



Government of South Georgia and the South Sandwich Islands

**Report on the outputs of the Advisory Group on Reindeer Management
Methodology**

November 2011

Executive Summary

Following a wide consultation, the Government of South Georgia and the South Sandwich Islands took the decision in early 2011 to responsibly and humanely eradicate reindeer from South Georgia. Following this decision, an expert advisory group was established to inform the most appropriate way to achieve the eradication, with reference to best practice guidelines around the world.

Initially, only aerial and ground shooting were under consideration as methods. During the course of discussions, it became apparent that a third option, herding and corralling, may also be a valid proposal. It was agreed that this method should be investigated further.

Herding and corralling is a desirable method as it allows animals to be killed humanely under veterinary supervision, allows for the utilisation of meat and other products, and allows for the disposal of carcasses.

Herding and corralling was used in 2001 and 2002 on South Georgia to capture small numbers of reindeer for translocation to the Falkland Islands, to varying degrees of success. The animals on the Busen were found to be easy to manage, with the Barff animals being "flighty" and more difficult to herd. It is likely that these difficulties will be reduced through the use of experienced reindeer herders.

Current estimates suggest that 90-95% of the population will be recoverable by herding. There will therefore be a requirement for some other form of management, either by shooting from the air or ground.

In January 2012 two Norwegian experts will visit South Georgia to reconnoitre the areas occupied by reindeer in order to better inform the development of a methodology appropriate for South Georgia. Through careful consideration of animal behaviour and terrain, the feasibility of herding and corralling as a valid management method will be established definitively.

Summary of outputs from the Methodology Advisory Group

1 Background

South Georgia is a subantarctic island with a terrestrial flora and fauna that is relatively species poor, that has evolved in the absence of grazing animals, and as a consequence copes poorly with grazing pressure. The vegetation is dominated by the native and widespread coastal tussock grass, which is highly productive and provides a key habitat for other native species.

Reindeer are a northern hemisphere species that were introduced by Norwegian whalers for subsistence to two discreet areas of South Georgia on three occasions between 1909-1925. Combined, the areas occupied by reindeer equate to the largest snow free, and consequently most biologically productive, part of the island. Subsequent to their introduction, the reindeer herds were maintained through regular hunts. Since the 1980's no hunting or management of the herd has occurred, and as a consequence the herds have expanded substantially, to the point where nearly all-available grazing habitat has been utilised. The boundaries of these areas are limited by glaciers, which prevent the animals spreading to the island as a whole.

Numerous different communities on South Georgia have been overgrazed by reindeer, the most significant being tussock and burnet communities, which has led to areas becoming eroded. Extensive overgrazing of tussock grassland is clearly evident on the island, most notably on ridge tops and raised coastal areas, where large areas are completely denuded.

There are numerous introduced plant species on the island, of which some are more damaging than others. There is a particular association between reindeer and the introduced grass species *Poa annua*, which resists grazing far better than native species. As native plants become overgrazed by reindeer, the introduced grass replaces them, completely altering the habitat and landscape of grazed areas.

Experiments in which reindeer were excluded from grazing certain previously grazed areas have demonstrated that important native species, such as tussock and burnet, can recover after the removal of grazing pressure. This recovery of native species results in a decline in cover of the introduced grass *Poa annua*.

Following a wide consultation process, the Government of South Georgia and the South Sandwich Islands (GSGSSI) formally took the decision in February 2011 to eradicate reindeer from South Georgia. An Advisory Group was established in March 2011 with the objective of providing expert advice to GSGSSI on suitable methods of achieving this.

The mandate of the group was to advise the GSGSSI on an appropriate methodology for the humane removal of reindeer from the island by:

- Analysis of the implications of both aerial and ground shooting;
- Considering the need for any approach to be humane;
- Considering the sensitive nature of the island's environment and wildlife;
- Advising in the development of a work plan, best practice guidelines and budget.

Membership of the group included – aerial eradication experts from New Zealand and Australia, ground shooting experts from the UK, Norwegian reindeer experts, people familiar with the island of South Georgia, two veterinary surgeons and representatives from animal welfare Non-Governmental Organisations.

This report is a summary of the deliberations of the group; it also provides additional background information, and will act as the basis for development of an operational plan.

1.1 Selection of an eradication method

The final choice of management option needs to take into account the following considerations:

Animal welfare – the need to kill animals as humanely as possible, with a minimum of stress.

Impact on native species – methodology should seek to minimise the impact on native species (particularly large aggregations of wildlife) where practicable.

Removal of carcasses – there is a requirement for carcasses to be removed from the island, the reasons for which are outlined in Section 1.3. Any methodology should therefore facilitate the recovery of carcasses.

Recovery of commercially valuable products – the gathering and removal of carcasses presents an opportunity to recover marketable products, which would provide some small cost recovery whilst casting the project in a more positive light. During the GSGSSI public consultation on reindeer management, 60% of respondents indicated that they would want to see commercial products recovered (though only 7% indicated that their support of an eradication would be dependent on the recovery of such products). Commercial products could include meat, antlers and velvet.

During the recovery of commercial products, mandibles from the reindeer and reproductive organs of the females should be collected, as these samples are of scientific value. In addition, some measurement of the animals should be taken; height of shoulder etc, blood and tissue samples. Scientific opportunities presented by the eradication are considered separately.

1.2 Choice of method

Initially only ground and air shooting were under consideration as methods by the advisory group, with recovery of carcasses either by helicopter or quad bikes. Whether shooting from the air or the ground, reindeer would be field dressed then transported to a central area for storage and further transport, with or without butchering. Efforts would be made to salvage meat where necessary, though carcasses would be abandoned if:

- Salvage would endanger the field team or helicopter crew
- Salvage would cause unnecessary disturbance to wildlife or other deer
- The carcasses were inaccessible

Projects in New Zealand have used both ground and aerial hunting, and experience has shown that there are often more issues to consider than just the cost effectiveness and efficiency of each method, such as seasonal timing, terrain and animal welfare considerations.

Due to the open terrain on South Georgia and lack of hunting since the 1980's, it is likely that the reindeer would be very vulnerable to all types of hunting. During the course of discussions, a third management option – herding and corralling of reindeer, became apparent. This method is used extensively in northern Europe, and was successfully used in South Georgia in 2001 and 2002 to capture reindeer for translocation to the Falkland Islands.

In order to inform decision-making, the following questions need to be considered:

- To what extent would operations to kill the deer (remove carcasses) have to take account of possible disturbance impact on other species or factors? Are there any ecologically sensitive areas that operations would have to avoid?
- To what extent does the geography/topography affect possible choice of method? What is the terrain in the area of operations? How accessible are these areas?

- Is there any information about the behaviour of the reindeer on South Georgia? To what extent have populations been subjected to hunting in the past? Are the animals wary and do they show any escape/fear response to presence of people, etc?
- To what extent are the animals concentrated in herds or more dispersed? Does this change over the season?
- Would geography and/or seasonal weather patterns limit access and affect the time of year when removal operations could take place?

These factors will be discussed further below.

1.3 Conflict with the SGHT rodent eradication project

Of great significance is the impact the presence of reindeer have on the proposed island-wide rat eradication project managed by the South Georgia Heritage Trust (SGHT). This is a project fully endorsed by GSGSSI, and one that has received significant sums of charitable money and is gaining increasing international publicity.

Eradication of the introduced reindeer is a prerequisite for the island wide rodent eradication to take place for the following reasons:

1 Reindeer have been shown to eat the poison cereal bait used in the rodent eradication project. In order to ensure that a sufficient quantity of bait to eradicate rats in the treated areas is available after reindeer consumption, an enormous volume of bait would have to be used, increasing costs prohibitively, and greatly increasing the amount of poison in the ecosystem. Furthermore, some reindeer mortality would result, and killing of ungulates by poisoning with anticoagulant toxins is not considered humane. Sub-lethal poisoning could also occur, causing great distress and suffering to animals affected.

2 Reindeer carcasses resulting from the consumption of poison bait would contain high concentrations of poison, which would then be available to scavenging birds such as giant petrels, gulls, skuas and the native South Georgia pintail. This would result in significant secondary poisoning of the avian fauna of the island, which would be unacceptable.

The removal of reindeer carcasses post eradication is necessary for the following reasons:

- 1) Scavenging rats would certainly feed on the carcasses, if, after a cull, there was a surfeit of carrion. This abundance of food may make rats less likely to eat the bait.
- 2) If such a sudden abundance of carrion significantly boosted the rat population there could then be more rats to kill in the subsequent rat eradication. Since rodenticides cause suffering to rodents, from an animal welfare perspective this would increase the animal welfare 'cost'. Additionally, an increased rat population might also affect calculations about bait quantity required, and increase the risk of both primary and secondary poisoning of non-target species.

With these considerations in mind, there is a strong preference for reindeer carcasses to be recovered from the island.

The first (trial) phase of the island wide rodent eradication was completed in early 2011. A further two phases are planned for 2013 and 2014, with the SGHT indicating a preference for attempting the Busen Peninsula in 2013, as its proximity to Grytviken/King Edward Point makes their clearance logistically simpler than farther flung areas, and would allow further experience of operating on South Georgia to be gained before tackling more complex sites. At least one herd, though preferably both, should therefore be eradicated prior to March 2013.

1.4 Impact on non-target species

There is a point of view that the ecological benefits of removing the reindeer from the island mean that any short-term disturbance to other wildlife is justifiable. However, all efforts should be made to minimize disturbance whilst still ensuring the end goal is achieved. The majority of birds species leave the island (or are past any critical breeding period) before winter, with post March/April seeing the lowest numbers of birds. The notable exception to this are the penguins, most importantly the large king penguin colony at St Andrews Bay on the Barff Peninsula. Reindeer are often seen amongst the colony, and any form of shooting in the vicinity, or disturbance which may cause the animals to harm native wildlife, should be avoided. Shooting on the ground may be possible with silenced weapons, however carcass recovery in this area would be a considerable challenge.

1.5 Area of operations

There are currently two discrete land areas occupied by reindeer, the Barff and Busen peninsulas (see **Figure 1**). The Barff Peninsula covers 189km² (Barff 131km² + Royal Bay 58km²) and the Busen Peninsula covers 124km². Therefore the total land area affected by reindeer on the island is 313km², of which approximately 100km² is vegetated. This is one third of the entire vegetated area of South Georgia, (306km²). The peninsulas are bounded by glaciers that are currently acting as an effective barrier to further population spread.

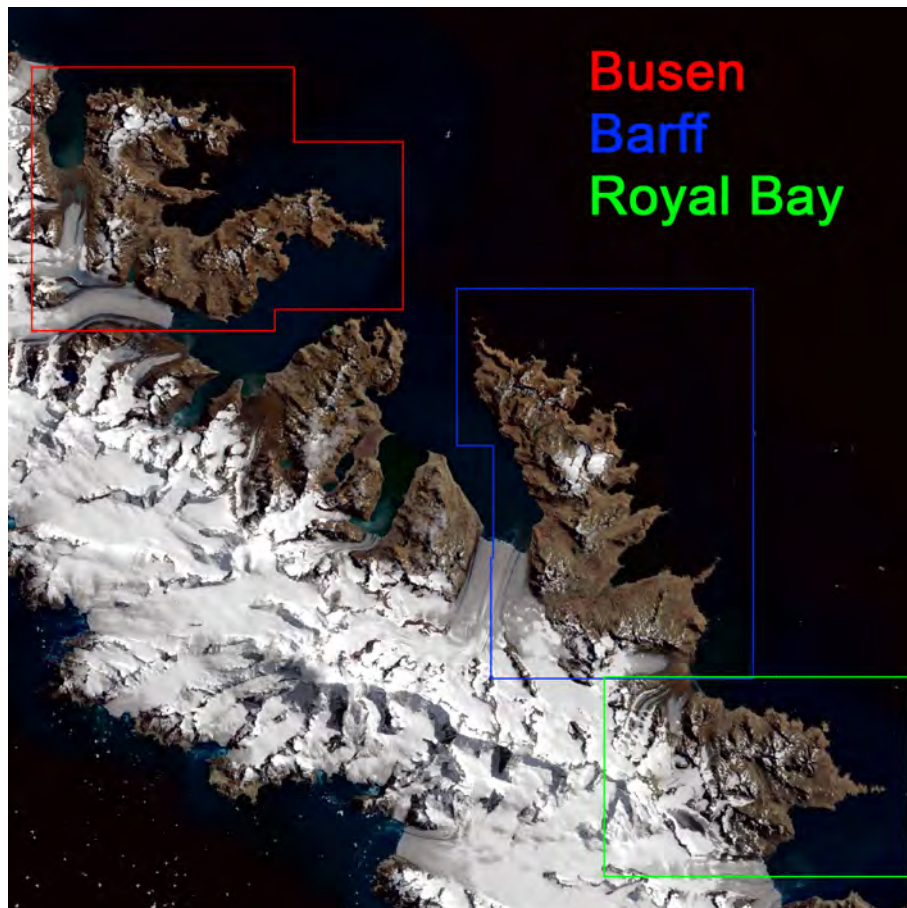


Figure 1 - Location of the two reindeer herds (Barff + Royal Bay are considered one herd)

It may be preferable for any removal operation to initially focus on one of these areas, reviewing the effectiveness of methods and any problems in a 'lessons learnt' feedback process before extending operations to the other area. However financially it may be prohibitive to mobilise teams twice, and there would also be conflicts with the rodent eradication in 2014/2015.

1.6 Topographic and environmental considerations

The majority of the Barff Peninsula is easily accessible on foot, the exceptions being the NW coast of the peninsula and the area around Mts Fusillier and Skittle, and the area south of St Andrews Bay. The bays on the SE coast of the Busen are not easily accessible other than by boat (though don't contain many reindeer), and the areas either side of Fortuna Bay are difficult. Realistically there are several areas where ground shooting would be difficult or impossible, likewise there are areas where

aerial shooting would be inappropriate (such as St Andrews Bay, a large king penguin colony). Vulnerable wildlife areas are shown on the GSGGSI Low Flight Avoidance maps, shown for relevant areas in Figures 2 and 3 below. The key for the maps is shown in Figure 4. It is likely that both aerial and ground shooting would need to be utilised in some way in these areas, or for the animals to be herded out of these sites.



Figure 2. Sensitive wildlife areas on the Barff Peninsula



Figure 3. Sensitive wildlife areas on the Busen Peninsula.

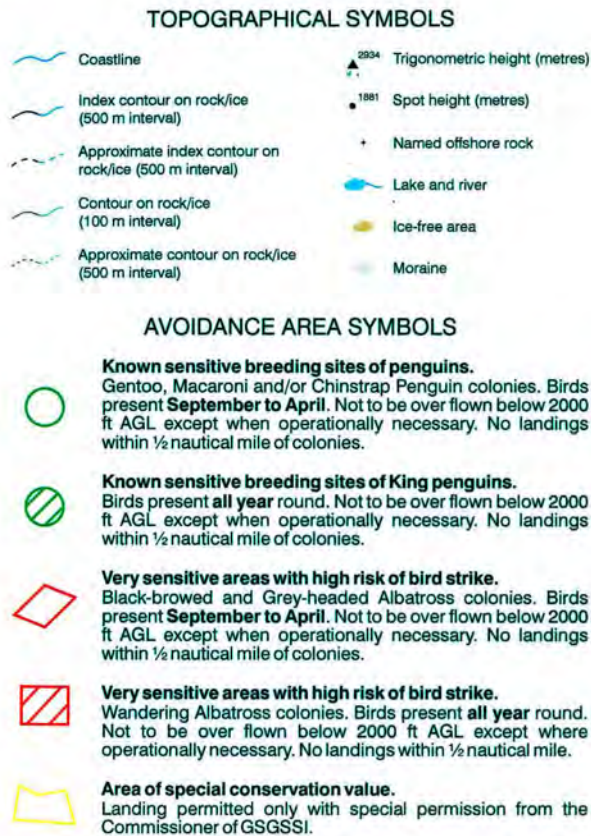


Figure 4. Key to low flight avoidance maps in Figures 2 and 3

1.7 Population estimates

Population counts have varied in accuracy over the years (Bell, 2001). Genetic population models estimate maximum populations to be 5000 animals on the Barff, and 1500 on the Busen (Lovatt, 2007). In reality, the Busen herd is currently thought to be 1000 (Bell, 2001, Lovatt, 2007) animals, and the most recent physical count on the Barff estimated a population of 2100 animals (Leader-Williams, 1988). Results of a census on the Busen are provided in Appendix 1 (Bell, 2001). Bell and Deitrich (2010) estimate the total South Georgia population to be 2600 animals. Using these figures, a low estimate of 2600 individuals and a high estimate of 3100 gives an average of 2,850 animals total population.

Studies in 1980 estimated densities at 40 animals per km² for the main Barff herd, and 85 animals per km² in the Royal Bay area. A 1982 study estimated a density for the Busen of 58 animals per km².

1.8 Lifecycle – seasonal considerations

The rut is estimated to peak between 20th and 30th March, continuing through the first 2 weeks of April, with the resulting calves being born in November (see **Table 1**). Conroy (1988) observed that before the onset of the rut, between Jan and March, animals form herds according to sex – with groups of up to 20 stags and 40 females and calves seen. However, he also noted groups of animals half this size, with single female/calve pairs frequently seen.

Month	Event	Male Antlers	Pregnant Female Antlers	Barren Female Antlers
November	Calve	Growth (Velvet)	Cast	Cast
December			Growth (Velvet)	Growth (Velvet)
January	Formation of single-sex herds			
February		Hard horn		
March	Rut		Hard horn	Hard horn
April				
May	Snow	Cast		
June	Snow			
July	Snow	Growth (Velvet)		
August	Snow			
September	Snow			
October	Snow			Cast

Table 1 – Table highlighting key annual events in reindeer lifecycle (Derived from Leader-Williams, 1988)

Normal stalking practice in UK involves shooting deer when they do not have dependent calves. Although the aim of the South Georgia project is the removal of reindeer from the island an important animal welfare aspect of the operation would be the avoidance of orphaned reindeer calves being left to starve. On South Georgia calves are born in November.

The optimum time for any shooting operations would be March/April, when animals have aggregated for the rut and when a closer approach is possible. This also coincides with a period of low bird and seal numbers. During the onset of winter animals are forced to the coast by thick snow and limited access to food, but weather conditions are often such that work on foot or from the air would be dangerous and difficult.

However, given the requirement to remove the carcasses, and the desire therefore to utilise meat and other products from the carcasses, the timing needs to be adjusted to before the rut, at which time the meat becomes tainted. Avoiding dependant calves, this gives a window of January-March.

2 Possible Methods

2.1 Ground shooting – key considerations

Ground shooting as a means of population control is not suitable in inaccessible or rough terrain where sighting of target animals and accurate shooting is difficult or when wounded animals cannot easily be followed up and killed. Shooting as a control technique, if properly carried out, is one of the most humane methods of killing feral deer, as long as best practice is followed. An example of best practice guidelines are provided in Appendix 4.

Herd flight response is a limiting factor for humane and instantaneous killing of deer. Silenced rifles may reduce animal disturbance and facilitate accurate shooting (DEWHA, 2004). Silencers should be purchased for this reason for any ground operations on South Georgia.

Best estimates give ground shooting only one-fifth the capacity of aerial shooting in areas where both can be undertaken (Saafeld and Zeng, 2008). However, ground shooting is less likely to induce a flight response in animals than a low-level helicopter overflight, which makes it more appropriate for use near non-target wildlife aggregations and other sensitive areas.

2.2 Ground shooting – relevant behaviour of animals

On South Georgia it has been observed that as long as the deer do not catch sight of a man, they are surprisingly unafraid of shooting, and will continue to graze around the carcasses of fallen animals (Payne, 1972). The Busen animals are also relatively simple to herd on foot, though terrain, namely steep scree slopes, prevents herding of animals out of Cape Saunders, Leith Harbour and Fortuna Bay, and would only be possible by use of helicopter (Bell, 2001). The Barff animals are much more sensitive to disturbance, and difficult to herd and manage (Dietrich and Bell, 2000).

Leader Williams (1974) discusses the difficulty of approaching animals in February, only being able to get as close as 60 yards through careful stalking, and suggests that during and after the rut would allow a closer approach.

It was felt that ground-based hunting as an eradication method might work well for a short, initial period. However, as the animals learn to connect the presence of people with guns, it is likely that the animal's behavior would change rapidly. This is common with reindeer hunting in Norway, with reindeer showing relatively little fear in the initial part of the hunting season but becoming increasingly skittish as the season progresses.

2.3 Aerial shooting – key considerations

In Australia and New Zealand aerial shooting has been used extensively and is considered to be very humane if carried out responsibly with experienced personnel, and if best practice guidelines are followed. An example of these guidelines is provided in Appendix 3.

Aerial shooting of reindeer from a helicopter is used for large-scale population reductions in remote and/or inaccessible areas. Teams involved in shooting from a helicopter should consist of a qualified and experienced shooter, a qualified and

experienced pilot and a spotter who locates the reindeer and records the location and number of animals shot (Sharp and Saunders 2005). In both Australia and New Zealand competency frameworks exist to assess and qualify aerial shooters. An example of New Zealand competency assessment guidelines is provided in Appendix 5.

Aerial shooting can be a humane method of destroying reindeer when it is carried out by experienced and skilled shooters and pilots as long as: the animal can be clearly seen and is within range; the correct firearm, ammunition and shot placement is used; and wounded animals are promptly located and killed. However, shooting from a moving platform reduces accuracy, so aerial shooting does not always result in a clean kill. Therefore, it is imperative that shots are followed up to ensure a humane death (Sharp and Saunders 2005).

New Zealand has a long history of using helicopters to cull deer, shoot and recover deer for export of wild venison, and live capture of deer to stock deer farms. During the 1960s and 1970s commercial deer recovery resulted in a 90% reduction of the deer population in subalpine grasslands. Peak harvest in the mid 1970s was almost 150,000 deer/yr. After a decline in the deer population the harvest has averaged 18-20,000 deer/yr.

New Zealand currently has around 50 skilled operators. Operators are very skilled at shooting running deer from a moving helicopter. Some of these operators have been used in overseas culling operations, for example the goat eradication in the Galapagos islands.

Safety is a key consideration for aerial culling, and best practice procedures are provided for reference in Appendix 6.

Shooting is relatively target specific if carried out responsibly, and does not usually impact on other species. However, there is always a risk of injuring or killing non-target animals if shots are taken when reindeer are in the vicinity of non-target species.

Reindeer are easily frightened by gunshots, helicopter rotor noise, wind etc. and may injure themselves by running into obstacles or each other, or injure other animals whilst stampeding. Shooting should be avoided in areas where this may occur.

2.4 Conclusions

Both ground and helicopter based shooting can be humane management methods, though both may not be if not carried out appropriately. Obviously experienced people are needed for both ground and helicopter hunting.

From an animal welfare perspective it was agreed that the 'default' position is that ground shooting would be the preferred method of choice, as inherently, assuming competence of stalkers and suitable firearm/ammunition, it carries less welfare risks than aerial shooting. There is general acceptance however that an element of aerial shooting may be required in remote and hazardous areas.

In the UK shooting deer from helicopters or moving vehicles is a prohibited method of killing. Therefore its use would raise questions as to why a method that is illegal in UK is being used in one of the UK's Overseas Territories. If it may be the case that the circumstances in South Georgia are such that ground stalking alone might be insufficient to achieve eradication then these circumstances would need to be clearly set out.

Under South Georgia's domestic legislation, aerial shooting would be allowable under permit issued by the Commissioner under the Wildlife and Protected Areas Ordinance.

Practical and safety aspects may well dictate that in some areas 'shooting to waste' and leaving the carcasses may be inevitable.

There appears to be a short period of suitable time for the operation, i.e. around Jan/Feb, when considering behaviour and ecology of the animals.

Weather conditions (wind) may severely restrict any planned field operations, particularly helicopter work.

Considering the above, preparation and field readiness prior to the operational period may be critical to being able to complete the planned work.

2.5 Herding and corralling – a third option

In Norway experience of handling and controlling reindeer has shown that herding and corralling - including the active use of helicopters for herding the animals towards lead-fences and corrals for final handling – has proved to be the most humane and effective way of managing and killing large numbers of reindeer. Herding and corralling was also successfully used on South Georgia for the Falkland Island Government reindeer translocation project. Based on this considerable experience, and potential concerns over exclusive use of aerial or ground shooting alone (and subsequent issues with carcass recovery) it was proposed that this should be the primary method for the main part of the eradication in South Georgia. This method is used by Sami reindeer herders in northern Norway, and was also applied with great success after the Chernobyl accident in the mid-eighties, when hundreds of wild reindeer had to be corralled for blood tests in the mountains of southern Norway.

Whilst using helicopters and vehicles to herd animals will cause a moderate amount of stress, this can be minimized by using best practice guidelines and experienced personnel. The amount of stress involved would be considerably less than pursuing and shooting great numbers of individual animals from helicopters. It is however an important prerequisite to leave this sort of practical ground-oriented operation to very experienced reindeer herders who bring with them hundreds of years of traditional knowledge. The former Deer Commission for Scotland produced a best practice guide for the use of helicopters to herd deer. This has been adapted for reference and is copied in Appendix 2. Further guidelines exist for the use of helicopters to muster feral horses in Australia. Principles in this document are applicable, and it is provided in Appendix 7.

A rough initial estimate from experienced Sami herders is that 8 people should be able to herd and handle up to 3000 reindeer within a month (given reasonable weather conditions). There will be need for supplementary methods as well, such as hunting from the ground and/or from helicopter.

By choosing herding/corralling as the primary eradication method it is possible to prepare the carcasses for further utilization and to remove the carcasses from the island. Care should be taken to ensure effort is put into the efficient killing of animals in terms of time, costs, and animal ethics. What products are recovered will be dependent on available transport, storage capacity and market. It is felt that some of these costs could be counterbalanced by income from selling the meat, assuming a suitable market can be found. In addition the waste (entrails, hides and bones) could be disposed of at sea, if a suitable vessel and maceration device can be found. In order to utilize as much as possible of the carcasses, the main part of the eradication operation should be completed before the main rutting season in March.

Concerns have been raised regarding the application of traditional Norwegian techniques to wild South Georgia reindeer, as opposed to Norwegian reindeer that are used to being managed. It was noted that corralling has on many occasions successfully captured Norwegian wild reindeer, and that these animals were far more skittish than the reindeer observed by group members on South Georgia.

Comparison of management methods

Control Method	Efficiency	Humaneness	Other considerations	Environmental Cost/Impact	Cost
Aerial Shooting	<p>Effective for large numbers, best returns where density is high</p> <p>Cover large areas quickly</p> <p>Helicopters can also be used for carcass recovery if required</p>	<p>Likely to induce panic and flight response, which could result in injury or death</p> <p>Not all animals killed cleanly, though follow up is fast with a helicopter</p>	<p>Effective in open terrain and areas inaccessible on foot</p> <p>“overkill” policy to be employed, which has consequences on whether meat is recoverable or fit for human consumption</p>	<p>Noise disturbance</p> <p>Potential for panicking animals to stampede through penguin and seal colonies</p>	<p>Expensive, costs increase as density of animals decreases</p> <p>Use for carcass recovery labour intensive and costly</p>
Ground Shooting	<p>Effective for small numbers</p> <p>Highly effective if contained in a corral</p>	<p>Most humane form of lethal control</p> <p>Chance of not being able to follow up injured reindeer in the field</p>	<p>Effective in flat open terrain</p> <p>Increased accuracy means most animals killed with single shot, more meat recoverable</p>	<p>Minimal impact</p>	<p>Expensive and labour intensive for large numbers</p> <p>Carcass recovery costly and labour intensive</p>
Herding and corraling	<p>Effective</p> <p>Requires skilled operators</p> <p>Requires a good knowledge of the reindeer herd & terrain</p>	<p>Stress considerations from mustering, needs to be done sensitively</p> <p>Allows for humane killing</p>	<p>Difficult in rough terrain whilst on foot</p> <p>Not possible to remove all animals, still a need to shoot remainder from the air or on foot</p>	<p>Non target fauna at risk from stampeding animals if not carried out responsibly</p>	<p>Increased manpower costs offset against decreased cost of carcass recovery, as animals killed on site</p> <p>Allows for simple recovery of meat</p>

3 Experience of herding reindeer on South Georgia. *(All in this section derived from; Lawrence, 2002; Bell, 2002; Dietrich and Bell, 2000; Bell and Dietrich, 2010)*

3.1 Falkland Island Government translocation, January 2001

In January 2001 the Falkland Island Government carried out a translocation of fawns from South Georgia to the Falkland Islands. This involved 4 weeks on South Georgia, based at Husvik, targeting the Busen herd. A suitable site was identified for the construction of handling facilities. This site was located on a flood plain on the southern side of the abandoned Husvik whaling station (54°11'S, 36°43'W), on Stromness Bay.

A team of 11 persons constructed a circular corral (approx 25 m diameter) and associated yards, as well as two 'wing' fences several hundred meters long to guide reindeer towards the corral. In early January 2001 a field party of eleven personnel arrived at the chosen site. A circular corral of approximately 25 m diameter was constructed using prefabricated aluminium panels that were approximately 3 m long and 2 m high. Guyed with fencing wire to steel stakes, the open panels were lined internally with hessian to create a visual barrier. Two 'wing' fences leading to the main corral were constructed using a combination of wire netting and fencing wire, and strips of plastic sheeting were tied to this fencing as bunting to create the impression of a physical barrier to the reindeer. Two pens adjoining the corral were constructed. One pen of 6 m diameter opened directly off the main corral, and was connected to a 'chute' that was V-shaped in cross-section and lined with timber panels. The second pen, for holding calves, also adjoined the main corral. Both these pens were also constructed with prefabricated aluminium panels, but were lined with timber panels to a height of 2.5 m. These two pens were later merged to provide an enlarged area for holding captive calves. Shelters and bedding material were provided for the captive calves.

Following the construction of holding facilities, herding was commenced on foot, using geographical features to assist in the movement of reindeer. Once the

reindeer were within the proximity of the corral, four to five additional personnel assisted with the final drive of animals to the 'wing' fences and into the corral.

Driving reindeer from the Busen herd was described as being more like driving flighty cattle than other deer species. They were found to move at a steady pace and could be directed relatively easily by several people, the landscape and then guide fences into the corral. In one herding effort over 200 animals (adults and fawns) were captured.

Herding was generally undertaken by six persons, although the first herding of the north coast of the Busen Peninsula was executed using four. Herders worked in pairs for both safety and practical reasons. Usually there was only one radio unit per pair, so the two persons needed to maintain visual contact. Hand signals were also used to facilitate this. Based on personal observations and advice from fieldworkers on the ground with respect to animal distribution and geography, a plan was devised by the herding team. Herding plans were often modified on the day to take into account behaviour of reindeer.

The primary herding group would link up with the remaining personnel as the reindeer entered Husvik valley from Tonsberg Peninsula or as they left Olsen Valley, directing animals to the wing fences and finally the corral.

Once into the corral, animals were held for a maximum of a few hours. During this time, animals circled around the corral initially before settling down and resting. They were not provided feed or water in the corral for this period of time. It was found to be easy to move them in groups from the corral into adjoining yards, followed by running adults through a 'race' or 'chute' (and releasing them) and fawns into a smaller pen where they were held until shipping.

It is felt to be highly important that good facilities for handling and holding of animals are available. This system worked well and animals responded accordingly.

3.1.1 Transport

The sea truck *Lady Diana* was utilised for the unloading operation at Husvik, taking four days. This phase of the operation was slow because of the cargo capacity and speed of the sea truck. The operation was facilitated by the use of two quad bikes and one trailer, ensuring rapid movement of goods off the beach. Items unloaded included 12 tonnes of reindeer feed, sixty 8' x 4' plywood sheets, 1.6 tonnes of hessian (3600 m of 1.5 m width), thirty five 4 m long timber boards and 30 rolls of wire netting.

For loading at Husvik, the *Lady Diana* was replaced with a larger and more powerful sea truck operated by Michael McRae (South Harbour West Falklands). Loading took only 2 days.

3.1.2 South Georgia facility design

A circular corral of approximately 25m diameter was constructed using prefabricated aluminium panels (3 x 2 m), originally intended for cattle yards. These were guyed to metal stakes and lined internally with hessian to create a visual barrier along most of the circumference. A section opposite the entrance was not covered with hessian to give a false impression of an escape route for the reindeer. The main gateway was formed with six panels, put into place once animals had been herded into the corral.

Two pens were constructed adjacent to the corral. A drafting pen of approximately 6 m diameter opened directly into the corral, with an adjoining v-shaped chute. A fawn holding pen approximately 1.5 times the size of the drafting pen was also constructed using the aluminium panels. Both pens were lined with plywood (2.5 m height). In the later phases of the South Georgia operation, these two pens were merged to provide increased area for the fawns and also to allow removal of fawns from the feeding area whilst troughs and water containers were being refreshed.

Shelters were constructed using timber crates, timber and a tarpaulin in the fawn holding area and hessian used for bedding material.

Wing fences were constructed using wire netting and plain wire. Plastic flagging (strips of plastic knotted around the wire) was used on most sections of the wing fences to create a visual barrier, although some parts were left un-flagged to give the impression of an escape route.

3.2 Results

During herding operations, a total of 98 fawns were observed including those not captured. Numbers of adult animals observed are detailed in **Table 2** also. Reindeer found at Cape Saunders, Leith Harbour and Fortuna Bay could not be herded out of these areas. Even with more personnel, this may have been impossible. Animals, for example, had to be herded down a scree slope from Cape Saunders whilst those from Fortuna Bay needed to go over a mountain pass. The use of a helicopter may have been the only way these animals could have been herded.

Location	Herding date	Adults captured and/or observed
Carlita/Olsen Valleys	14/1/01	169
Busen Peninsula (north coast)	16/1/01	60
Cape Saunders	20-21/1/01	NR
Stromness Harbour	22/1/01	35-40
Fortuna East	26/1/01	NR
Olsen Valley	27/1/01	c.200
Jason Harbour	29/1/01	51 (40-45 male)

Table 2. The number of adults captured and/or observed at herdings. NR = not recorded.

3.2 Private reindeer translocation, February 2002

In February and March 2002, a private expedition carried out a reindeer translocation from South Georgia to the Falkland Islands. Two capture sites were utilized: Ocean Harbour (on the Barff Peninsular) and Leith (located by Stromness).

Ocean Harbour

A four-wire one-kilometre wing-fence was constructed on the east side of the bay running up the hill behind the old ship to the scree. This was laid to follow a well-used deer track. A second short wing-fence was run down into the sea. Both wing-fences funneled into a set of mobile cattle yards, which were hidden by tussac. The 'funnel area' of the fencing was more strongly constructed than the wing-fences. The wing-fences were first transformed into a two-meter fence with eight wires and then covered with green netting when closer to the cattle yards. The three drives executed at this site were largely unsuccessful; the total catch being five male fawns and two female fawns.

The reasons for the poor success rate were:

1. The Barff reindeer were difficult to drive, breaking back between herders that were spaced only 20 mtrs apart. (The Leith reindeer did not display this behaviour).
2. The angle of the long wing-fence was not acute enough, so did not funnel the deer down towards the yards.
3. When pressed the Barff reindeer will swim; so using the sea as a substitute wing-fence failed.

Leith

The catching facilities were constructed on the south side of the football field. A 400-mtr wing-fence was erected (four wires with two meter wooden boards placed vertically and interwoven through the wires). This was felt to be by far the best fence design used and was recommended for future use. A second, similarly constructed, short wing-fence was erected to the line of storage towers. Both fences funnelled into the mobile cattle yards that had been erected and hidden behind the old cinema.

Once again the 'funnel area' was strengthened with green netting and double-high boundary netting was used for the final length of the fence. The boundary netting provided a 'see-through' section immediately before the corral. A roll of burlap was positioned at the funnel for use as a temporary fence to hold the reindeer until they could be locked in the cattle yards.

The drives at Leith were much more successful than Ocean Harbour with up to 50 reindeer being caught at any one time.

The best herding technique, developed by trial and error, involved identifying a family group and then concentrating on that one group. Any time that herding mixed family groups together the stags began to fight and the drive was unsuccessful. Using two/three herders to slowly work a family group to the vicinity of the football field further refined the technique. Once in this position the other herders, brought around on the zodiac, joined them. One person remained hidden under hessian at the funnel near the cattle yards ready to shut the enclosure.

3.3 Lessons learned from the translocations

3.3.1 General Observations

- Animals of the Busen herd were observed to be much tamer and easier herded than the Barff Peninsula (Reindeer and Sörling Valleys) animals.
- Fawns appeared to be approximately 3-4 months of age in late-February.
- South Georgia reindeer are of a similar size to Alaskan reindeer.
- Males were observed to be commencing rutting behaviour and velvet shedding in late-February.
- Coat shedding was nearly complete, with new winter hair approximately two thirds of the expected mature length.

3.3.2 Specific Observations

Barff herd (Reindeer and Sörling Valleys)

- Low fawn production in groups observed.
- Males were starting to rut with velvet being shed and exhibition of some rutting behaviour patterns. Similar to late August in Alaska.

Busen herd (Husvik and Stromness area)

- Similar in body size to Barff reindeer.
- Much tamer than Barff reindeer.
- Easy to approach and easier to herd.
- Generally observed small groups (1-10 individuals) comprised primarily of males with a few barren females. Would suspect that cows with fawns would be in larger groups in other areas based on Alaska reindeer behaviour patterns.
- Total of 204 individuals counted in Olsen Valley.

A. Animals in the two herds were observed to behave differently. Animals on the Barff herd were 'spooked' very easily i.e. as soon as they observed people, even at a distance of several hundred meters. Trial herding (albeit with 3 persons on foot) failed. In 2002 Jerome Poncet attempted herding of animals in this population at Ocean Harbour. His team reported that the animals were difficult to drive, breaking back between herders that were spaced only 20 metres apart and when pressed were observed to swim to escape.

In contrast, animals in the Busen herd could be approached relatively closely without disturbing and could be herded relatively easily on foot. Jerome Poncet and his team also found in 2002 that herding of animals from the Busen herd at Leith was relatively easy. In a 2000 recce visit two adults grazing approximately 40-50 metres from the Husvik manager's residence were observed. One animal was shot with an unsilenced rifle. The second animal was startled for a moment but did not move away, and continued grazing.

B. Terrain found in the range of reindeer. Much of the terrain where reindeer can be found (in both herds) consists of long, open, grassed valleys. This terrain was used to the teams advantage in the herding of the Busen reindeer on foot. It is country that can generally be crossed on foot relatively easily. Despite a large proportion of the range of the Busen herd also being rugged and steep terrain, much of this can also be covered by experienced walkers; the reindeer use only a small percentage of the total area as most higher terrain is free of vegetation. Some of the coastline (e.g. between Stromness and Husvik) is fringed by steep slopes, potentially making herding of reindeer relatively easy. In general, access to the entire range of the Busen herd is fairly straightforward, with the exception of the west coast of Fortuna Bay and some of the bays on the south east coast.

Barff herd (Reindeer and Sörling Valleys)

- Reindeer and Sörling Valleys suitable for herding animals as they are long valleys with steep sides.
- Sörling Valley extends the width of the Barff Peninsula.
- The only appropriate site for yard construction would be on the flat expanse of land behind the beach adjacent to the Nordenskjöld Glacier.

Busen herd

- Olsen Valley is a long valley with high, steep sides, extending from Carlita Bay to Stromness Bay, just south-east of Husvik. This valley would be suitable for herding of reindeer. Aside from this area, much of the Busen Peninsula is steep, rugged terrain. It is unlikely that large numbers of reindeer would be found over this area. A previous study also suggested this.
- Large expanses of open country, fringed by steep slopes lie behind both Husvik and Stromness.
- The area north of Leith and west to Fortuna Bay were observed from the ship only, but appeared to be of similar terrain as the Busen Peninsula.
- Despite a large proportion of the range of this herd being rugged and steep terrain, much of the reindeer range could be covered by experienced walkers. The reindeer use only a small percentage of the total area as most higher terrain is free of vegetation.

C. Husvik

The Husvik whaling station provided a suitable operational base for the 4 week expedition. All supplies were landed by flat-bottom punt onto the beach. It is centrally located for the Busen herd, and has a large open plain which could be used to construct a corral network.

3.4 Summary of implications for an eradication

It is likely that the Busen herd will be easier to cull than the Barff herd due to both geography and animal behaviour, irrespective of method used. A phased approach where the Busen herd is tackled first would be useful in relation to building up the experience before moving onto the Barff herd.

The 2001 FIG translocation of reindeer demonstrated that herding of mobs of over 200 reindeer was possible, at least in the Busen herd on South Georgia.

Herding was generally undertaken by 6 persons on foot, with the remaining 5 crew assisting once animals were close to the corral. Herding was undertaken in the second half of Jan 2001, over a 2 week period.

Fawns were estimated to be 10-12 weeks of age at the time of capture, based on their size and the assumption they were born in November (as per previous studies).

Difficulties were encountered herding in more mountainous areas (e.g. Cape Saunders), but having some additional personnel and/or the use of a helicopter (i.e. for driving reindeer) would have assisted. The easiest areas to herd from were found to be the long valleys with high sides (e.g. Olsen Valley) where the geography significantly assisted gathering.

Based on this experience, and the input of Norwegian experts, a largely ground based muster of reindeer to pre-prepared yards/corrals as the primary means of eradication appears to be a very sensible and workable option.

Concerns to be addressed are:

- do the reindeer move ahead of the walkers quietly and showing minimal signs of stress ?
- can adequate sustenance be provided to the reindeer during their brief period in captivity or will they be happier without it?
- at what point will the humane killing of reindeer in the yards begin and what will the effect be on the other reindeer being held?
- How will the stress of yarded animals be minimised and will this be less stress than a short period of being pursued by helicopter would cause, if herding was not used?
- How will the carcasses of animals destroyed in the yards, be managed?

Experienced shooters and hunting pilots will also be important from a welfare angle, when tackling the less co-operative animals which could not be yarded.

1. As much "on the ground" preparation should be completed before the start of any operational time period as possible (e.g. Corral building, familiarising hunters with site.)
2. Be prepared to modify methods to accommodate onsite learning.
3. Have flexible timeframes for phasing methods. It may require assessment of several aspects or trigger point measures when deciding to start or stop rules for each phase or method.
4. Each method should be able to work independently but they will need to be well coordinated.

4 Key animal welfare concerns

The herding process itself will need to be carefully undertaken to avoid the reindeer panicking in flight, with associated risk of injury. The 2001 translocation operation on SG used a number of drives on the Busen involving sections of the herd rather than one mass drive. Corraling subsets of the herd may reduce any risks of panic amongst large numbers of animals.

The killing of animals at the site, with respect to welfare and logistics, will be more of a challenge than the gathering.

In terms of animal welfare, a number of factors are important:

- 1 Making sure animals aren't panicked whilst being herded, and aren't stressed/injure themselves or other animals
- 2 Making sure corralled animals have room to move, and aren't densely packed
- 3 Minimising time spent in the corral – streams for drinking water could be factored into the areas to be corralled, but availability of grazing will be minimal.
- 4 Points 2 and 3 would be largely solved if there was sufficient capacity in terms of processing carcasses to ensure animals are moved through the system quickly.
- 5 Fawns – if operations were carried out prior to January, fawns would still dependent on their mothers, and would be particularly vulnerable to injury during herding and corraling. Operations could only be carried out humanely in this regard from January onwards, as occurred with the FIG and private translocations.

The majority of these elements of animal welfare can be mitigated by having sufficient capacity to process the animals quickly.

The 2001 translocation was carried out in January. No issues were encountered with fawns either during herding, in the corral or whilst physically handling them.

5 Recovery of meat

It would be logistically very difficult or impossible to put refrigeration facilities ashore on the Barff and Busen, as there are no jetties or plant machinery available. However, it has been indicated that it will be possible to have a fishing vessel with a refrigeration and freezer hold sat just offshore, capable of freezing 15-20 tonnes a day. Enquiries have suggested there would be no issue with the carcasses being stacked in the freezers if appropriately packed. Conditional on good cleaning practices, there would be no issue with using a fishing vessel in this manner. Once in the Falklands, carcasses could be containerised and shipped.

This assumes a market can be found for the meat, and that it would be economically sensible to do this.

It has been indicated that Norway is not a possible market for the meat, due to domestic economic considerations. Other markets being pursued are the USA, Canada and Russia. Precise details regarding hygiene and butchering requirements will vary depending on the import requirements of the country in question.

Primarily the hindquarters, fillets, hearts, tongues and antlers will be recoverable. A rough estimate is that this will equate to 40-45 tonnes of high quality product, with an estimated value of £500,000.

Export to EU countries is not currently possible, as regulations state meat can only be imported from a listed third-country – South Georgia is not a listed country.

A small mobile butchery can be established onshore to bleed and gut animals. Carcasses will then be transported to a ship for skinning and butchering. Clean water will be required onshore, for washing hands and equipment as well as rinsing skins and feet prior to butchering.

Slaughterers will have to document compliance with slaughter and hygiene regulations, and animal welfare regulations.

By way of example and reference, relevant EU regulations on food hygiene and import requirements are included in Appendices 7 and 8.

6 Conclusions and the way ahead

Early indications suggest that 90-95% of animals should be recoverable by herding, with the remainder being left behind. Further efforts to gather these animals would be difficult and time consuming. It is therefore proposed that uncaught animals be shot by hunters on foot (members of the herding/slaughtering team will be more than suitably qualified to do this). Animals in remote and inaccessible areas will be shot from helicopters, and if necessary the carcasses left on the hill.

6.1 Preparatory planning

A thorough reconnaissance has been scheduled to be done as part of the detailed planning of the operations (in Jan 2012, at the same time of the year as the operations are planned to take place). Migrating routes and barriers should be mapped in advance. "Snowroads" and other passages frequently used by the reindeer should be identified as part of this.

It is vital that the reconnaissance trip to the island in Jan 2012 establishes the level of need for helicopter support, as any use of helicopters will need to be agreed and deconflicted with the South Georgia Heritage Trust, who own and operate the helicopters and have their own operational requirements for the aircraft in early 2013. A prompt and constructive dialogue will be imperative at an early stage, once a clear picture of requirement is known.

Initially two seasons were considered necessary to carry out the operations. However, if the reconnaissance in 2012 indicates that a more rapid operation is possible, doing both peninsulas in one season should be considered.

6.2 Equipment needed for lead fences and enclosures/corrals

Use of a cargo tender is likely to be vital for transporting cargo ashore. Four-wheel bikes will be needed to carry the equipment from the shore to the corral sites.

There will obviously be a smaller setup for Busen than for the Barff peninsula. The need for lead fences and enclosures/corrals will be dimensioned for the maximum need (Barff). A preliminary estimate has been provided as a total cost of 250.000 NOK (**28-30 000 GBP**) for equipment/material for lead fences and enclosures, based on an estimated maximum need of app. 1500 meters of lead fences and enclosure system. The estimate should be considered more closely following reconnaissance in January 2012. The system of lead fences and enclosures will consist of 2.5 meter tall wooden poles (8 cm diameter), 1.5 meter tall wire netting plus separate wire above the netting and hessian netting. The distance between the poles will normally be 2-3 meters, and 4-5 meters for the lead fences (depending on the terrain etc). Much of the actual material used by reindeer herders in Norway is imported from (or through) the UK. The transportation to South Georgia should therefore be relatively simple.

The sketch below shows how a corral system may function in principle. The fencing system for use on South Georgia would need to be simpler (with fewer compartments than shown). In addition, long lead-fences will be needed towards the main entrance/"gate" of the first compartment. Experienced reindeer herders who can be hired for the job will have all the experience needed for setting up a suitable corral system (including lead-fences) according to the given conditions on the various sites. The corral system should end up in a narrow corridor where one by one animals can be lead toward a field butchery (upper part of the sketch). A field butchery should be manned with app 10 skilled persons (certified firm). In Norway such a team will normally have a capacity of butchering app. 200 reindeer pr day. In addition will be a need for a number of reindeer herders as mentioned to set up the fencing system and also to carry out the herding operation on the ground (assisted by one experienced reindeer herder in each helicopter used for "pushing" the animals towards the corral system, as required.

Reindeer corral (fencing) system in principle

Figure 5 shows in principle the various elements that may be connected for herding/sorting a large number of reindeer (many hundreds or more). For the planned operations in South Georgia - leading the animals towards a field butchery - this system will be greatly simplified (fewer fencing elements). Figures 6 and 7 show the system working in Norway.

In order to release animals from any part of the system, one may simply make exits where needed, without constructing any "gate"-like openings. Some herds make circular movements clockwise, whereas (in Norway) they will most frequently move counter-clockwise. This should be taken into account when setting up the fencing system.

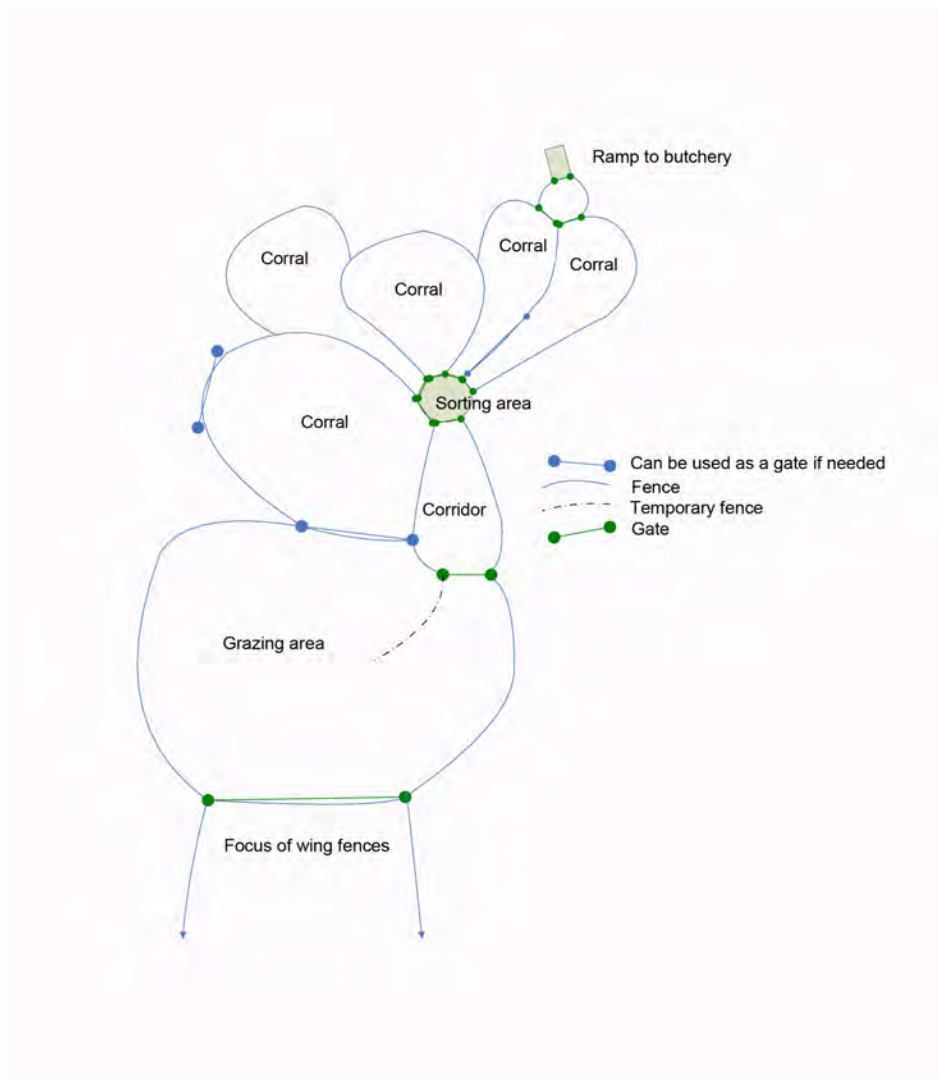


Figure 5. Sketch of a generic corral system



Figure 6. Initial enclosure and lead fence system. (Henrik Eira)



Figure 7. Central enclosure with satellite enclosures clearly visible. (Henrik Eira)

6.3 Qualifications for personnel regarding construction of enclosures, herding/gathering and slaughtering

There would be considerable benefits to hiring “multi-tasking” personnel with experience of reindeer herding, construction of fence-/enclosure systems and slaughtering combined. The various elements of the proposed operations are closely linked, and every person should know both their own, and others, responsibilities as operations proceed. The authorized reindeer slaughter firms in Norway have mainly recruited experienced reindeer herders, and experienced people from this community will no doubt be able to carry out the ground operations with sufficient effectiveness. Of great importance is the ability to “read” the animals during the gathering process, and also to read the signs from colleagues in the field. An experienced reindeer herder will also be needed to assist the helicopter pilot during the air-based gathering of reindeer herds towards the enclosure system. Most of the people in question speak Sami and Norwegian, normally with rather limited knowledge of English. However, an overseer and representatives from the Norwegian Nature Inspectorate should be able to meet the necessary needs for translation between GSGSSI representatives and the Sami personnel during the entire operations.

6.4 Estimates of manpower and costs for field operations

A team of 8 “field persons” is considered to be ideal for an effective working process on the ground, slaughtering included. In addition the Norwegian Nature Inspectorate should be represented by 3-4 experienced officers (including an overseer and a couple of experienced shooters (helicopter- as well as ground-based)). The field personnel to be hired (8 persons) will probably accept an average salary of app. 250 NOK per hour (app. 28 GBP per hour), i.e. app. 225 GBP per day.

Rough estimate of work (estimated for the Busen herd) is as follows:

- Travel time: app 14 days (round-trip northernmost Norway-South Georgia-Norway) (8 x 14 = **112** day's work)
- Setting up and taking down enclosure system and lead fences: app 10 days: 5-6 for setting up and 3-4 days for demounting (8 x 10 = **80** day's work)
- Gathering and slaughtering, Busen peninsula: app 5-6 days, given suitable weather conditions (6 x 8 = **48** day's work), based on a slaughter capacity of app. 200 animals per day.

This sums up to a total of 240 day's work, and a total working cost of **54 000 GBP**.

The estimated travel cost per person is around 25000 NOK, equal to 2800 GBP; for 8 persons app. **22 400 GBP**.

Hence, the total costs of equipment and hired field personnel based on the above, adds up to app **106 000 GBP** , which equals **100-110 000 GBP**, based on today's currency ratio (1 GBP = 9,00 NOK).

Extrapolating these costs for the Barff, a worse case scenario of double the cost of the Busen a figure of £108,000 labour, so a total for the project of **£210-220,000**.

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Appendix 1. Reindeer census and distribution results for the Busen herd, 2001



Map of census area with 1 km grid squares. Numbered grid squares represent grid squares where reindeer were observed (see Table overleaf for numbers of animals). An asterisk denotes areas suitable for grazing but where no animals were observed.

Census results

Grid square	Adult males	Adult females	Fawns	Mortalities
1	0	18	11	
2	1	55	17	
3	0	63	25	
4	0	17	6	1 male
5	0	2	0	1 fawn
6	1	12	4	1 ?
7	3	0	0	
8	5	87	38	1 male
9	0	35	20	
10	1	11	4	
11	1	10	7	
12	8	0	0	
13	4	37	16	
14	11	0	0	
15	0	2	1	
16	3	4	1	1 fawn
17	0	4	1	
18	0	4	2	
19	6	0	0	
20	18	3	2	
21	17	0	0	
22	45	0	0	
23	3	22	7	
24	2	7	4	
25	9	0	0	
26	4	0	0	
27	15	13	6	1 ?, 2 fawns
28	8	15	7	1 male, 2 foetuses
29	2	7	4	2 males
30	1	2	2	
31	4	8	3	1 female
32	8	59	23	
33	0	2	2	1 foetus
34	6	0	0	
35	2	12	3	
36	0	18	0	1 ?
37	0	3	3	1 male, 2 ?
38	4	0	0	
39	7	0	0	
40	0	11	6	
41	0	11	9	
42	4	0	0	
43	0	6	9	
Total	203	560	243	

Appendix 2

Use of helicopters: safeguarding welfare. Best practice guidance.

Aim

The aim of this guide is to provide guidance on safeguarding welfare when helicopters are used in the presence of deer. In developing the guidance, DCS and veterinary professionals have considered, for comparative purposes, how deer behave when moved by other vehicles, by people on foot, or as a result of management activities such as intensive culling.

Setting the context.

Helicopters are used in deer management activities for logistical support, deer census and moving deer from or to specific areas. They are also used for filming deer for documentary, promotional or research purposes. It is imperative that the welfare of deer is safeguarded to the same extent as it is when other deer management activities are undertaken.

Guidelines

Those involved in helicopter operations should be fully aware of the effects of helicopters on deer. All personnel should monitor and respond to the signs and conditions in the table below

	Green	Amber	Red
General Behaviour:	Deer are alert to visual, sound, and scent stimuli	Deer reacting to presence of helicopter	Deer fleeing in uncontrolled manner
Signs to observe:	Deer: •Should behave and interact normally with others in the herd •React to visual, sound or scent stimuli •Show controlled movement •May run •May stand	Deer: •May be in poor condition •May be on rough/steep terrain •May run at speed •May have mouths open or tongues hanging out •Stragglers may be left behind	Deer: •Are falling •Are stumbling •Are injured •Not adhering to herd hierarchy nor dynamics •No longer reacting to visual, sound ...etc (in effect 'at bay')
Action:	Unlikely to be causing distress	Continue with caution or withdraw (potential for welfare issue)	Withdraw

In addition, all personnel should comply with the following guidelines in order to avoid causing unnecessary suffering

When requiring to move deer, provide the minimum of pressure required to cause deer to move off or change direction.

Ensure that all personnel on the helicopter constantly monitor the herd for early signs of distress.

Withdraw the helicopter from the vicinity if the herd begins to fragment (where it is no longer a cohesive unit and groups or individuals begin to separate).

Withdraw where deer continually resist attempts to change their direction.

Particular attention should be taken to ensure that the combination of the helicopter and the topography does not pose an additional welfare risk e.g. in steep or rocky areas. Personnel using helicopters should be fully aware of and able to identify welfare issues and react accordingly.

Preventing unnecessary suffering remains the primary concern. The purpose for which the deer are being moved is therefore crucial in deciding whether the activity should take place. Where deer are to be moved for deer management or control objectives, operators should be committed to completing the operation, provided the signs remain within the green and amber zones and where there would be a greater overall welfare cost in undertaking the task on another occasion.

Appendix 3

Aerial shooting: best practice

The following information is adapted from Standard Operating Procedures and Codes of Practice for aerial shooting of animals that were developed in Australia to provide guidelines for the humane control of pest species. They were written in consultation with various animal welfare groups, including the RSPCA (Sharp and Saunders 2005).

Application

Aerial shooting is appropriate if used in a strategic manner, as part of a coordinated program designed to achieve sustained effective control or eradication. It is a cost-effective method of population reduction where reindeer density is high. Costs increase greatly as reindeer numbers decrease.

Aerial shooting is best used to target reindeer in remote, inaccessible or rugged terrain. In areas of heavy-cover, effectiveness is limited since reindeer may be concealed and difficult to locate from the air. The optimal period for aerial shooting is when animals form natural aggregations, such as before and during the rut (March).

For safety reasons, shooting from a helicopter cannot be undertaken in adverse weather conditions (e.g. strong wind, rain, low cloud). Shooting of reindeer should only be performed by competent trained personnel who have are accredited as competent and have experience in aerial shooting, are proven marksmen and hold the appropriate licences. Helicopter pilots must hold the appropriate licences and permits and be skilled and experienced in aerial shooting operations. They must also have approval from the Civil Aviation Safety Authority to undertake aerial shooting operations. Storage, use and transportation of firearms and ammunition must comply with relevant local legislative requirements.

Humaneness of aerial shooting as a control technique depends on the skill and judgement of both the shooter and the pilot. If properly carried out, it can be a humane

method of destroying reindeer. On the other hand, if inexpertly carried out, shooting can result in wounding, which may cause considerable pain and suffering. Aerial shooting should not be carried out if the nature of the terrain reduces accuracy resulting in too many wounding shots and prevents the humane and prompt dispatch of wounded animals. Shooting must be conducted in a manner that maximizes its effect, thus causing rapid death. This requires the use of appropriate firearms and ammunition.

Only head (brain) or chest (heart-lung) shots must be used. Shooting at other parts of the body is unacceptable. With aerial shooting, chest shots are preferred over headshots. The heart and lungs are the largest vital area and an accurate shot is more achievable particularly within the range of unusual angles encountered when shooting from above. Wounding in the chest/shoulder area, if not lethal, is likely to severely restrict an animal's ability to move and will facilitate the placement of further lethal shots. However, compared to an accurate headshot, a chest shot does not render the animal instantaneously insensible. Although shots to the head are more likely to cause instantaneous loss of consciousness, there is a high risk of missing a smaller, moving target area. Shots to the head should only be attempted at short ranges and in ideal conditions. The brain is a relatively small target that is well protected by bone. Only the slightest misplacement of the bullet can result in non-lethal and debilitating wounds, such as a broken jaw.

Death from a shot to the chest is due to massive tissue damage and haemorrhage from major blood vessels. Insensibility will occur after an interval ranging from a few seconds to a minute or more. If a shot stops the heart functioning, the animal will lose consciousness very rapidly. Correctly placed headshots cause brain function to cease and insensibility will be immediate. The shooter must be certain that each animal is dead before another is targeted. Wounded reindeer must be located and killed as quickly and humanely as possible with further shot(s) directed at the chest or head. If left, wounded animals can suffer from the disabling effects of the injury, from sickness due to infection of the wound, and from pain created by the wound.

Helicopter shooting operations do not always result in a clean kill for all animals;

therefore prompt follow-up procedures are essential to ensure that all wounded animals are killed. This can be achieved by:

- 1 Flying the helicopter back to wounded animals so that further shot or shots can be placed into the vital areas of the animal.
- 2 Use of a deliberate 'overkill' policy whereby numerous rounds are used per animal instead of a single shot. Since it is very difficult to assess if an animal is dead from a distance it is essential that after the initial shot, another one or more shots be fired into the chest or head to ensure a quick death.
- 3 In areas that are accessible, a ground crew of several individuals should be used to locate and humanely kill any wounded animals.

The cost of ammunition and extra flying time must not deter shooters from applying the appropriate follow-up procedures.

To minimise the animal welfare implications of leaving dependent fawns to die a slow death from starvation, aerial shooting programs should not be undertaken when females are fawning, which occurs on South Georgia in November.

Health and Safety considerations

The potentially hazardous nature of aerial shooting requires that safety protocols be strictly followed. Each team member must be aware of and trained in all aspects of helicopter and firearm safety.

Shooting from a helicopter can be hazardous particularly in areas of rugged topography. The combination of low-level flight, close proximity to obstacles and the use of firearms make this task extremely hazardous. It is essential that ejected firearm shells do not interfere with the safe operations of the helicopter. It may be necessary to fit a deflector plate to the firearm to ensure shells are ejected safely.

Procedures

Target reindeer should be mustered away from watercourses before being shot as wounded animals will be difficult to locate if they go down in water. Once a target is sighted and has been positively identified, the pilot should position the helicopter as close as is safe to the target animal to permit the shooter the best opportunity for a humane kill. The pilot should aim to provide a shooting platform that is as stable as possible. Shooting from a moving platform can significantly detract from the shooter's accuracy.

A reindeer should only be shot at when:

- It can be clearly seen and recognised;
- It is within the effective range of the firearm and ammunition being used;
- A humane kill is probable. If in doubt, do NOT shoot.

Reindeer will try to out run the helicopter rather than take cover in vegetation. In a line of running animals, always shoot the animals at the tail end first and then move forward until all animals in the line have been shot. In most aerial shooting situations the shooter should aim at the chest, to destroy the heart, lungs and major blood vessels.

Follow-up

If an animal is wounded by an initial shot but not killed, a 'fly back' procedure should be adhered to immediately where the wounded animal is located and additional shot(s) are administered to ensure a quick death. Any wounded animal in a group should be killed immediately before any further animals are targeted and shot. After a group of animals have been shot, it is essential that the pilot fly back over them to search for animals that still may be alive. When shooting reindeer, all animals should receive multiple shots to the vital areas to ensure a rapid death. Animals may appear to be dead but may only be temporarily unconscious.

Records should be kept of numbers and locations of animals killed, hours flown, ammunition used and details of fly-back procedures.

Appendix 4

Ground shooting best practice:

Shooting must be conducted with the appropriate firearms and ammunition and in a manner that aims to cause immediate insensibility and painless death. When shooting at an animal it must be clearly visible and able to be killed with a single shot. The objective of good bullet placement is to induce unconsciousness as swiftly as possible, rendering the animal insensitive to pain, and for this to be quickly followed by death. A correctly placed bullet causes death within seconds (The Deer Initiative, 2009).

Any ground shooting of deer would be carried out in accordance with the relevant sections of the British Association for Shooting and Conservation's Deer Stalking Code of Practice, which states (BASC, 2009):

Although deer are comparatively large animals, the vital areas for clean kills are small. UK advise states that no one should consider stalking unless they can consistently shoot a group of three shots within a 10cm target at 100m.

A shot should be taken at a range that will ensure a humane kill. Shots should never be taken at a moving or badly positioned deer, in poor visibility, through cover, or at any time when the aim is not steady. After taking a shot, it should always be assumed that the deer has been hit until proven otherwise by thorough searching. A shot should always be followed up, and injured animals humanely dispatched, regardless of the time and effort involved.

Guidelines for minimum rifle calibre and specification in the UK as established in The Deer Act 1991 are as follows:

For all deer of any species - the bullet must weigh at least 100 grains AND have a minimum muzzle velocity of 2,450 feet per second AND a minimum muzzle energy of 1,750 foot-pounds.

The UK Deer Act 1991 (c. 54) Schedule 2 prohibits the killing of deer by any ammunition other than hollow-nosed or soft-nosed types.

The Australian Government Department for the Environment sets out key welfare and safety considerations of ground shooting deer (DEWHA, 2004), as does the UK Deer Initiative (The Deer Initiative is a broad partnership of statutory, voluntary and private interests dedicated to "ensuring the delivery of a sustainable, well-managed wild deer population in England and Wales ") which has produced a series of Best Practice guides (The Deer Initiative, 2009). Key considerations drawn from these sources are as follows:

Proper shot placement will target key areas of the animal. A shot that destroys the vital areas of the brain (headshot) will achieve instantaneous loss of consciousness and death. However, the brain is a very small target and for this reason headshots should be avoided except for humane dispatch. A neck shot will prove fatal if the spinal chord is severed, if it is not, loss of consciousness cannot be guaranteed. The spinal chord is a very small target and for these reasons neck shots should be avoided. The most appropriate shot placement for ground shooting of reindeer will be to the chest, centred on the complex of blood vessels just above the heart. Damage, either to these blood vessels, the heart itself and/or the lungs that surround it, will cause a rapid loss of consciousness and death through loss of blood circulation. Because the chest vital zone is by far the largest it should be the shot of choice in most circumstances. (The Deer Initiative, 2009).

If possible, all deer in a group should be killed before any further groups are targeted. The smallest groups, and those with fawns/calves should always be targeted first. Wounded deer must be located and killed as quickly and humanely as possible ("followed-up) with a second shot preferably directed to the head. If left, wounded animals can escape and suffer from pain and the disabling effects of the injury (The Deer Initiative, 2009).

The objective is to fire at the closest range practicable in order to reduce the risk of non-lethal wounding. Accuracy with a single shot is important to achieve an immediate and, therefore, humane death.

An animal should only be shot at when:

1. It is stationary and can be clearly seen and recognised
2. It is within the effective range of the firearm and ammunition being used
3. A humane kill is most likely. If in doubt, no shot will be taken.

Efforts must be made to ensure there are no other deer behind the target animal that may be wounded by the shot passing through the target. This risk is minimized by the use of expanding soft nosed ammunition, or frangible ammunition, which are unlikely to pass through the body of a reindeer.

Shooting of individuals should stop when the flight response of the herd limits further accurate shooting (DEWHA, 2004).

If death cannot be verified, a second shot to the head should be taken immediately.

Appendix 5

Firearms/Welfare Competency Standards

Prerequisites	<hr/> <ul style="list-style-type: none">• None <hr/>
Objectives	<ul style="list-style-type: none">• To ensure that all staff and contractors intending to undertake DOC animal pest control operations are aware of animal welfare issues and the need to ensure animals are killed in a humane manner <hr/>
Standards	<ul style="list-style-type: none">• All staff and contractors who wish to undertake DOC animal pest control operations within Wanganui Conservancy must show adequate knowledge of the following competencies by passing a certification process on animal welfare issues surrounding the humane killing of pest animals• All staff certified in this module must be reassessed every two years <hr/>
Accountabilities and Responsibilities	<p>The Area Manager is accountable and the Programme Manager is responsible for ensuring that:</p> <ul style="list-style-type: none">• Only staff/contractors certified in this module are used on DOC animal pest control operations• That staff are reassessed every two years <hr/>

Competencies:

All staff must be able to;

- 1) Demonstrate knowledge of how to kill animals humanely, including knowledge of
 - a) The vital areas of their intended targets
 - b) The effect of their projectiles on these vital parts
 - c) The limitations of their bullets in reaching these vital parts
 - d) How to dispatch wounded animals
 - e) The characteristics of different types of ammunition
 - f) The minimum calibre recommended for a particular species

- 2) Demonstrate knowledge of why it is important to kill animals humanely, including knowledge of;
 - a) animal welfare issues
 - b) animal welfare law and implications

Supporting Information

Recommended minimum calibre for species hunted;

Deer (except sambar)	.243 (soft nosed hunting ammunition should be used)/ 12 gauge Shotgun (buckshot)
Sambar deer	.264 (6.5mm) (soft nosed hunting ammunition should be used)/ 12 gauge Shotgun (solids)
Cattle/horse/pigs	.270 (soft nosed hunting ammunition should be used)/ 12 gauge Shotgun (solids)

NOTE: Staff can use a smaller calibre at their Area Manager's discretion. It is expected that Area Managers would only grant this to staff who could demonstrate a higher level of shot placement than the minimum requirements – i.e. can consistently group shots into a small area (and therefore consistently place shots into the kill zone).

- Only shoot when an animal can be clearly seen and within firearm range.
- Head (brain), neck or chest (heart-lung) shots must be used. Shooting other parts of the body is unacceptable. Chest shots are preferable because hearts and lungs are the largest vital organs and if not lethal, are likely to severely restrict an animal's ability to move, allowing placement of further lethal shots.
- The shooter must be certain that each animal is dead before another is targeted. Wounded animals must be located and killed as quickly and humanely as possible (with further shots to the chest or head).
- If females with young at foot are shot, efforts should be made to find dependent young and kill them quickly and humanely.
- It is unacceptable to set a dog onto an animal with the intention of bringing it down, holding or attacking it.
- It is only acceptable to knife bailed or wounded goats when the risks of shooting the animal (i.e. to dogs or from bullet ricochet) are too great. The goat must be held firmly and the carotid arteries cut with a sharp knife, spinal cord should also be cut.

Animal Welfare Act

http://www.legislation.govt.nz/browse_vw.asp?content-set=pal_statutes

Guide to Animal Welfare Act – note section 13 covers hunting

<http://www.biosecurity.govt.nz/legislation/animal-welfare-act/guide/index.htm#top>

Guide to Ammunition

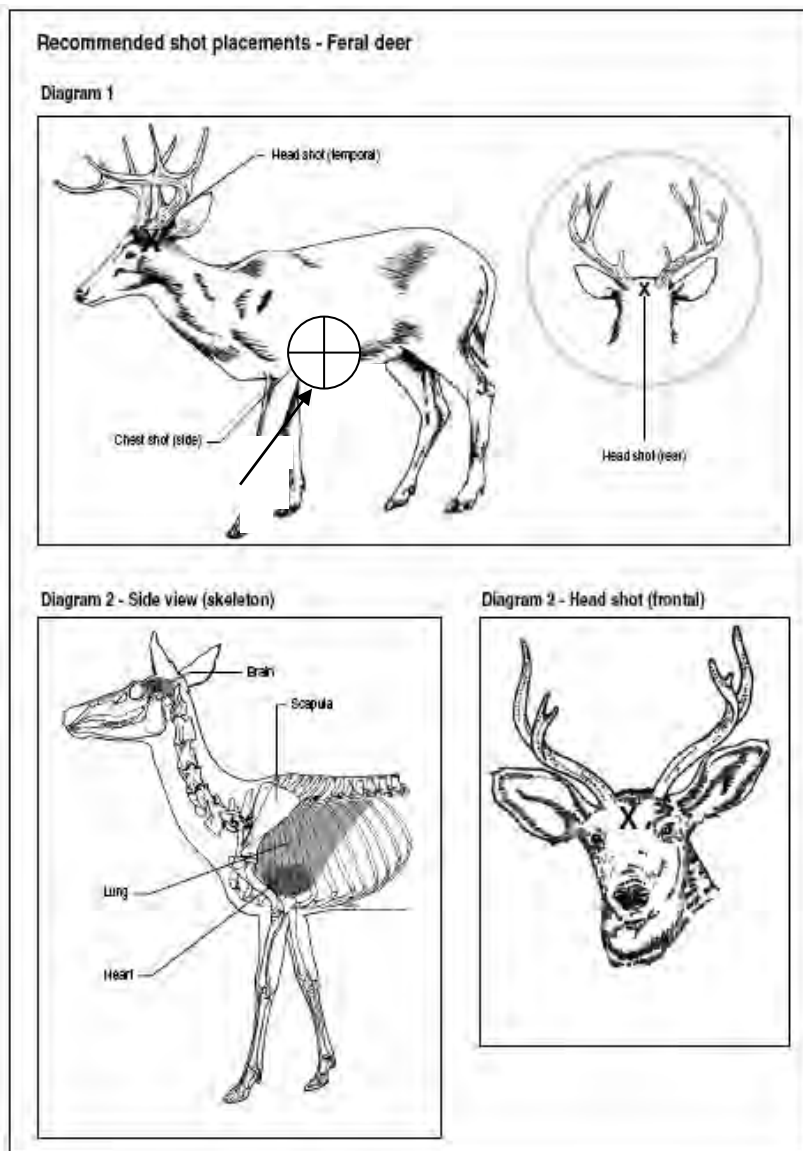
Montana Hunter Education Student Manual
<http://fwp.mt.gov/education/huntereducation/manual.html>
Chapter Five: Understanding Ammunition

Guide to Kill Zones

Montana Hunter Education Student Manual
<http://fwp.mt.gov/education/huntereducation/manual.html>
Chapter Eight: Making the Shot and Afterwards
Part C: Where should I aim; Part D: What to do after the shot

Wanganui Conservancy Hunting Dog Policy [Dog Policy](#)

International Hunter Education Association
<http://homestudy.ihea.com/index.htm>



Source: DEE001 Ground Shooting of Wild Deer - NSW Department of Primary Industries
<http://www.dpi.nsw.gov.au/aboutus/resources/majorpubs/guides/humane-pest-animal-control>

Wanganui Conservancy Firearm Competency Standards

Ground Control

Prerequisites	<hr/> <ul style="list-style-type: none">• Must have demonstrated adequate knowledge of Welfare Competency Standards• Must have current Firearms Licence• Must be familiar with DOC/Contractor Health and Safety Plans <hr/>
Objectives	<ul style="list-style-type: none">• To ensure that all staff and contractors using firearms on DOC animal pest ground control operations, do so competently, safely and effectively <hr/>
Standards	<ul style="list-style-type: none">• All staff and contractors who wish to use firearms on DOC animal pest ground control operations within the Wanganui Conservancy must show adequate knowledge of the following competencies by passing a certification process in the use of firearms for ground control• All staff/contractors certified in the use of firearms for ground control operations must be reassessed every two years• All staff certified in the use of firearms must undergo an annual hearing test <hr/>
Accountabilities and Responsibilities	<p>The Area Manager is accountable and the Programme Manager is responsible for ensuring that:</p> <ul style="list-style-type: none">• Only staff/contractors certified in the use of firearms are used on DOC animal pest ground control operations• That staff/contractors are reassessed every two years• That staff undergo an annual hearing test <hr/>

Competencies:

All users must be able to;

- 1) Be a holder of a current firearms licence (including the appropriate category for the firearm being used)

- 2) Ensure personal and public safety when using a firearm by knowing and understanding the seven rules of firearm safety contained with the arms code.
 - Treat every firearm as loaded
 - Always point firearms in a safe direction
 - Load a firearm only when ready to fire
 - Identify your target
 - Check your firing zone
 - Store firearms and ammunition safely
 - Avoid alcohol or drugs when handling firearms
- 3) Demonstrate, understand and practice safe and responsible skills in the storage of firearms when not in use (including storage in the field)
- 4) Demonstrate and practice safe skills in the handling of firearms, in particular, the passage of a 'firearm in use' via obstacles such as fences, windfalls and rough terrain, and near working animals such as dogs and livestock
- 5) Demonstrate and practice safe skills in the transporting of firearms
- 6) Demonstrate knowledge of firearms including;
 - a. Safe operation of their firearm
 - b. Appropriate selection of firearm and ammunition for the intended task
 - c. Knowing and recognising what makes a firearm unsafe
 - d. Competence in sighting in, loading and unloading of their firearm
- 7) Conduct firearm cleaning and maintenance including
 - a. Selection and use of cleaning materials and tools
 - b. Appropriate cleaning intervals for the firearm
 - c. Knowledge of the consequences of not undertaking adequate cleaning and maintenance
- 8) Demonstrate competence in using the firearm by;
 - a. Reaching a prescribed marksmanship level, being – (Note: staff who pass the high powered rifle component will be automatically passed on the .22 component)
 - i. With your high powered rifle, the ability to consistently (9 times out of 10) hit a target 200mm in diameter at a distance of 100 metres from an unsupported prone position
 - ii. With a .22 rifle, the ability to consistently (9 times out of 10) hit a target 50mm in diameter at a distance of 25 metres from an unsupported prone position
 - iii. With a shotgun, hit at least four (4) out of five (5) stationary targets (as per setup described at end of appendix)

- b. Being conversant with the use of supports which aid field accuracy
- 9) Demonstrate knowledge of the effects of;
- a. Range
 - b. Wind
 - c. Slope
- 10) Understand the need for “safe shooting procedures” when sighting in a firearm
- 11) Be aware of and demonstrate understanding of safety procedures when hunting in groups
- 12) Understand the need to advise police and other interested parties when shooting in peri-urban situations

Supporting Information

Arms Code (covers a number of the above competencies)

<http://www.police.govt.nz/service/firearms/arms-code.pdf>

Storage, Handling, Transport, Cleaning of Firearms

Montana Hunter Education Student Manual

<http://fwp.mt.gov/education/huntereducation/manual.html>

Chapter Three: Firearm safety

Firearm Knowledge

Montana Hunter Education Student Manual

<http://fwp.mt.gov/education/huntereducation/manual.html>

Chapter Four: Today's Firearms

Guide to Ammunition

Montana Hunter Education Student Manual

<http://fwp.mt.gov/education/huntereducation/manual.html>

Chapter Five: Understanding Ammunition

Sighting in, Range Rules, Shooting Positions

Montana Hunter Education Student Manual

<http://fwp.mt.gov/education/huntereducation/manual.html>

Chapter Six: Shooting Skills

Hunts Manual – NZ Mountain Safety Council

Chapter 6: Carriage; Storage

Chapter 7: Firearm knowledge; Sighting in; Cleaning; Slope; Kill zones; Ballistics

Chapter 8: Wounded animals

International Hunter Education Association

<http://homestudy.ihea.com/index.htm>

Wanganui Conservancy Firearm Competency Standards

Aerial Control

Prerequisites	<hr/> <ul style="list-style-type: none">• Must have demonstrated adequate knowledge of Welfare Competency Standards• Must be certified in the Wanganui Conservancy Firearm Competency Standards (Ground Control)• Must have acted as an observer on an official aerial operation• Must be familiar with DOC/Contractor Health and Safety Plans <hr/>
Objectives	<ul style="list-style-type: none">• To ensure that all staff/contractors using firearms on DOC animal pest aerial control operations, do so competently, safely and effectively <hr/>
Standards	<ul style="list-style-type: none">• All staff/contractors who wish to use firearms on DOC animal pest aerial control operations within the Wanganui Conservancy must show adequate knowledge of the following competencies by passing a certification process in the use of firearms for aerial control• All staff/contractors certified in the use of firearms for aerial control operations must be reassessed every year• All staff certified in the use of firearms must undergo an annual hearing test <hr/>
Accountabilities and Responsibilities	<p>The Area Manager is accountable and the Programme Manager is responsible for ensuring that:</p> <ul style="list-style-type: none">• Only staff/contractors certified in the use of firearms are used on DOC animal pest aerial control operations• That staff/contractors are reassessed every year• That staff undergo an annual hearing test <hr/>

Competencies:

All users must be able to;

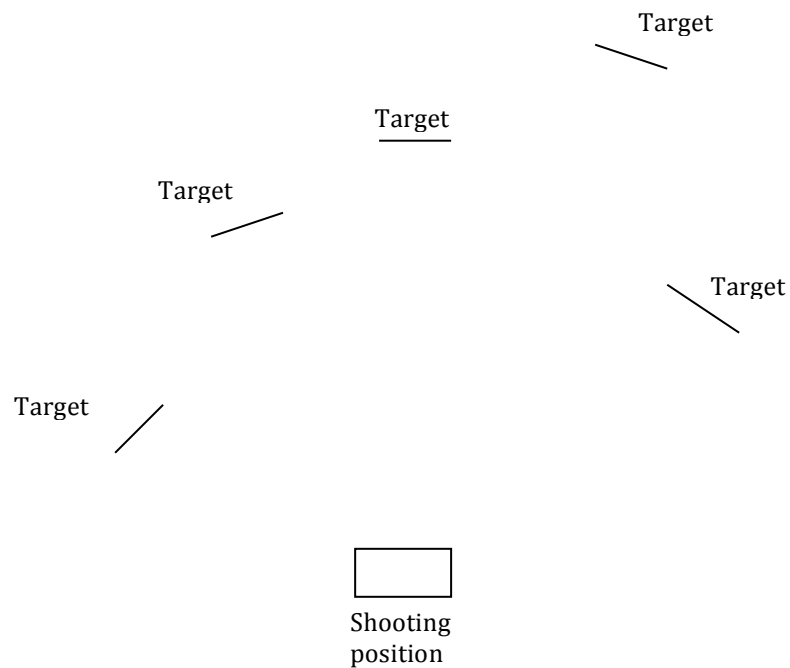
- 1) Be the holder of the appropriate firearms licence if required e.g. Category E

- 2) Demonstrate advanced competence in using the firearm by;
 - a. Reaching a prescribed marksmanship level, being – (Note: staff will only be certified in the marksmanship level(s) passed)
 - i. With your high powered rifle, the ability to consistently (7 times out of 10) hit a target 100mm in diameter at a distance of 100 metres from an unsupported prone position
 - ii. With a shotgun, break at least four (4) out of five (5) clay targets, down the line.
- 3) Know the safe firing zones from a helicopter
- 4) Know the characteristics and limitations of firearms to be used in aerial operations
- 5) Demonstrate competence with the firearm of choice in any operation including;
 - a. Loading and unloading
 - b. Safe storage of firearm in the machine
- 6) Understand and demonstrate safe animal recovery techniques from helicopters
- 7) Demonstrate previous experience in working on a helicopter including;
 - a. Know the DOC requirements for the use of helicopters (ref DOC SOPs)
 - b. Know the safe practice code around helicopters
 - c. Knowledge of the characteristics of machines used in any operation
 - d. Know correct operation of harness system (note the use of a harness is compulsory)

Shotgun Range Setup (ground)

Five deer targets (showing body kill zone) to be set up in an arc so that the shooter (from the firing position) has to fire to their left and right (see example below).

The targets should be at various distances, between 10 and 40 metres from the shooter. Shooters to use buckshot and at least one pellet must enter the kill zone. Shooters to get two shots per target.



Wanganui Conservancy Firearm Competency Standards

Assessment

Assessment will comprise a one and a half day training session at a firing range. Assessment will consist of practical and theoretical tasks

Practical

- Shooting competency
- Adherence to range procedure
- Cleaning of firearms
- Loading/unloading firearms
- Transport of firearms
- Crossing obstacles with firearms
- Other?

Theoretical

- Written quiz covering competencies
- Lectures
 - Safety
 - Welfare
 - Ballistics etc
- Other

Staff will be assessed by the PM Threats

Wanganui Conservancy Firearm/Welfare Competency Standards

Assessment Sheet

Name: _____ Firearms Licence No.: _____

Date: _____ Licence Endorsements: _____

Practical Competency	Competent	Not yet competent (requires more training)	Comments	Assessor sign off
Centre fire – ground std				
Centre fire – aerial std				
.22 – ground				
Shotgun – ground std				
Shotgun – aerial std				
Cleaning firearms				
Loading/unloading				
Crossing obstacles				
Adherence to Range Procedure				
Transport of Firearms				
Security of firearms				
Theoretical Competency	Competent	Not yet competent (requires more training)	Comments	Assessor sign off
Welfare Quiz				
Ground Shooting Quiz				
Aerial Shooting Quiz				
Attended lectures				

Appendix 6

Aircraft Safety in AERIAL HUNTING

Based on DOCDM 139530 (Aircraft Safety in Aerial Hunting and Helicopter Servicing) by S Cross, Hokitika.

Aerial Hunting Techniques

Introduction

Helicopters are used by the Department of Conservation for a range of activities. Equal care and attention is required around aircraft whether personnel board an aircraft infrequently or are engaged in large scale operational projects.

DOC officers have the responsibility of ensuring that aircraft are used effectively and efficiently to achieve the object of the operation.

It is the responsibility of the pilot to ensure that the aircraft is operated within its capabilities.

Pilot / crew working relationships require a close bond; a small mistake on either part could lead to a serious accident. This team work is built up on mutual trust and communication; sometimes this may only be through eye contact.

This trust is strengthened by the level of experience and joint teamwork over a period of time.

H 1.0: PRE - PLANNING

Before engaging an aircraft, there are a number of things that require investigation.

H. 1. 1 Explain operation / tasks to the pilot before hand

- Task, Duration, Location
- Notify pilot of known hazards and their locations

H. 1. 2 Equipment and Loads

- Method with which load is best carried. i.e.; animals (to be discussed in conjunction with the pilot)
- Use of strops, karabiners, chains - these must be certified

H. 1. 3 Aircraft

- Availability
- Capabilities - of machine and pilot, crew.
- Limitations.
- DOC staff must know where the emergency and safety devices are located on the aircraft and their operating procedures (should be part of initial briefing from pilot)

H. 1. 4 Training

- Staff should have the appropriate training prior to being used on aerial shooting operations (i.e. minimum requirement is a helicopter safety certificate from the helicopter company + compliance with the Wanganui Conservancy Firearms Standards)

H 2. 0: CALLING OUT AND SELECTION OF HELICOPTER

This decision is based on a number of factors. All will need to be taken into consideration.

H. 2. 1 Tasks

- Search & Destroy, Live capture.

Pilots must hold the appropriate W.A.R.S., Air and work service licences, and have a permanent approved ID letter on their helicopter at all times.

H. 2. 2 Aircraft Airworthiness

- All aircraft must hold relative certificates of maintenance and service checks by certified engineers.

H. 2. 3 Pilots

- Must hold commercial licences, be experienced with wild animal recovery/search and destroy operations and hold a current Air Operators Certificate.

H. 3. 0: RESPONSIBILITIES

Pilots are responsible for their aircraft and the safety of crew.

H. 3. 1 All aircraft used in DOC operations will be under the supervision of a designated officer in charge (O/C Aircraft).

H. 3. 2 The O/C Aircraft must advise their controlling officer of the location, nature and duration of any operation prior to commencement.

H. 3. 3 Leave intended flight plan with Office Staff.

H. 3. 4 Flight Plan to cover

- Date, Operation, Pilot and Crew, aircraft, flight path/locations, duration, expected return time, Person who will be advised on return and phone number.

H. 4. 0: SAFETY PRECAUTIONS WITH AIRCRAFT

H. 4.1 Refer DOC SOP [DME:\\OLDDM-781029](#)

H. 5. 0: BOARDING AND LEAVING A HELICOPTER

Refer DOC SOP [DME:\\OLDDM-781029](#)

H. 6. 0: LANDING SITES FOR HELICOPTER

The load lifting capability of a helicopter depends directly on the dimensions of the landing site and height of the surrounding obstacles, e.g. a helicopter will lift more from a flat unobstructed field than it would from a landing site of minimum dimensions.

Also have regard to the landing site that is intended for use at the other end of the journey.

H. 6. 1 Selection of Landing Sites

When crews are required to select a landing site these factors must be considered.

- **Size** - see the following diagram as to size. Where operational necessities or urgent medical requirements preclude the preparation

of such a site, a smaller pad may be acceptable (1 1/2 rotor disc diameter)

- **Approaches** - It is desirable to have an obstruction free approach and exit path into prevailing wind.
- **Slope** - The ground should be relatively level (1 in 10) if an aircraft is required to land.
- **Surface** - The surface should be sufficiently firm enough to support a fully laden helicopter, e.g.; Iroquois - stop; start a two ton truck without sinking. Hughes 300 or Robinson R22 - 250 kg truck. The area should be checked for holes, tree stumps, rocks and loose objects which could be blown away and cause damage to the aircraft or crew. Avoid dusty locations, e.g. dry sandy river beds.

H 6.2 Isolated Sites

Sending personnel into isolated sites require some guidelines. No person should travel aboard an aircraft into an isolated area unless:

- Properly clothed, including footwear for the type of country the work is being carried out in.
- Has some basic survival and first aid equipment (in the event of aircraft accident or malfunction)
- Some communication equipment is carried (After leaving the aircraft, FM, SSB, PLB, Air band)
- Be well versed in general aircraft behaviour
- In case of emergency have prior knowledge of nearest shelter

Remember NEVER rely on the return of the aircraft

H.6.3 Landing In Remote Areas

For uncontrolled Landing

Evening hunting leads to the Helicopter returning around dusk or dark. Landing may be required for fuel or to pick up animals and equipment.

- Crew left on the hill must have survival kit / lighter, torch to assist pilot locating them in these conditions
- The pilot must ensure the crew is left in a retrievable location during the hours of poor light

- Be aware of ground fog, low cloud, evening winds

For Controlled Landing

- Night landings are a last resort and will only be attempted in extreme emergencies in the field situations
- Try and mark the external boundaries by torches or lamps and illuminate the centre of the landing site by the use of car headlights or similar bright lights inclined towards the direction of the aircraft approach. Any lights used must be securely fixed to prevent them being blown away. The landing site should be twice as big as for day landings and ground condition perfect. Do not shine lights directly on the aircraft. At night a pilot's eyes become accustomed to the dark, any bright lights could destroy the pilot's ability to see.

H. 7.0: AIRCRAFT LOADING

CONSULT WITH THE PILOT FIRST AS TO HOW HE/SHE WANTS TO LIFT AND FLY THE LOAD

H.7.1 Loading - it is obviously important that aircraft are not loaded beyond their carrying capacity. Some models have almost identical physical characteristics but have different lifting capabilities. The "controller" of the aircraft operations will need to check with the pilot to ensure loads are made up within the weight limits of the particular aircraft being used. It is preferable to have a large safety factor between the actual load weight and maximum capacity load.

H.7.2 The pilot is responsible for the loading of the aircraft within its weight and balance limitations

NEVER LOAD ANYTHING ON AN AIRCRAFT WITHOUT THE PILOTS KNOWLEDGE

H.7.3 All items must be securely fastened. The pilot will either do this him/herself or at least check that it is properly secured.

H.7.4 External cargo must be balanced both laterally and fore and after within certain limits.

H.7.8 Helicopter loads should be slung on cargo hooks.

- Civil Aviation Rule Part 133 (NO person shall be carried with the carriage of sling load operation unless he or she performs a function essential to the helicopter sling load operation). This covers a crew

member (DOC staff) additional to the pilot, who may be required to assist the pilot to manoeuvre the load for accurate delivery.

H.7.9 Always do things for the pilot don't make the pilot do things for you. The less the pilot has to think about, the safer and happier the pilot will be.

H.7.10 Never ride on a load, chain or sling.

H. 8.0: AERIAL HUNTING

Aerial borne hunters utilise various types of helicopters to search and destroy wild animals in a variety of landscapes, from the lowland valleys up into the alpine mountains. Both pilot and crew are required to work responsibly at all times.

At no time should any member of the team take any unnecessary risks for the sake of any wild animal, adverse weather or financial restraints.

H 8.1 Rules for Aerial Hunting / Shooting

- The helicopter company is responsible for the helicopter and pilot.
- All flying decisions are the pilot's responsibility in accordance with Civil Aviation rules.
- The pilot and crew are to have had previous training in the technique together. The pilot must be able to place a shooter or crew on steep ground, slip or nominated position and hover there while the shooter or crew make a safe entry or exit.
- The shooter must have practiced in a controlled type situation any techniques that are to be used in aerial hunting and be accustomed to flying.
- The use of the techniques is to be authorised by the pilot.
- The shooter and crew are to be in two-way communication with the pilot at all times or be fully briefed in the task expected to be carried out.
- All shooting decisions are made by the shooter
- The helicopter operator is responsible for all the safety equipment used.
- Any crew being dropped off and the helicopter departs locality, must have sufficient equipment to leave the area on foot in case the helicopter can not return.

- Any crew member involved in aerial hunting seated without a door is exposed to the risk of fall, through leaning out an open door, must wear an approved harness at all times (see H 9.9 Harnesses / seatbelts)
- All karabiners are to be lockable and used with screw to the bottom of the karabiner. Twist lock karabiners are preferred for attaching crews harness to the body of the helicopter.
- Care with animals must be observed when being stropped up, where they are likely to become snagged on roots or clothing (horns and antlers).
- Each crew member must carry a readily accessible sharp knife.
- The strop must be attached to the helicopter in such a way the pilot can release it with one action. Do not connect rope to the helicopters hook as it can grab and not release, use metal to metal.

BEWARE OF CHAIN CATCHING IN THE SKIDS.

H 8.2 Criteria for Shooters and Crew for Aerial Hunting

Shooters must:

- Have passed the Whanganui hunting standards for aerial shooting
- Be trained in techniques involved or supervised.
- Be able to carry out any request made from the pilot
- Be responsible for their own actions.
- Be capable of making accurate assessments of dangers involved and capable of discharging a firearm from an aircraft in a safe manor.
- Be competent firearms specialist. Hold the required A or E Category licences for the firearms used.
- Be able to identify the particular dangers associated with each helicopter used.
- Aware of the possible consequences of failure of equipment or of the helicopter.
- Able to make clear decisions as to tenure and the right to destroy any animals on any given land (or as to the operation plan for that area).

H 8.3 Criteria for Pilots for Aerial Hunting

Pilots must:

- Hold a commercial licence and have logged a minimum of 1000 hours flying time preferred.
- Be competent in Wild Animal Recovery operations.
- Have previous experience of flying in similar terrain to which the search and destroy occurs (Minimum 500 hours preferred).
- Be skilled at strop and lifting work at various altitudes.
- Make clear requests to crew.
- Be trained in the techniques used.

H. 8. 4 Firearm Safety

- Are in safe working order.
- Loaded when only when hunting area is reached.
- Pointed down at all times / safety catch on when not in use.
- Never pointed at helicopter at any time.
- Consider firing zone (see figures end of doc)
- Shots are taken in the safe firing zone also considering the rotor position (see figures at end of doc)
- Never left unattended in aircraft, vehicle or in public place.

H. 9. 0: EQUIPMENT

H 9.1 Firearms

- Have good knowledge of types of firearms and their working parts.
- Be aware of empty case ejection, inside bubble, rotors, around pedal mounts. Ensure deflectors are fitted to firearms that could eject spent cases up into rotors.

- Carry enough ammunition for the operation / in secure container.
- Extra ammunition can be left with:
 - fuel dumps on the hill
 - locked in vehicles / fuel vehicles
 - tent camps / huts
- Mechanically safe and regularly cleaned.
- Of such calibre's to be efficient to produce clean kills
- Spares carried in helicopter, MSS Auto - magazines, as these can be lost in operation
- Ensure the correct ammunition is used.

H 9.2

Knives

- Sharp knife and steel must be carried by all crew.

H 9.3

Boots

- Adequate boots (For lace up boots, laces must be kept well tied).
- Strong good grip rubber sole boots are an advantage.

H 9.4

Flight suits and Accessories

- Should be of adequate quality to stop wind chill.
- Preferably in a bright colour to stand out at a distance.
- Be replaced when worn / torn
- Gloves and scarves must be kept well secured when not in use.
- A flight suit will double as a sleeping bag if the crew member(s) are required to spend time waiting for the helicopter to return.

H 9.5

Helmets

- Helmets are worn at the discretion of the crew.
- Hearing protection to be used (Grade 4)

H 9.6 Safety Kit

- 1 x Lighter
- 2 x Thermal blankets
- 1 x Metal cup
- 2 x Chocolate bars
- 2 x Museli bars
- 2 x Cup a soups
- 1 x Solid fuel tablet

H 9.7 Personal First Aid Kit

- Refer HSE manual

H 9.8 Radios / Communications

- All helicopters are fitted with VHF Air Band radios only some have the VHF DOC channels.
- All aircraft work on Air band channel 119.1, Direct working can be carried out on channel 123.5
- Aircraft fitted with Cell phones and pagers must ensure these are in working order. Identify areas of poor signal strength. Respond to pager messages ASAP.
- Advise base of any significant change to flight plan prior to the overdue time, Supply progress report to ground support or change of Area boundary
- Helmets fitted with headsets and aviation type headsets provide clear communications in the air.
- Headsets are normally supplied by the helicopter company
- If radio communications are lost, pilot and crew must be made aware. An alternative method must be sought.

H 9.9 Harnesses / Seatbelts

- The crew must be fitted by an approved harness system to the body of the helicopter (i.e. SA 171 General purpose belt; SA 170 Linemen's belt)

The CAA requirement to wear the shoulder seatbelt is not required if the wearer is utilizing the harness system

H 9.11

Strops

- Recommended, the helicopter company supplies strops and chains for lifting work.

At no time should any member of the crew ride the chain or strop.

H. 9. 14

Animals

- Care taken when animals (wounded or not) are required to be flushed from cover by other members of crew. Observe their intended route. Let animals run clear, consider ricochets.
- Hooked up by animal's horns, antlers or the weight of the animals pulling you down the slope, knocking you off balance.
- Hooked up in the strop when lifting or hit by the chain
- Slips with the knife when gutting or cutting throats, blood on knife handle.

H.11.0

TRAINING

Training is essential for all personnel who could be called on to work in a support role with aircraft.

Staff should have the appropriate training prior to being used on aerial shooting operations (i.e. minimum requirement is a helicopter safety certificate from the helicopter company)

H.11.1

Training must be given in a controlled situation. Crew are required to physically demonstrate to the Pilot and O/C aircraft they are competent to make a safe entry / exits, load and discharge firearms in a safe manor and be familiar in aircraft behaviour at various altitudes.

The training has a two-fold effect:

- Increase in safety
- Increase in operational efficiency (Not obvious, but very true)

H.12.0

EMERGENCIES

H.12.1 Fire

Be aware of fuels being ignited through spills / helicopter exhaust or crashes. Helicopters contain many litres of volatile fuel. Exit the helicopter and keep back during the fuelling operation.

NO SMOKING

Remember wool is a slow burner. Beware of nylon.

In all cases of helicopter emergency, **REMEMBER THE ROTORS.**

H. 12.2 Power Failure

On Land

Do as the pilot tells you. The pilot will attempt an "Auto rotation" (which is an emergency landing procedure), stay with the machine.

Over Water

Stay with the machine until the rotor blades have stopped turning and it is totally submerged. Then swim out or do as the pilot instructs you.

H 12.3 Emergency Plan

Should have an emergency plan – see DOCDM 139530 for an example

H 12.4 Hazards

Refer Area Office hazard plan – refer DOCDM 139530 for an example

DIRECTORY OF REFERENCES AND ADDITIONAL RESOURCES TO BE CONSULTED

H 16.0 Terms

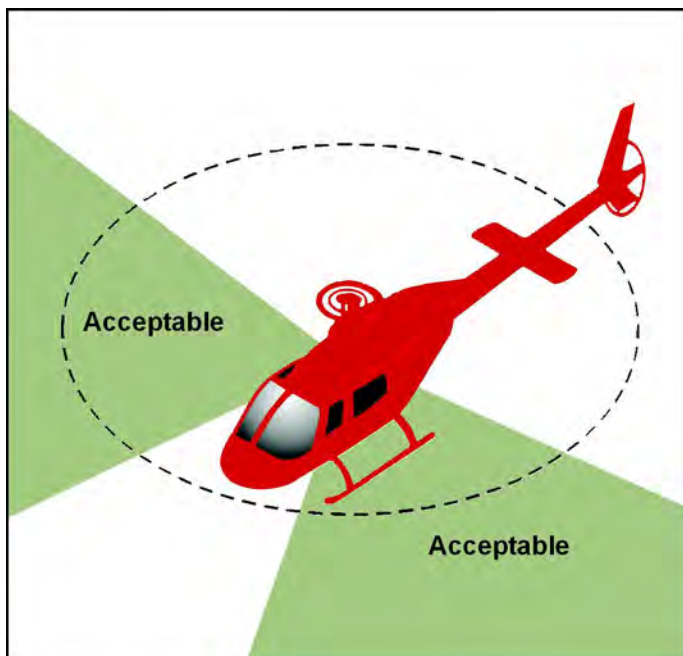
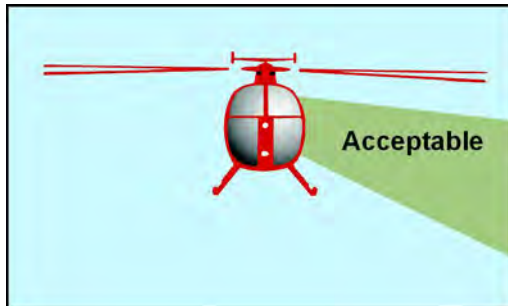
Pilot	Person sole responsible for the aircraft.
Shooter	Person discharging firearm, generally seated next to pilot.
Crew	All persons in aircraft, including shooter, except the pilot.

Suppliers

Flightsuits	Dowells Thermalwear Oamaru
Helmets	Pacific Helmets CHCH
Air to ground sets	Flightline Services CHCH
Harnesses	ANCRA NZ Ltd 09 579 4132

Helicopter Shooting Zones

NOTE: These are indications only. You should always check with the pilot as to what the acceptable shooting zones are for the particular machine you are using prior to undertaking the operation.



Appendix 7

Mustering of feral horses

Prepared by Trudy Sharp & Glen Saunders, NSW Department of Primary Industries

Background

Feral horses (*Equus caballus*) can cause significant environmental damage and losses to rural industries. Although considered pests, feral horses are also a resource, providing products such as pet meat for the domestic market and meat for human consumption for the export market. Control methods include trapping, mustering exclusion fencing, ground shooting and shooting from helicopters.

Feral horses are mustered by helicopter, motorbike or on horseback, sometimes with the assistance of coacher horses. Once mustered into yards, net traps or fenced paddocks, the horses are usually sold to abattoirs for slaughter which can offset the costs of capture and handling. Less commonly, they are sold as riding horses or relocated to reserves or horse sanctuaries. Where there is no market for them or where removal may be too costly or impractical e.g. in conservation areas or remote areas without access to transportation, horses are sometimes destroyed by shooting in the yards.

This standard operating procedure (SOP) is a guide only; it does not replace or override the legislation that applies in the relevant State or Territory jurisdiction. The SOP should only be used subject to the applicable legal requirements (including OH&S) operating in the relevant jurisdiction.

Application

- Mustering should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control.
 - Mustering may only be efficient and economic when horse densities are high.
- In relatively flat and accessible country, mustering is usually performed by people on horses or on motorbikes. In rough, hilly country and more extensive areas, helicopters or light aircraft are used to drive the horses towards a set of yards where a ground team completes the muster.
- Musters are best centred on smaller areas which include the watering points or grazing areas that are of most importance to feral horses. Intensive mustering of a defined management area (of approximately 400km²) around a permanent watering point may offer the most effective way of catching most horses. Few horses would have to be pushed outside their normal home range.
- When mustering very large areas, many horses are pushed outside of their home range areas, which they resist leaving. Also, the greater the distance the horses are pushed, the more chance they have to escape. Those that get away will be harder to catch next time. Mustering of extensive areas should only be done if transport vehicle access is restricted by rough terrain, or if there are few suitable yard sites.

- Mustering is relatively labour intensive compared to trapping and can be more stressful to the horses.
- To ensure that mustering, capture and handling is performed with the least stress to the horses, operators must have a good knowledge of horse behaviour and movement patterns. They should also be familiar with the terrain they are to cover so that dangerous areas (e.g. sinkholes, bogs) can be avoided.
- Aircraft operators must ensure that their flying operations comply with requirements of the Civil Aviation Safety Authority.
- Shooting of horses should only be performed by skilled operators who have the necessary experience with firearms and who hold the appropriate licences and accreditation. Storage and transportation of firearms and ammunition must comply with relevant legislation requirements.

Animal Welfare Considerations

Impact on target animals

- Capture and handling increase stress in feral horses as they are not used to confinement or close contact with humans. Operators should endeavour to keep stress to a minimum during these procedures. Exposure to prolonged or excessive stress causes severe physiological effects and can result in the following conditions:
 - Capture myopathy;
 - Heat stress and dehydration;
 - Acute lameness due to injury or damage to tendons, ligaments or bones;
 - Fight injuries due to mixing unfamiliar groups or individuals;
 - Bruising and injury caused by rough capture techniques and poorly designed handling techniques;
 - Stress-induced infections, such as salmonellosis;
 - Feeding disruption resulting in ill-thrift or colic; and
 - Abortion in heavily pregnant females
- To avoid heat stress, mustering should be carried out when conditions are cool or mild. Mustering should not be conducted if horses are in poor body condition e.g. during droughts.
- The tail end of the mob should set the pace rather than being forced to keep up with the leaders. Distances that the horses have to be mustered should be kept to a minimum e.g. by using portable yards.
- Feral horses should be handled quietly without force to avoid panic and trampling.
- Horses that are severely injured during mustering or confinement must be killed quickly and humanely with a rifle shot to the head.

- Whenever possible avoid mustering when females are foaling or have young at foot. Unweaned foals may be left to die of starvation if their mothers are mustered and they are left behind. Foaling is concentrated over spring and summer. Apart from the welfare implications, control at times of foaling will reduce effectiveness as females are usually more cryptic and tend to leave the group to give birth in isolated locations
- Electric prods and dogs must not be used to assist in the handling of feral horses.
- Mixing unfamiliar groups or individuals in yards may result in fighting, stress and injury. Normal social groups should be maintained whenever possible. There should be sufficient holding yards to avoid mixing different groups of stock.
- Only fit and healthy animals should be selected for transport. Heavily pregnant, very young or weak/sick/injured animals must either be destroyed, proper veterinary assistance given or transported at a later date when they are more suitable for transportation.
- The loading, transport, unloading, holding and slaughter of feral horses must be undertaken with the minimum amount of stress, pain or suffering. Guidelines on these procedures can be found in the following documents:
 - Model Codes of Practice for the Welfare of Animals:
 - Land Transport of Horses (1997)
 - Livestock at Slaughtering Establishments, SCARM Report 79 (2002)
 - Killing or Capture, Handling and Marketing of Feral Livestock Animals (draft)
 - AQIS (1995). Operational guidelines for the welfare of animals at abattoirs and slaughterhouses. Australian Quarantine and Inspection Service. Australian Government Publishing Service, Canberra.

Impact on non-target animals

- Mustering is target specific and does not usually impact on other species.

Health and Safety Considerations

- During construction of yards, operators should be wary of the risks of injury from lifting heavy items. Leather gloves and eye protection will help prevent injuries from wire, steel posts and hammers.
- The mustering, confinement and handling of feral horses is not without risk to the operators involved. A first-aid kit should be carried at all times.
- Operators must be wary of horses especially when working with them in a yard. Beware of horses kicking directly backward with either or both hind feet. Horses can also strike, bite and crush people against fences.
- Firearms are potentially hazardous. All people should stand well behind the shooter when horses are being shot. The line of fire must be chosen to prevent accidents or injury from stray bullets or ricochets.
- Firearm users must strictly observe all relevant safety guidelines relating to firearm ownership, possession and use.

- Firearms must be securely stored in a compartment that meets State/Territory legal requirements. Ammunition must be stored in a locked container separate from firearms.
- Adequate hearing protection should be worn by the shooter and others in the immediate vicinity of the shooter. Repeated exposure to firearm noise can cause irreversible hearing damage.
- When shooting, safety glasses are recommended to protect eyes from gases, metal fragments and other particles.
- Care must be taken when handling feral horse carcasses as they may carry diseases such as melioidosis, ringworm and dermatophilosis that can affect humans and other animals. Routinely wash hands and other skin surfaces after handling carcasses.

Equipment Required

Yards

- Either portable or fixed holding yards can be used. Many yards that are already established were originally designed for cattle rather than horses.
- The entrance should have winged fences to effectively direct horses into the yard. Hessian is usually run out from the yard for about around 100 metres to form part of the wing fences. This acts to prevent horses running into the fences. The wings should be further extended until they reach natural barriers such as the side of a range or a hill. Ribbon wings made out of flagging tape attached to twine are effective. To deflect approaching horses, one wing fence needs to longer than the other, commonly 500 metres to 1 km long.
- Net traps are sometimes used instead of yards. These are constructed of high strength fishing net with long hessian wing fences that funnel horses into the trap.
- Yards should be large enough for the horses to enter at a reasonable pace and pull up and settle before encountering fences and panels. Entrance gates must be wide enough (about 6 metres) to allow the easy flow of animals.
- The yard fencing should form both a physical and visible barrier to minimise the potential for injuries. Steel or timber post-and-rail fencing is recommended. Barbed wire and narrow gauge high tensile steel should not be used for fencing in closely confined situations as it can cause severe injury to horses.
- The materials used must minimise the risks of injury or escape of horses once inside the enclosure. Projections such as loose wire or sharp edges likely to cause injury should be eliminated and fences should be secure and high enough to prevent horses escaping. Hessian hung above normal yard height can be used to deter horses from pressuring or jumping vulnerable parts of the yard such as the main gate.
- Yards should be designed to minimise both dust and boggy conditions.

- In extremes of climate (hot or cold) shelter must be provided for horses. This is particularly important for young horses or animals in poor body condition during cold, windy and rainy conditions.
- Details of yard design and construction can be obtained from relevant guidelines, for example:
 - Dobbie, W. (1992). *Control of brumbies in central Australia*. Conservation Committee of the Northern Territory and the Northern Territory Department of Primary Industries and Fisheries, Alice Springs.
 - Dobbie, W.R., Berman, D.McK. and Braysheer, M.L. (1993) *Managing Vertebrate Pests: Feral Horses*. Australian Government Publishing Service, Canberra. Appendix A.
 - McKiernan, B. (1999). Agfact A6.7.1 *Horse yards and handling facilities*. NSW Agriculture.

Firearms and ammunition

- Smaller calibre rifles such as .22 magnum rimfire with hollow/soft point ammunition are adequate for euthanasia of horses at short range (< 5 metres). If shooting animals from a greater distance, a higher powered rifle will be required, refer to **HOR001 Ground shooting of feral horses** for more detailed information.

Light fixed wing aircraft or helicopter

- The aircraft must be suited to the purpose and must be registered to perform the task.
- Small Robinson helicopters are popular because of their manoeuvrability. Ultralight aircraft could also be used with helicopters but they are less manoeuvrable than helicopters, and so may not be as effective
- The pilot must be suitably licensed and hold the appropriate endorsements for aerial mustering of stock.

Procedures

Choosing a yard site

- A suitable yard site needs to be flat to enable the erection of portable yards, and have sufficient space for trucks to turn.
- Yards should be set up on a stock trail to encourage horses to run along the trails which, ideally, should lead to the main entrance. Low spots should be avoided as horses prefer to run uphill. The approach to the yard should be flat or slightly uphill. The yard should not be easily visible to the horses until they are close to the entrance.
- If possible, yards should be positioned in a shady area with as much natural vegetation as possible. However, avoid having trees near the entrance of the yards as they can restrict manoeuvring of helicopters.

Mustering

- It is preferable that mustering be carried out when conditions are cool or mild.
- Horses should not be excessively chased but moved steadily with the

slowest animals setting the pace. Horses should never be driven to the point of collapse.

- Only muster that number of horses that can be comfortably handled. The less the number of horses included in any one operation, and the shorter the distance travelled the less stress is likely for the animals.
- 'Coacher horses', domesticated horses that are released amongst feral horses to quiet them, are sometimes used to assist with mustering.
- Horseback musters, involving skilled horse riders pursuing feral horses and directing them into the winged yards, are also occasionally used.
However, this technique is not common as it requires very skilled riders and the capture success is low with only a few animals taken at a time.
- Heavily pregnant mares, mares with small foals and other horses, especially those in poor condition, should be allowed to drop out of groups that are being mustered if required to protect the safety and welfare of the animals. Also, if a female horse continually breaks away and will not move along with the group, it is possible that she may have a dependant foal hidden somewhere. It is best to leave her go and move on with the rest of the group.

Holding horses in yards

- Horses captured by mustering should be allowed a minimum of 24 hours rest with adequate shelter, food and water before they are transported on journeys longer than 8 hours. During this time they must be assessed daily for signs of injury, disease, inappetence, illness or distress. Account must be taken of their possible unwillingness to eat feed they are not familiar with.
- Hosing down horses with water refreshes recently mustered horses and is essential in hot weather; it also has a quietening effect.
- Horses require 25 litres of water a day, although double this amount may be required in very hot weather (> 40°C). Addition of electrolytes to the drinking water is desirable for horses mustered in hot weather. Yarded horses require 6 kg of good quality hay a day.
- To minimise stress and injury in the yards, ideally, horses should be segregated into the following groups:
 - Females with suckling foals;
 - Pregnant females;
 - Other females and juveniles; and
 - Males. If males are observed to be fighting or they are of significantly different age or weight they should be drafted into separate yards.
- Horses should not be held in the holding yards for extended periods. If horses are being held for any length of time they should be drafted into a large holding paddock that contains adequate shade, shelter, food and water.

Shooting of horses

- It may be necessary to humanely destroy horses by shooting in the following situations:

- When there is no market for the captured horses;
- If horses have sustained serious injury during mustering or in the holding yards;
- Dependant young that are separated from their mother;
- Previous disease or condition that would prevent the animal from being transported, slaughtered or domesticated.
- Shooting must be conducted to cause sudden and painless death with minimum distress to the animal. Only head shots are acceptable.
- The shooter should approach the animals in a calm and quiet manner. To prevent unnecessary agitation of the confined horses, other people should keep away from the area until shooting is completed.
- To maximise the impact of the shot and to minimise the risk of misdirection the range should be as short as possible.
 - Never fire when the horse is moving its head. Be patient and wait until the horse is motionless before shooting. Accuracy is important to achieve a humane death. One shot should ensure instantaneous loss of consciousness and rapid death without resumption of consciousness.
 - Shots must be aimed to destroy the major centres at the back of the brain near the spinal cord. This can be achieved by one of the following methods (*see diagrams in Appendix*):
 - Head Shots
 - Frontal position (front view)*
The firearm should be directed at the point of intersection of diagonal lines taken from the base of each ear to the opposite eye. The bullet should be directed horizontally.
 - Temporal position (side view)*
The horse is shot from the side so that the bullet enters the skull midway between the eye and the base of the ear. The bullet should be directed horizontally.
 - Death of shot animals can be confirmed by observing the following:
 - Absence of rhythmic, respiratory movements;
 - Absence of eye protection reflex (corneal reflex) or 'blink';
 - A fixed, glazed expression in the eyes; and
 - Loss of colour in mucous membranes (become mottled and pale without refill after pressure is applied).

If death cannot be verified, a second shot to the head should be taken immediately.
- When large numbers of animals are to be killed in the holding yard, provisions should be made to dispose of carcasses in an appropriate manner i.e. by burying and/or burning. Numerous guidelines are available which describe disposal methods e.g. Burton, 1999; AUSVETPLAN Operational Procedures Manual: Disposal (1996); NSW EPA (2001) Guidelines for disposal of dead stock.

Further Information

Contact the relevant Commonwealth, State or Territory government agency from the following list of websites:

Commonwealth	Department of Environment and Heritage http://www.deh.gov.au/
ACT	Environment ACT http://www.environment.act.gov.au/
NSW	NSW Department of Primary Industries www.dpi.nsw.gov.au
NT	Parks & Wildlife Commission www.nt.gov.au/ipe/pwcnt/
QLD	Department of Natural Resources and Mines www.nrm.qld.gov.au
SA	Animal & Plant Control Commission http://sustainableresources.pir.sa.gov.au
TAS	Department of Primary Industries, Water & Environment www.dpiwe.tas.gov.au
VIC	Department of Primary Industries, Agriculture & Food www.dpi.vic.gov.au
WA	Agriculture WA www.agric.wa.gov.au

References

- Agriculture and Resource Management Council of Australia and New Zealand (1996). AUSVETPLAN (Australian Veterinary Emergency Plan). Operational Procedures Manual: Disposal. Edition 2 version 2.0. Document available electronically from the Animal Health Australia website: <http://www.aahc.com.au/ausvetplan/disfnl2.pdf>
- American Veterinary Medical Association (2001). 2000 Report of the AVMA Panel on Euthanasia. *Journal of the American Veterinary Medical Association* **218**, 669–696.
- Bureau of Land Management. (undated). Standard Operating Procedures: Methods for the humane capture of wild horses or burros. U. S. Department of the Interior. Document available electronically from the Bureau of Land Management website: http://www.or.blm.gov/Burns/Planning/planning_docs/Comment_Period/S_Steens_Gather_Appendix_D.pdf
- Burton, R. (1999). Humane destruction and disposal of stock. Agnote DAI-136. NSW Agriculture, Orange. Document available electronically from the NSW Agriculture website: <http://www.agric.nsw.gov.au/reader/aw-companion/dai136.htm>
- Dobbie, W. (1992). *Control of brumbies in central Australia*. Conservation Committee of the Northern Territory and the Northern Territory Department of Primary Industries and Fisheries, Alice Springs.
- Dobbie, W.R., Berman, D.McK. and Braysheer, M.L. (1993) *Managing Vertebrate Pests: Feral Horses*. Australian Government Publishing Service, Canberra.

English, A. W. (2001) A report on the management of feral horses in National Parks in New South Wales. Document available electronically from the NSW National Parks & Wildlife Services website: <http://www.nationalparks.nsw.gov.au/npws.nsf/Content/English+Reports+on+feral+horse+management+in+national+parks+and+reserves>

NSW Environment Protection Authority (EPA) (2001). Procedure for dead stock disposal. Document available electronically from the NSW EPA website: <http://www.epa.nsw.gov.au/mao/deadstockdisposal.htm>.

NSW National Parks & Wildlife Service (2003). Draft Guy Fawkes River National Park Horse Management Plan, NSW National Parks & Wildlife Services, Hurstville.

Primary Industries Ministerial Council (draft). Model Code of Practice for the Welfare of Animals: Killing or Capture, Handling and Marketing of Feral Livestock Animals. CSIRO, Australia.

Ramsay, B. J (1994). *Commercial use of wild animals in Australia*. Australian Government Publishing Service, Canberra.

SCARM (1997). Model Code of Practice for the Welfare of Animals: Land Transport of Horses. Report No. 62. Standing Committee on Agriculture and Resource Management, CSIRO.

Senate Select Committee on Animal Welfare (SSCAW) (1991). *Culling of large feral animals in the Northern Territory*. Senate Printing Unit, Parliament House, Canberra

Standing Committee on Agriculture, Animal Health Committee. (1991). Model Code of Practice for the Welfare of Animals: Feral Livestock animals – Destruction or Capture, Handling and Marketing. CSIRO, Australia.

Recommended shot placements - Feral horse

Diagram 1

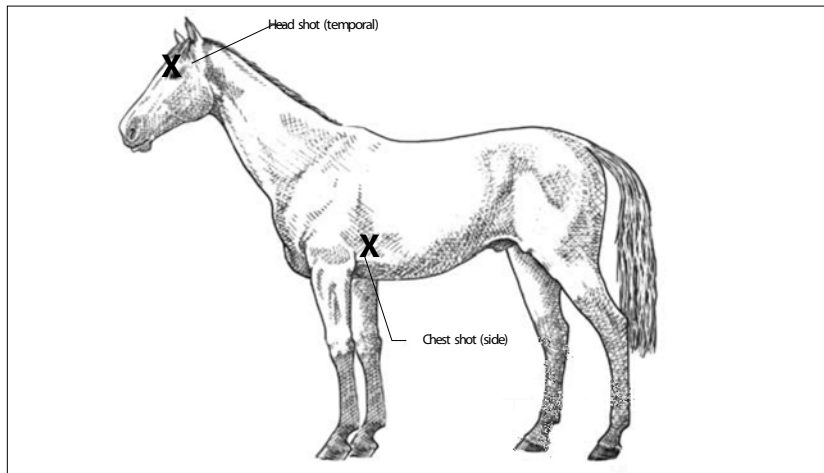


Diagram 2 - Side view (skeleton)

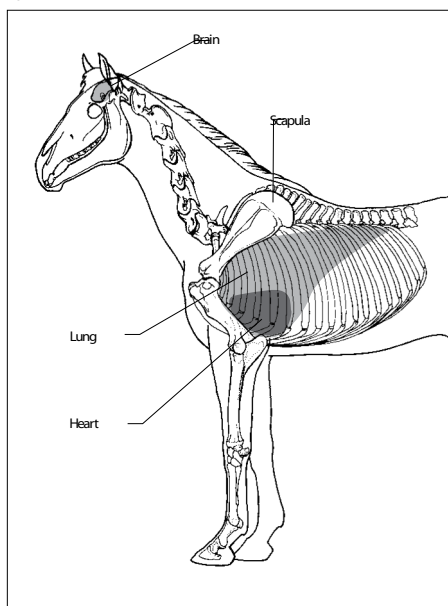
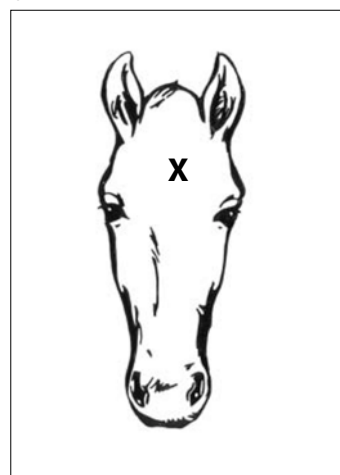


Diagram 3 - Head shot (frontal)



Note: Head shots (temporal or frontal) should be used for shooting feral horses at short range (< 5 metres). See text for details.



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