hunting management to Fish & Game Councils would present a serious conflict of interest.

Other recreation groups

Recreational hunters share the 'back country' (i.e. conservation lands administered by DOC) with other recreational user groups. However, with the exception of trampers and remote-experience fishers, there is little actual overlap between hunters and other user groups, since the former usually choose more remote areas while the latter concentrate their activities around the fringes of the conservation land. There is no evidence from recreation use surveys of any major conflict between hunters and other user groups (Groome et al. 1983, Sheridan 1993). Nevertheless, some user groups have expressed concerns related to the use of limited hut facilities and also unease at being in the same locality as hunters for fear of being shot at (Sheridan 1993). However, none of the 22 fatalities that occurred over a 10-year period (1979–1988) as a result of hunting-related firearms incidents involved non-hunters (pers. comm. B. Badland, New Zealand Mountain Safety Council). Furthermore, 18 (82%) of these incidents involved either members of the same hunting party or hunters who accidentally shot themselves. Clearly, some reassurance of the minimal risks to non-hunters while they are on conservation land would be useful, as would regular tests or reminders on rifle handling and safety procedures for recreational hunters.

Farmers and bovine Tb

The increasing focus from the farming community and the government (through the Animal Health Board) on the threats posed by bovine Tb also provides for potential conflict with recreational hunters. The resources available for wild animal control (principally possums) have increased significantly in recent years in recognition of the severity of this problem. While previous control operations focused on possums, increased knowledge about the disease and potential vectors has led to other species also being targeted for control, including wild deer and feral pigs. Furthermore, the threat of the spread of bovine Tb to formerly clear areas has been increased as a result of stock escaping from deer farms and a spate of illegal liberations (of deer and feral pigs particularly) that have occurred in recent years (Fraser et al. 1996). Recreational hunters have been clearly implicated in the latter and this will inevitably lead to further conflict between hunters and wild animal control agencies. There is clear evidence of high Tb prevalence in wild deer in some areas (Nugent & Lugton 1995) and there is some evidence to suggest that this can discourage recreational hunters (pers. comm. G. Asher, Ministry of Agriculture & Fisheries).