FOXES IN TASMANIA:

A REPORT ON AN INCURSION BY AN INVASIVE SPECIES

Invasive Animals Cooperative Research Centre

June 2006

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Foreword

The Red Fox (*Vulpes vulpes*) has wreaked havoc on mainland Australia's environment and agricultural production since its introduction in the 1870s. Over the same period Tasmania has remained virtually fox-free, allowing its biodiversity to remain pristine and vibrant. Should foxes ever become established, the impacts on the economic, environmental and social values of Tasmania would be devastating.

Historically there have been sighting reports and other evidence of foxes from Tasmania. However, in 2001 it was reported that foxes may have been systematically introduced to the island. Accumulated evidence also indicates that such an act may have also occurred in 1999 and 2000.

In response to these recent possible incursions, the Tasmanian Government established the Fox Free Taskforce. This body has the responsibility of investigating reports of fox evidence and sightings and of taking appropriate actions, including managing, controlling and monitoring fox introductions and activity, and implementing eradication programs as needed across the State. Since 2001, the Taskforce has received more than 1000 reported sightings of foxes (reports that have varied from poor to excellent in terms of quality) and implemented a baiting campaign covering more than 600,000 ha.

The Fox Free Taskforce and the Tasmanian Government have always been in a difficult position. Foxes found and destroyed in Tasmania mean that the community could judge the Taskforce as having failed to keep the State free of foxes. In contrast, a successful control program and the lack of any clear evidence of foxes (dead or alive) could be judged as a costly effort carried out for no clear benefit.

The Invasive Animals Cooperative Research Centre (IA CRC) has a strong interest in protecting Australia from the impacts of invasive animals including the ravages of fox predation. It was therefore clearly within its charter to assist Tasmania by providing the resources to undertake an independent review of the recently reported incursions of foxes into Tasmania and an analysis of subsequent management actions. The review team I selected for this task includes recognised international authorities on foxes and the damage they cause and consists of Dr. Glen Saunders from NSW Department of Primary Industries, Professor Stephen Harris from Bristol University in the UK, Professor Chris Dickman from Sydney University and Mr Chris Lane from the IA CRC.

The information and recommendations contained within this review should be carefully considered in future fox management programs for the State of Tasmania. We simply cannot afford to be wrong in assessing the potential existence of foxes or in any responsive management program.

On behalf of the IA CRC, I would like to extend my sincere gratitude to the review team who undertook this important task. I would also like to thank the Tasmanian Government and its employees, the Fox Free Taskforce Team and all the individuals and organisations that gave up their time to provide information and evidence for the purposes of this review. In doing this I would like to single out Nick Mooney of the

Department of Primary Industries, Water and Environment and members of the Fox Free Taskforce who provided a great deal of their support and resources to this process.

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List of Abbreviations

APVMA	Australian Pesticides and Veterinary Medicines Authority
AQIS	Australian Quarantine and Inspection Service
CALM	Department of Conservation and Land Management - WA
DFTD	Devil Facial Tumour Disease
DNA	Deoxyribonucleic acid
DPIWE	Dept. of Primary Industries, Water and Environment (now DPIW)
DNRE	Dept. of Natural Resources and Environment - Victoria
FMD	Foot and Mouth Disease
FFT	Fox Free Taskforce
FTE	Full Time Equivalent
IA CRC	Invasive Animals Cooperative Research Centre
NCB	Nature Conservation Branch
NHT	Natural Heritage Trust
OH&S	Occupational Health and Safety
PCR	Polymerase Chain Reaction
PWS	Parks and Wildlife Service
TCT	Tasmanian Conservation Trust
TFGA	Tasmanian Farmers and Graziers Association
TMAG	Tasmanian Museum and Art Gallery

Terms of Reference

The Tasmanian Fox Free Taskforce was established by the Tasmanian Government in 2001 to manage an incursion of foxes into the State. Other organisations and government agencies including the Pest Animal Control Cooperative Research Centre, Conservation Volunteers Australia, Australian Wool Innovation, Department of Environment and Heritage and the Natural Heritage Trust have also invested research or management resources into this effort. The Australian Fox Threat Abatement Plan, produced by the Commonwealth of Australia, recognises the importance of Tasmania's fox-free status to the nation's biodiversity.

Since the recent accumulation of evidence that indicated foxes were present in Tasmania, in excess of 1000 fox sightings have been reported; remains of foxes have been found in the State, as have confirmed footprints, and scats have been positively identified as containing fox DNA or fox hair. Some 80,000 fox baits containing 1080 have been laid strategically across the State in response to concentrations of sightings and reports.

To guide future actions, the Invasive Animals Cooperative Research Centre (IA CRC) has sponsored this *expert review of the Tasmanian fox incursion with recommendations for future monitoring and management.*

Terms of Reference

1. After examining available evidence, provide expert commentary as to the likelihood of foxes occurring in Tasmania;

2. Review and recommend available techniques for monitoring and managing foxes at low densities and how these might best be applied in Tasmania;

3. Comment on proposals for future research and development or monitoring, including the proposed IACRC demonstration site; and

4. Comment on any other matters deemed relevant to avoiding or reducing fox impact in Tasmania.

Conclusions

After examining all of the available evidence on foxes we conclude that an unknown number of foxes have been deliberately and/or accidentally introduced to Tasmania since 1998 and that some of these and possibly their progeny are still living in the wild in Tasmania. This should be the starting premise for the way forward; not debating the merits of past actions or the veracity of all reports.

The likely density of these foxes is still at a stage where eradication is achievable provided the necessary resources are made available.

While we interviewed many who claimed that the evidence for presence of foxes has been the subject of continuous hoaxing and fabrication, not one person was prepared to match their conviction with the risk of doing nothing and foxes becoming permanently established in Tasmania.

On reviewing the situation elsewhere, particularly on mainland Australia, there is absolutely no doubt that foxes are capable of successfully colonising Tasmania. Were this to occur, the cost to Tasmania's economy and more importantly, its biodiversity, would be catastrophic.

Key Recommendations

1. Actions taken to remove the threat of foxes establishing in Tasmania have been extraordinary and the Fox Free Taskforce (past and present members) should be officially commended for their dedication.

2. Taskforce staff levels are expected to be five FTE (three field staff) in 2006/07 with the current commitment indicating that the Taskforce will be disbanded from July 2007. The review team strongly recommends that 2006/2007 staffing levels be maintained indefinitely to allow the monitoring program to be fully implemented. Only on the basis of outcomes from the monitoring program (to 07/08 at least), should staffing levels beyond 2008 be considered for change. If incoming reports escalate, greater resources will be required to upgrade eradication efforts.

3. If there is no local commitment to fox control activities beyond 2006/7 (should the need arise), external funding providers such as the Invasive Animals CRC and NHT, should re-consider the nature of their investment which is currently proposed to assist with monitoring activities.

4. The continuation of community engagement on the fox issue is imperative. Given the critical nature and risk of foxes ever establishing in Tasmania this effort should be underpinned by long-term State funding rather than external funding.

5. The review team recommends the utilisation of a formal Fox Technical Committee comprising fox experts within Tasmania and across mainland Australia which would provide the Taskforce with positive direction and enhance its activities. The Steering Committee in its present form would be better recognised as a stakeholder group.

6. 1080 must remain the preferred toxin for lethal baiting of foxes. The phasing out of 1080 in Tasmania, specifically as used for control of herbivores, must not affect the ongoing availability of this poison for fox control. An amendment under the *Agricultural and Veterinary Chemicals (Control of Use) Act 1995* should be sought to allow this practice to continue indefinitely. Experimental work should continue to develop more effective baits and techniques for fox control and to minimise effects on wildlife and pets. The suitability of 1080 baiting for fox control should continue to be publicly advocated.

7. Given OH&S requirements for Taskforce members to travel in pairs while conducting 1080 baiting, which the review considers is unnecessary, the most cost-efficient alternative is to employ private contractors to undertake any baiting program.

8. The utilisation of DNA detection in scats as a means of detecting the presence of foxes in Tasmania is rightly becoming the focus of monitoring activities. There should be no misunderstanding that this will be a highly labour intensive activity and that sufficient resources (Government, community and voluntary) will need to be allocated. This monitoring program must not simply be a public relations exercise but rather a science-based effort to determine the probability of foxes being present or absent in Tasmania and in turn directing control efforts if the former.

9. With regards to hoaxing, it is ultimately the Tasmanian taxpayer that becomes the loser. The antagonism which has been publicly displayed towards the efforts of the Taskforce should be re-directed at those individuals responsible for hoaxing and in turn diverting the Taskforce members from following up reliable information. The means for prosecuting proven hoaxers should be investigated.

10. A fully documented exit or long-term strategy is required. This should cover all contingencies up to full establishment of foxes in Tasmania and appropriate actions to protect ‘at risk’ species and biodiversity more generally. It should also contain clear triggers agreed to by the Fox Technical Committee (see Recommendation 5) based on evidence or lack thereof to upgrade or downgrade the response.

1. Introduction and Background

The red fox (*Vulpes vulpes*) was introduced by huntsmen to the Australian environment on several occasions in the mid-nineteenth century, but became established following two releases in 1871 at Ballarat and Geelong, Victoria (Rolls 1969). By 1880 foxes occupied much of Victoria; they crossed the South Australian border in 1888, reached New South Wales in 1893 and Queensland and Western Australia early in the twentieth century (Jarman 1986). The rate of movement (≤ 160 km / year) was particularly rapid, with some evidence that spread was actively assisted by humans (Saunders et al. 1995). The early spread and establishment of fox populations was closely linked to the spread of rabbits just a few years previously.

The fox's present distribution, which now covers all of mainland Australia except the tropical north, was achieved in 100 years. Notable exceptions include Tasmania, Barrow and Kangaroo Islands. There have been several unsuccessful attempts to introduce the fox into Tasmania (Statham and Mooney 1991). All larger Australian islands have regular sea and air traffic making irresponsible, deliberate efforts at introduction almost inevitable in the long term (Saunders et al. 1995). Early detection would be unlikely in isolated locations. The fox survives in many environments ranging from urban to arid through to alpine, but is probably most abundant in the fragmented environments typical of agricultural and urban fringe landscapes because these offer a wide variety of cover, food and den sites (Saunders et al. 1995).

The fox has long been recognised as a serious threat to populations of Australian wildlife (e.g., Wood Jones 1925, Marlow 1958, Finlayson 1961). Native Australian fauna did not evolve with the fox and hence have few or no fox-specific predation avoidance strategies. Furthermore, the impact of the fox on wildlife has probably been exacerbated by habitat fragmentation and modification since European settlement (Mansergh and Marks 1993). The fox is also increasingly perceived as a significant predator of livestock, although studies to determine the extent of this impact have provided inconsistent results (Saunders et al. 1995). The only positive impact is the role played by foxes in the regulation of rabbit populations, which is thought to be significant, but only at low to medium densities of rabbits (Pech et al. 1992).

It has been reported that invasive animal species in Australia cost the nation conservatively $720 million per year in economic, environmental and social impacts. The fox alone is estimated to cost Australia $228 million per year in agricultural and environmental damage and associated costs of control. Breaking this down further, $190m is attributed to environmental impact, while sheep production loss, management costs and research costs equate to $17.5m, $16m and $4m respectively (McLeod 2004).

The early history of fox introductions to Tasmania is poorly documented. Reports include intentional introductions (a release at Oatlands in 1864 and a

pair imported to Hobart in 1890); an apparent accidental incursion (Burnie 1998) and several unresolved incursions (two foxes reportedly caught at Scottsdale in 1910 and a fox caught in a rabbit trap near Launceston in 1972) (Lever 1985, Statham and Mooney 1991, Bloomfield et al 2005). Fortunately, none resulted in establishment. The recent events, and claims of organised intentional releases of foxes into Tasmania, have raised national and international alarm. The uniqueness of Tasmania's biodiversity and the already proven magnitude of damage that foxes cause to the environment, as well as to the agricultural and tourism industries, make it imperative to investigate the veracity of these incursions and respond appropriately.

Foxes are extremely cryptic, alert, elusive and almost nocturnal by nature. While high fox densities are apparent in many areas on the mainland, sightings of the species are not common. If foxes do exist currently in the Tasmanian environment, they would currently be at extremely low densities across the State and would be considered as rare and critically endangered were they an endemic species. Under these circumstances, an encounter with a fox or a confirmed sighting in Tasmania would also be rare. Further, adult foxes would be unlikely to encroach on each others' territories, food would be abundant, predators and competitors few, and abundant cover would diminish the need to make high-risk, visible movements and hence make fox sightings even more of a remote possibility. These factors will be considered when reviewing the available evidence on the presence or absence of foxes in Tasmania.

Previous reviews have been carried out on foxes in Tasmania (e.g. Bloomfield 2002, Kinnear 2002). A number of planning documents have also been written; e.g., Fox Free Tasmania Action Plan, and Eradication Management Strategy. This current review will build on these and, by the nature of its broader terms of reference, provide an assessment on the likely current status of foxes in Tasmania and guidance for future monitoring and management strategies.

2. Legislation

Before considering the chronology of events it is useful to describe the relevant State and Federal legislative framework covering invasive animals that operated in Tasmania from 1998 through to the current day:

The *Environment Protection and Biodiversity Conservation Act 1999* is Commonwealth legislation that identifies fox predation as a key threatening process in Australia. All States and Territories within Australia should apply a consistent approach when managing foxes for the protection of native fauna. A national Fox Threat Abatement plan was developed in 2000 as a means of achieving this intent.

In Tasmania, foxes were declared 'vermin' under the *Vermin Control Act 2000*, thus allowing their destruction to be ordered by the Secretary of DPIWE. The subsequent *Vermin Control Act 2002* makes provision for an authorised officer to instruct landholders to control vermin on their property.

Foxes are also prohibited animals in Tasmania under the provisions of the *National Parks and Wildlife Act 1970*, and not even the Minister can issue a permit for their importation.

The penalty for causing or allowing the importation of foxes into Tasmania under this legislation in 1998 was set at $1000. The statute of limitations (the time after an event that prosecution could be pursued by the government), was six months.

The *National Parks and Wildlife Act 1970* underwent some amendments in late April 2000 which resulted in a new penalty for the import of foxes from not less that 200 penalty units ($20,000) and not more than 500 penalty units ($50,000), or imprisonment for a term of 2 to 5 years, or both, for each animal.

Further amendments to legislation (the commencement of the *National Parks and Reserves Management Act 2002* extended the time length of statute of limitations from six months to five years (Section 67). The principal legislation that currently applies to the import of foxes into Tasmania is Section 32 of the *Nature Conservation Act 2002.*

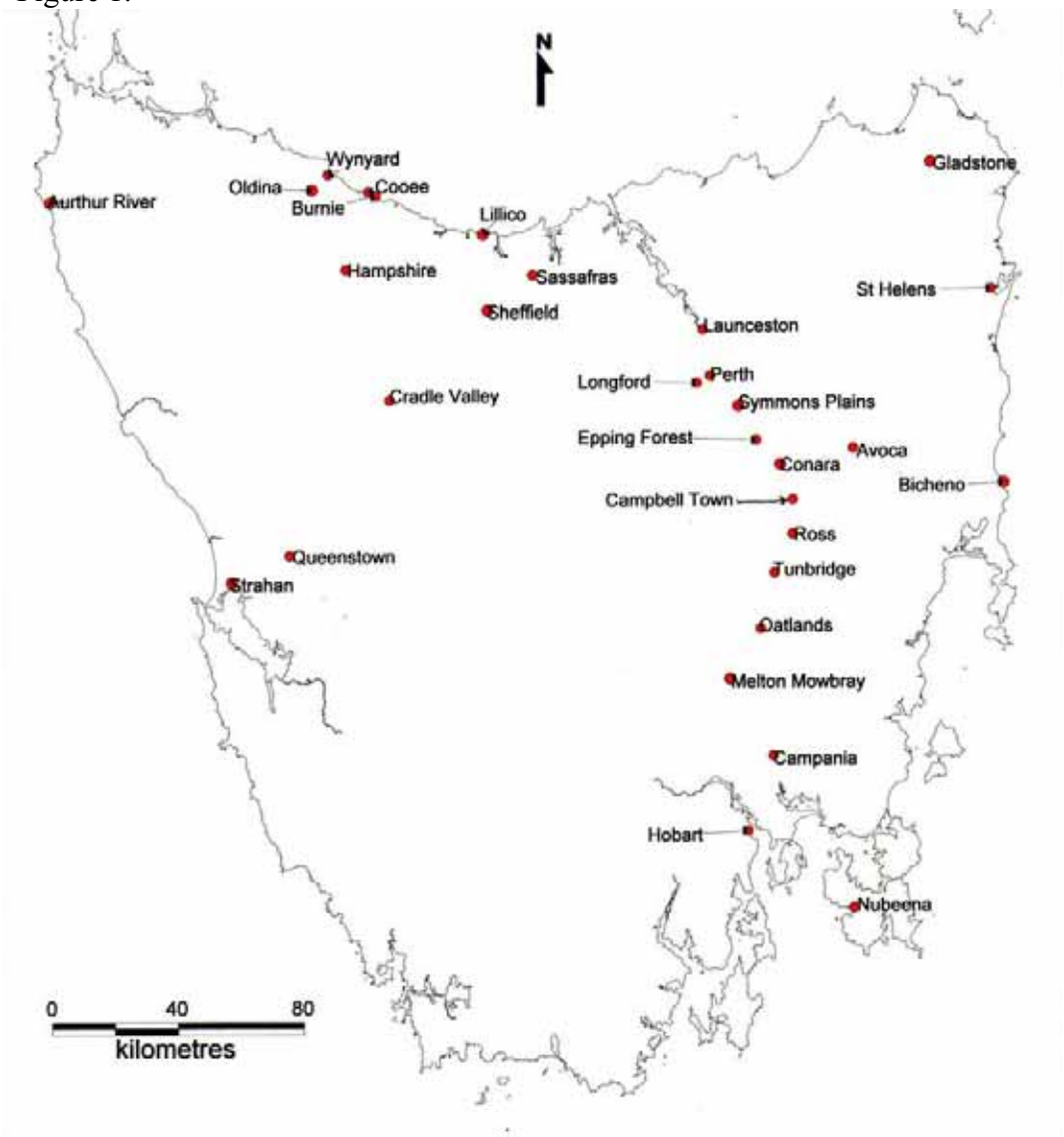
The use of leg-hold traps is banned in Tasmania under the *Animal Welfare Act 1993*. Padded leg-hold traps may be used with ministerial approval, and large cage traps may also be used as part of the fox eradication program.

3. Chronology of Events

3.1 Locations

While there have been a number of documented fox introductions or incursions into Tasmania in the past, we will deal only with the chronology of events and associated actions beginning from May 1998 onwards. The map below (Figure 1) provides reference for the localities of reported incidences of foxes in this section of the report.

Figure 1.



Source: Fox Free Taskforce 2006

3.2 Fox-Related Incidents

3.2.1 Burnie Wharf

On 31st May 1998, staff at the Burnie wharf reported that a fox had walked off a container ship. Six wharf employees chased the fox which eventually escaped the wharf complex and was not seen again (Bryant 2002).

This incident culminated in the setting up of an Incident Control Centre in Burnie involving many stakeholders and an intensive search effort (see below). The only subsequent evidence of a fox in the Burnie area following this incident was a clear set of approximately 130 fox prints (better quality ones were photographed and cast) found along the tide line on a nearby beach in early June 1998 (Nick Mooney, DPIWE pers. comm. 2005). The origin of the ship containing this fox was Webb Dock in Melbourne. We understand that some actions were taken, e.g. baiting, to remove the resident urban fox population at Webb Dock and reduce the risk of further incursions via this means.

3.2.2 Cooee Abattoir

Investigation of a report of a fox skin on a car bonnet at Cooee Abattoir (June 1999) found that it was most likely a skin brought into the State in a truck returning to Tasmania after exporting stock (Bryant 2002).

3.2.3 Deliberately Imported Foxes

It was alleged that 11 foxes from two litters were imported into Tasmania by three persons in early October 1999. A combined investigation of information and allegations of fox importation was carried out in mid 2001 by the Tasmanian Police and the Parks and Wildlife Service (PWS) division of DPIWE.

During the investigation, it was also alleged that the 11 foxes in question were split into three groups and released in the Longford/Cressy area, the east coast (possibly St Helens) area, and the Oatlands area.

The Tasmanian Police reported the findings of its investigation and concluded that there was no substance to the information provided, other than that the persons named in it existed, and that there was no evidence to support the assertion that there were foxes in Tasmania (Glenn Atkinson, DPIWE pers. comm. 2005). We understand that this police investigation dealt only with the importation of foxes *per se* and finished before any hard evidence came to light (e.g. the Longford footprints or the 'Bosworth' fox).

3.2.4 Wynyard

The PWS received two colour photographs, including the negatives, of a fox that were claimed to have been taken in the Wynyard area (February 2001).

The person who took the photographs nor their companion at the time could not or would not take the Department to the site of the photo, or provide the negatives of the photos taken either side of the fox negatives (Nick Mooney, DPIWE pers. comm. 2005). This casts some doubt on the authenticity of the report.

3.2.5 AGFEST

In the set up phase of AGFEST (an annual agricultural show held near Longford) a fox was reported to have been observed leaving a shipping container which had arrived from the mainland (late April, early May 2001). While many exhibitors and management committee members were interviewed regarding the reported observation, the information could not be traced back to its original source (Glenn Atkinson, DPIWE pers. comm. 2005). There were also some credible and independent sightings of a fox in the same area at the time of AGFEST and immediately after it was held (Glenn Atkinson, DPIWE pers. comm. 2005).

3.2.6 St Helens

A report was received in July 2001 by two persons claiming they had shot a fox in the St. Helens area a month earlier. The matter was reported to a Tasmanian newspaper, The Examiner, with photos accompanying the story. Investigations revealed that the two men had conspired in a hoax and this matter was disproved (Glenn Atkinson, DPIWE pers. comm. 2005).

3.2.7 Longford

An anonymous photo of two men with faces partly hidden holding a dead fox next to a well known road sign near Longford (known as the 'Longford' fox) appeared on the cover of the Examiner newspaper (July 2001). Following an appeal for the men to come forward, the Taskforce was contacted by someone claiming to be one of the men in the photograph. He described where the fox was shot and said he would provide the skin which was subsequently sent by mail to the Taskforce. The person claimed he wanted to remain anonymous because he was poaching at the time he shot the fox. PWS later received an anonymous letter containing details of the shooting and insistence that the event was real. No further evidence around this incident has arisen and its authenticity remains questionable (Nick Mooney, DPIWE, letter to Tasmanian Times 30/07/04 and Glenn Atkinson, DPIWE pers. comm. 2005).

Ten days later (August 2001) PWS staff found a series of foot prints about two days old in a clay-pan (Woodstock Lagoon) near-by to the claimed site of the shooting. Casts were taken of some of these footprints, the best of which was forwarded to mainland experts to provide peer identification independent of one another. All identified the cast as belonging to an adult fox. This represents strong evidence of the existence of a live fox in that area at the time, and was the first confirmation of the presence of at least one fox other than just from sightings.

3.2.8 Symmons Plains

Eric Bosworth, a hunter from Perth (Tasmania), reported that on the night of 13 September 2001, he and a companion (also named and interviewed), shot a fox (generally reported as the 'Bosworth' fox) in the Symmons Plains area (about 17 kms from Longford). Mr Bosworth, although believing that he had shot something on the night in question (he shot at a strong eye shine), did not check what it was and consequently only discovered that it was a fox when he revisited the site 10 days after the event (Graham Hall, DPIWE pers. comm. 2005). The fox was male and 14-16 months old (as assessed from subsequent cross sections of teeth).

Various samples of this fox were sent to different laboratories and experts for analysis. The lower intestinal tract of the fox was absent when the fox stomach was removed (Chris Emms, DPIWE pers. comm. 2005). Most of the content of the stomach was sent to Hans Brunner in Victoria, a national expert on mammalian hair identification; a round red berry and some corbie pasture grubs were sent locally for identification; feathers and a bird foot were sent to the CSIRO National Collections Unit (Richard Schodde); and a skink tail to a South Australian expert (Mark Hutchinson).

The subsequent analysis revealed that the gut content contained 'hair, bones and teeth' of *Pseudomys higginsi* (the long-tailed mouse, a native rodent known only from Tasmania) along with feathers, insects (larvae of moth) and traces of plant fibre. Although this rodent species is not typically found around Symmons Plains, remains have been found in Masked Owl pellets at Epping which is only 11km away from the site (Nick Mooney, DPIWE pers. comm. 2005).

Feathers appeared to be from an Australian Magpie (common in the area), the foot from either a juvenile grey-shrike thrush or a golden whistler (the former is resident in Tasmanian and common at Symmons Plains and some of the latter species over-winter in midlands remnant forest such as occurs near Symmons Plains). The skink tail section (the piece commonly dropped by small skinks as a predator distraction) could not be identified to species but was consistent with several species common in the midlands of Tasmania.

The indirect entry of the bullet into the head was consistent with Mr Bosworth stating that as he fired the eye-shine went (the head may have been turning at impact). Forensic investigation could not match the bullet found in the dead fox to that of the rifle owned by Mr. Bosworth due to the highly fragmented state of the projectile. The projectile was however, of the construction type known as copper wash, consistent with it being from a rim-fire firearm. The firearm that Mr. Bosworth claimed to have used and freely submitted for analysis was a .22 Magnum rim-fire**.**

In independent interview, Mr Bosworth's companion concurred with Mr Bosworth's report. Both have stuck to their report despite ongoing public ridicule.

3.2.9 $50,000 Reward Offer

In March 2002 the Honourable David Llewellyn, Minister for the Environment, announced a $50,000 reward for information leading to a conviction of a person or persons responsible for the introduction of foxes into Tasmania. From this announcement, many people came forward with information (over time) which led to 28 separate lines of investigation (Glenn Atkinson, DPIWE pers. comm. 2005).

It has also been speculated that this announcement may have encouraged other persons in Tasmania who were rearing a fox or foxes to deliberately release them for fear of being charged under recently amended legislation. It has not been possible to substantiate if any (or how many) more foxes may have been deliberately released (Szell 2002).

By the latter half of 2002, investigations had run their course and all lines of enquiries had been exhausted. No further follow-up was conducted as any prosecution would cease to have value given that three fox breeding seasons had passed since claims of the initial releases. Prosecution of any person or persons was also unlikely due to expiry of the statute of limitations for the regulatory powers under the *National Parks and Wildlife Act 1970*. It should be noted that while the information from about half the lines of enquiry could not be proved, it was also not possible to conclude that the information provided was incorrect.

3.2.10 Burnie Fox Scat

An alleged fox scat was collected by the Taskforce from the urban/rural fringe of Burnie in May 2002 and was subsequently confirmed through hair analysis to be from a fox. This find also appeared to support a high quality sighting report of an adult fox and cubs in the Burnie vicinity in mid January 2002 (Tim Bloomfield, DNRE pers comm. 2005).

Hair from a Common Ringtail Possum (*Pseudocheirus peregrinus*) was present in the scat which led further investigations to areas around Burnie where ringtail possums commonly occur. However, subsequent monitoring of these areas did not reveal further fox sign or sightings by residents or by the Fox Free Taskforce.

3.2.11 Burnie Roadkill

On 16th October 2003, Burnie police were informed by a bicyclist that a dead fox had been found on the Bass Highway roadside near Burnie Wharf and across from the Burnie Mitsubishi dealership. The fox was picked up from the road by police but unfortunately without an *in situ* photograph. The site had fresh blood on the road (confirmed by the collecting police officer and subsequent examination by Taskforce staff), suggesting that the fox had only recently been hit by a vehicle. Injuries were consistent with it having been road-killed or otherwise killed by severe trauma to the head. The fox was not in rigor mortis at the time of collection by police, but subsequently exhibited

rigor mortis at the Police Station, indicating recent death. From this fact alone it is clear that this fox had been alive in Tasmania (Glenn Atkinson, DPIWE pers. comm. 2006).

There is conjecture as to whether this fox was actually run over by a vehicle on the highway at Burnie and if it was actually a resident 'Tasmanian fox' or another recent escape from a ship, or alternatively that it had been killed elsewhere and placed at the site. One theory is that the fox had been killed on a ship entering the Burnie port or in the wharf area and dumped outside the precinct to avoid scrutiny or disruption to port activities (as occurred in 1998). It remains unknown as to how the fox came to be in Tasmania or, if killed elsewhere, who placed it on the road. Importantly, the fox was an apparently healthy adult female that had never bred. The gut contained no prey endemic to either Tasmania or mainland Australia (Nick Mooney, DPIWE pers. comm. 2005).

3.2.12 Conara Fox Scat

The Taskforce carried out a monitoring program in the Conara area and surrounds during February 2005 as a follow up to public reports. A total of 185 scats were sent off to the University of Canberra for analysis. Extensive testing of the scats revealed that the DNA sequence of one sample tested was a 100% match with *Vulpes vulpes*.

3.2.13 Lillico Beach

Analysis by national experts of DNA, hair samples and a jaw bone confirmed the identity of a juvenile fox carcass found by a member of the public on a road-side near Lillico Beach at Christmas 2005 but not subsequently reported as a fox until the following February 2006 when the remains were quickly recovered. A number of people including road-workers subsequently claimed to have seen the road-kill in the intervening period. A juvenile found at this time of the year would have been born the in the spring of 2005. This could be the first confirmed case of foxes breeding in the wild in Tasmania; if so this has obvious and potentially ominous implications.

3.2.14 Old Beach

In May 2006, 20 poultry were killed over two nights in a hen house at Old Beach near Hobart. The attack was typical of a fox (but could also have been a native predator). After the first attack, barbed wire was placed over the hole used to enter the hen house. Blood collected from timber near the barbed wire was subsequently analysed by the University of Canberra and confirmed to be that of a fox. The owner reported at this investigation that he thought he saw a fox nearby in October 2005 - he did not report it at the time because he thought he would be ridiculed.

3.3 Tasmanian Government Response

3.3.1 Burnie Wharf Fox Escape – May 1998

The then Department of Environment and Land Management (PWS and Nature Conservation Branch) led the effort after this incident. Stakeholders in the investigation included the Australian Quarantine and Inspection Service (AQIS), Animal Services from the Department of Primary Industries and Fisheries, Tasmanian Police, Victorian Department of Natural Resources and Environment (DNRE), Environment Australia and other volunteers (Bryant 2002). An intensive search effort for the escaped fox involved 132 staff and volunteers. Four to six people were maintained in the field until 28 June 1998 where they carried out many monitoring and investigative activities. A response team continued to investigate leads until the 5th August 1998 (Bryant 2002).

As well as coordinating the effort, the Department also established a dedicated website and email hotline at the time.

3.3.2 PWS Staff Training – August 2001

In response to the pre-2001 fox incidents reported above, 7 staff of the PWS and one from NCB were sent to Victoria for intensive training in fox control and monitoring techniques by the Victorian Department of Natural Resources and Environment (DNRE) (Fox Free Taskforce 2004).

3.3.3 Review – December 2001

Tim Bloomfield from the Victorian DNRE was contracted as a Taskforce consultant to review the fox evidence of fox presence collected by PWS and to undertake a risk assessment and to make ongoing recommendations on how the government might handle the fox situation in the State (Fox Free Taskforce 2004).

3.3.4 Fox Free Taskforce – Late January 2002

The Honourable David Llewellyn announced that the Fox Free Tasmania program would begin. Twenty-two staff were employed in the Fox Free Taskforce with teams based at four sites across the State – Launceston, Burnie, Hobart and St Helens.

A specific fox hotline 1300 number was established so that anyone with fox information or reports could report and talk directly to Taskforce staff.

3.3.5 1080 Fox Baiting Program – September 2002

Following research conducted in Tasmania to look at the possible impacts of 1080 baiting on native species (which found negligible population effects), effects of wildlife on baiting (which found a slight effect) and the

development of delivery methods for broad scale fox baiting programs, using techniques to minimise effects of the program on wildlife and vice versa, the Taskforce conducted its first 1080 fox baiting program in Tasmania (Fox Free Taskforce 2004).

3.3.6 Fox Free Taskforce Staff Training – 2003

Taskforce staff received further training at NSW Agriculture (now NSW Department of Primary Industries) at Orange, NSW in June, 2003.

3.4 Past Fox Reviews

3.4.1 Bloomfield – January 2002

Tim Bloomfield was initially seconded in December 2001 to review evidence gathered by Government employees working on the reported fox incursions and to provide recommendations for consideration in future management. His report was provided to the Government in January 2002. Importantly, Bloomfield considered there was enough evidence to indicate that foxes were present in Tasmania and that immediate actions needed to be put in place to protect the Tasmanian environment. He also recommended the need for more intensive follow-up of reports (sightings etc).

In his report Bloomfield states:

"Foxes are the greatest known threat to Tasmania's wildlife in our time and the eradication of foxes from Tasmania will only occur by the application of a thorough, comprehensive and extensive program. The control measures selected must be applied at sufficient distribution and frequency that there can be confidence that all individuals (foxes) will have been treated." (Bloomfield 2002a).

3.4.2 Bloomfield – November 2002

Subsequent to his initial review, Tim Bloomfield provided the Tasmanian Government with a report on the activities of the Tasmanian Fox Eradication Program.

Bloomfield recommended that community awareness and education programs needed to be more effective. This would require the targeting of visitors and travellers of Tasmania, farm based monitoring sites and monitoring programs with hunter groups. He also proposed that further resources for the fox eradication program needed to be committed and an Invasive Species Unit should be created. The Invasive Species Unit would have the role to promote the value of native species and agriculture, identify threats, engage community action and put in place strategies to stop invasive species threats (Bloomfield 2002b).

3.4.3 **Kinnear – March 2003**

Jack Kinnear was brought in as an independent reviewer of the fox eradication program in late 2002. He had six terms of reference, ranging from assessing the effectiveness of the 1080 fox baiting strategy, considering complementary control techniques, reviewing communication and stakeholder engagement strategies, through to assessing the consequences if the eradication of foxes was unsuccessful.

While seven recommendations were put forward, the most important one proposed by the author was:
"the Tasmanian and Commonwealth Governments and their relevant agencies should recognise the fox threat for what it is – an impending disaster comparable in magnitude in reference to damage, to an outbreak of a calamitous disease such as Foot and Mouth disease. The key word here is magnitude in reference to the damage to the economy, and very much more to Tasmania's biodiversity. Accordingly, while the response scenarios would be different, …the eradication of the fox nonetheless, should be given the highest priority within the relevant agencies in relation to staffing, funding and the allocation of resources needed to complete the task. Should failure be the result, anything less would be seen, both currently and historically, as a gross example of government irresponsibility." (Kinnear 2003).

This review totally supports the above recommendation of Jack Kinnear.

4. Evidence

4.1 The Invisible Enemy

Hard evidence provides certainty but does absence of evidence of foxes provide evidence of their absence? Incontrovertible proof of foxes in Tasmania would provide clear and unambiguous support for ongoing action and acceptance of the problem as a State and National emergency. An overabundance of hard evidence would also be indicative of an established fox population, with the inference that efforts to control the incursion had failed. Conversely, any lack of scientific certainty with individual cases should not be used as a reason to postpone measures to avoid or minimise a threat of significant reduction or loss of biodiversity (McNeely et al. 2001). The present situation presents a difficult dilemma.

In researching parallel instances of mammalian introductions it became apparent that the fox situation in Tasmania was almost unique. We could find no major case studies of introductions or even alleged introductions that had been made with the degree of malicious intent reported here. Similarly, we found no reported evidence of invasive animal introductions and positive identifications littered with so much suspicion of hoax and conspiracy as in Tasmania. The cryptic nature of foxes and the publicity surrounding the initial police investigations also meant that the quality of visual sightings was difficult to assess and was usually based on incorrect identification. Added to this mix is the long-held suspicion by most of the Tasmanian public of sightings of the extinct thylacine (*Thylacinus cynocephalus*) – despite numerous reports and searches over a 70 year period, no irrefutable hard evidence let alone a living thylacine has yet been produced.

For the purposes of this review, and indeed for the Taskforce, analysing the veracity of all the reports and assessing the implications of all the accumulated evidence is perhaps one step short of impossible.

4.2 Hard Evidence

Hard evidence by definition is real and unassailable. The following instances have been reported as hard evidence of the presence of foxes in Tasmania. In some cases, the claim of hard evidence has been publicly refuted.

May 1998: Fox walks off a container ship and into Tasmania at Burnie wharf, later confirmed by prints. Six workers reportedly chased the fox until it escaped from view.

August 2001: Confirmed fox prints found at Woodstock Lagoon near the Longford incident.

September 2001: Fox shot near Symmons Plains ('Bosworth' fox) and carcase retrieved. Contents of gut revealed evidence of an endemic species.

May 2002: Scat collected near Burnie is confirmed as that of a fox through hair analysis (fox guard hairs were identified in scat).

October 2003: Fox found freshly dead on the verge of Bass Highway on the outskirts of Burnie. Carcase retrieved by police.

February 2005: Scat found in the Conara area confirmed as a fox scat through DNA analysis.

February 2006: Dead fox reported by roadside at Lillico Beach and carcase retrieved by Taskforce. Tissue, hair and jaw samples confirmed positively as fox. Age of fox (approx. 4-6 months) provides first hard evidence of foxes breeding in Tasmania.

May 2006: Poultry reported killed at Old Beach (near Hobart). Blood collected and confirmed as fox. The blood was recovered following the application of barbed wire to a hole through which an animal had passed to kill the poultry.

4.3 Police Investigation into Illegal Importation of Foxes

In mid June 2001, the Tasmanian Police commenced an investigation into information received by DPIWE regarding the illegal importation of foxes into Tasmania. This investigation lasted approximately one month. The Minister for Police told a Parliamentary committee in June 2002 (about the June 2001 investigation *"….we are highly suspicious of how it [the smuggling] happens and believe we probably know, but, there is one thing to have an indication and high suspicion and there is another thing of having the evidence to actually prove it and there is the matter of the statutes of limitations with our current legislation"*.

Following the announcement in March 2002 by the Honourable David Llewellyn of a $50,000 reward for information leading to a conviction of a person or persons responsible for the introduction of foxes into Tasmania, more information from the public came forward. Despite further lines of investigation pursued from this information, no convictions were made.

Limiting factors associated with the above investigations include the low likelihood of physical evidence being in the possession of any offender/s given the highly publicised illegality of introducing foxes. Finding reliable physical evidence of foxes supposedly held by an offender years before, such as holding pens, would be unlikely due to deliberate destruction of evidence. Any person associated with such an activity (i.e., of having a fox in their possession, and/or having released a fox into Tasmania) would therefore have to have made an admission of guilt, which obviously did not eventuate. Some information did come forward from witnesses who claimed they had conversations with persons allegedly involved in the fox importation; however, following investigation such conversations were subsequently denied.

4.4 Reporting.

To date, the Fox Free Taskforce has received in excess of 1000 reports (to April 2006) from the public that they have seen, heard or observed signs of a fox or foxes. Reports have been received from across the State, except from the far south-west. Most reports of foxes tend to be close to roadways and human habitation.

Reports received are given a rank by the Taskforce as to whether the sighting is 'excellent', 'possible' or 'unlikely'; as determined by an objective list of criteria. To be labelled an excellent quality sighting, the report should meet at least three of the following criteria:

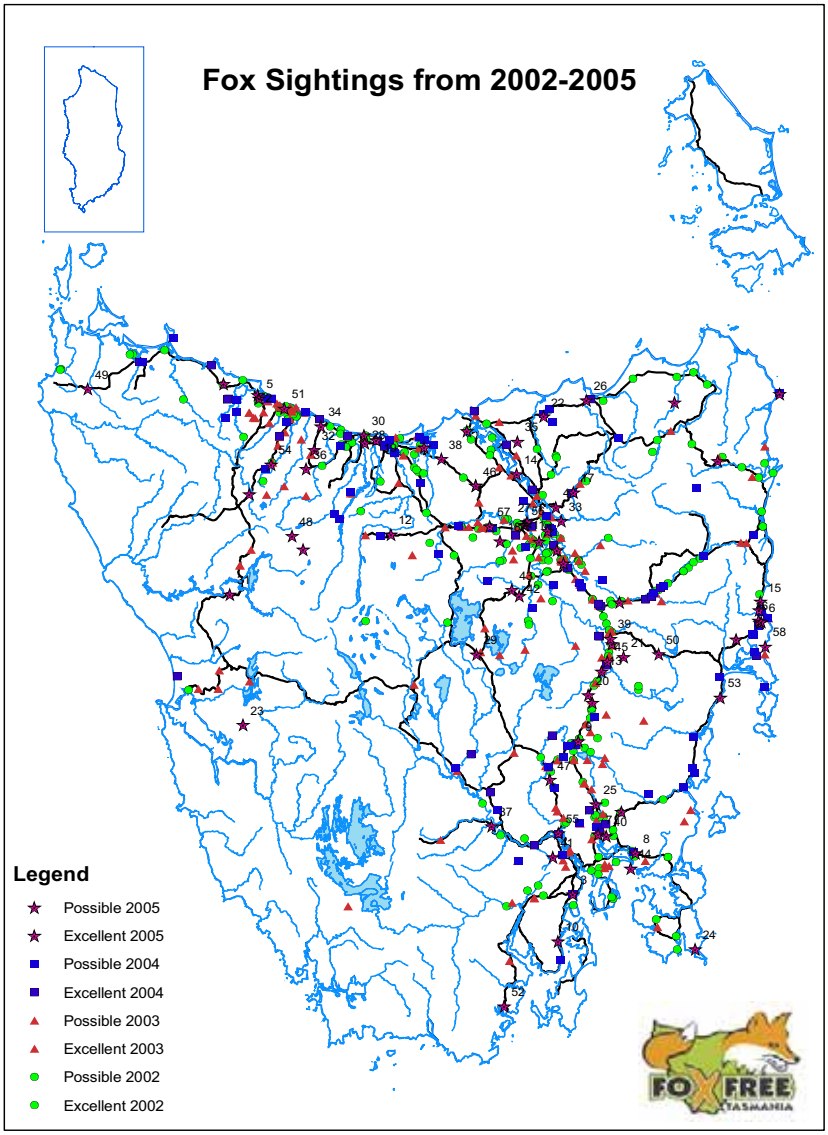
1. reasonable time to observe the animal,
2. description of the animal
3. visibility at the time (weather, vegetation cover, open paddock etc)
4. location of previous sightings, and
5. knowledge of wildlife and / or foxes.

Below an excellent rating, sightings are ascribed as possible or unlikely. The purpose of using these criteria is to prioritise Taskforce activities in the field, and for staff to follow up at least the more likely events. A rank does not confirm or disprove that a fox sighting has been made. There is always the added possibility of a sighting being a hoax (a bogus report) or a mis-identification (mis-identifications can be made of animals such as red morph forms of brushtail possums, brown hares, ginger cats, large quolls or some dogs).

The current set of criteria has been changed and amended over time as increased numbers of reports have come forward and better ways of ranking have been developed. Tasmanian wildlife authorities have decades of experience in trying to unravel aspects of both thylacine and fox reports and are well aware of the fragility of sighting reports on their own as evidence.

The following map (Figure 2) locates the total number of sighting reports received by the Taskforce and categorised as excellent or possible sightings. A summary of total reports by rank for the years 2002-2005 (Table 1) then follows.

Figure 2



Source: Fox Free Taskforce 2005

Table 1. Summary of total ranked reports by year.

Sightings	2002	2003	2004	2005	Total
Unlikely	91	55	44	10	200
Possible	190	130	85	88	493
Excellent	56	52	43	33	184
Sub Totals	246	182	128	121	877

4.5 Response to Sightings

When it is determined that an immediate response is required from a sighting report, a number of actions are carried out:

- two staff members respond and arrive at the site (where this is known),
- permission is obtained from the landholder for the Taskforce to enter the property or area of the sighting,
- firearms are transported to the site (but not necessarily used),
- if it is dark, spotlighting of the area and beyond is carried out immediately,
- where a fox isn't seen using the above technique, Taskforce members then search for the presence of physical evidence,
- if it is ineffective to search for physical evidence (e.g., in darkness), a follow up response will be conducted the next day,
- all outcomes of the investigation are recorded on an 'Information Data Sheet',
- information on this data sheet is then entered into the Taskforces computer database on completion of the investigation.

Note: investigations may remain ongoing, particularly if evidence suggests that further monitoring of the site is necessary or appropriate.

4.6 Protocols for Collecting Evidence

Taskforce officers follow protocols when collecting what is suspected to be evidence of foxes in the field. This includes:

- photographing all evidence *in situ* and with a scale indicator,
- filling in an 'Evidence Identification Sheet' with copies of the sheet accompanying the evidence and another being forwarded to the Launceston office of the Taskforce,
- wearing latex gloves when handling scats and other physical evidence,
- placing any scat in a paper bag, separately packaged from other scats, to avoid cross contamination,
- placing hair samples in plastic bags,
- photographing footprints (with a scale) in situ before they are cast and the casts to be labelled,
- leaving any fox carcases *in situ* and contacting the manager or team co-ordinator, and
- recording details regarding any carcases presented by the public (including information on fox carcass, the individual and any vehicle information).

4.7 Processing of Evidence

Beyond general advice that suspected fox evidence should be treated as court evidence, the review team was unaware of any formal protocols being in place for the handling and processing of evidence similar to those for collection outlined above (at least during the earlier sequence of events). This may have resulted in the loss or discarding of some of the critical earlier

samples, poor assessment and reporting of outcomes, lack of public record and transparency. This obviously needs to be rectified by identifying specialists in the field of hair and bone identification, DNA analyses, and stomach content analysis. In turn these specialists need to be aware of what is required from the sample, the reporting requirements, storage of samples and of the need to return all samples to Tasmania should the need arise for subsequent analyses.

Such protocols now appear to be in place for all new DNA samples, which are sent only to the University of Canberra for processing, but as yet not for other kinds of evidence.

Criticisms raised publicly, in written media and on internet websites, have consistently raised suspicion over the veracity of the hard evidence obtained by the Taskforce. Dr David Obendorf, for example, has maintained that 'it is the overall intelligence assessment that is critical in determining the quality and therefore reliability of any evidence received or obtained.'

By example, Dr Obendorf claimed that in relation to three critical incidences, Symmons Plains ('Bosworth' fox) (Sept 2001), Longford (July 2001) and Burnie (Oct 2003), the Taskforce did not assess evidence with sufficient rigour to confirm or deny that foxes and/or their remains could have been the result of hoaxing, falsification or fabrication. Dr Obendorf's arguments to support his assumptions seemed well reasoned and provided the review with a quandary in assessing all the available evidence. An examination of documented evidence by Dr Obendorf and others is provided in Appendix C.

Differing opinions and interpretations were also expressed by others on the validity of hard evidence. For example, the evidence on the 'Bosworth' fox shooting incident suggested inconsistencies which cast doubt as to whether or not the fox had indeed been shot in Tasmania, whereas investigating officers associated with the reports of the introductions of foxes into Tasmania have stated that the identified individuals would be incapable of perpetrating such a hoax.

On reviewing some of the evidence in relation to DNA samples, stomach contents and also the lack of reporting and poor documentation of investigations of same, it was possible to see how suspicions of veracity could arise and be in turn reported in the media. The review team was also informed by people convinced that foxes were in Tasmania that without doubt, some of the reports of foxes were deliberate hoaxes. Many hoaxes were believed to have been perpetuated by individuals keen to embarrass or disrupt the Taskforce and its activities.

A rigorous, almost forensic approach to all aspects of Taskforces duties is required to support ongoing Government investment. There is a level of indifference in the community's attitudes which can be corrected with a rigorous and transparent process especially when critics raise doubts over the veracity of evidence. Although such a process is now in place, it will take some time and perhaps education, for the public to move from indifference to

acceptance of any future evidence of foxes.

No system will ever necessarily expose the best planned of hoaxes. Similarly, evidence found by the public is often compromised by well meaning but ill-informed collection or examination eg. removal of carcases. This even further complicates the proof of authenticity and is another item requiring public education.

Despite the suspicions raised, it was impossible for the review to discount all the hard evidence presented and we concluded that indeed an unknown number of foxes has been deliberately and/or accidentally introduced and that some of these and possibly their progeny and are still living in the wild in Tasmania. With this in mind, eradication of foxes from Tasmania must still be the single intent of the Taskforce.

The most recent piece of evidence, a fox cub located at Lillico Beach (February 2006), was again impossible to exclude as a hoax but even worse, raises the greatest of concerns that foxes in Tasmania are breeding.

Investigation of the hard evidence and reports associated with the above cases shows some deficiencies in protocols for collection and reporting. Specific guidance is required to maintain the integrity of the Taskforce and its actions in relation to the collection and treatment of evidence. These steps will reduce the questions that are continually raised by sceptics on the reliability of the evidence in future cases. Having said that, even with the most rigid procedures in place, sceptics and criticisms may still come forward due to questions and concerns raised about previous circumstances or because of oblique motivations, one being that the Taskforce is an easy target for those cynical of Government.

The utilisation of a formal Fox Technical Committee comprising fox experts within Tasmania and across Australia may have provided the Taskforce with positive direction and ideas on such issues (see Section 6.6).

4.8 Sighting Reports

Without accompanying hard evidence, the use of sighting reports can only be used as an essential but unreliable part of the monitoring process. It is interesting, however, to note that the frequency (seasonal variations) of fox sightings in Tasmania compares favourably with the frequency of fox sightings in mainland states (see section 7.8).

It is well recognised in criminal cases that eyewitness error is the single largest factor leading to false convictions. In the United States, for example, eyewitness error has been implicated in 90% of convictions that have been overturned on the basis of DNA evidence (D. Hine unpublished, University of New England, Armidale). It would therefore be prudent that sightings of foxes by eyewitnesses be carefully assessed and continue to be categorised in terms of their correctness and reliability.

Many factors influence what we observe, how events are interpreted and what is relayed or provided in expressing an incident or report. People also develop a different awareness and focus on differing aspects of an incident, even when they are exposed to the same situation (Kouri 2000). Influencing factors include the following:

- Sharpness and sensitivity of our senses,
- Perception – physical and psychological differences,
- Quite often, individuals have a tendency to fill in what they believed occurred and not what they actually observed,
- Illusions – false perceptions based on observable facts incorrectly interpreted, including optical illusions,
- Education, background and past experiences.

Added to the dilemma of assessing the reliability of public reports is the question of what else a witness could have seen if they didn't see a fox. In many instances, follow up by the Taskforce has revealed that a 'fox' sighting was in fact a feral ginger cat, a possum, a bettong, a quoll, hare, dog or any wildlife species of similar size or colour.

The problem faced when using sighting information as an indication of fox presence is the scepticism that it can create. For example, reports of sightings not backed up by firm evidence are not confirmation at all. Many farmers, hunters, bush walkers and other outside workers, who are more likely to come across a fox in the environment, claim that if there were foxes in Tasmania, then they would have seen them. Indeed the probability of a reliable sighting would be much higher within this group but again, absence of evidence is not evidence of absence. Also, the likely present density of foxes ie. rare in the landscape, would make the probability of any group seeing a fox extremely low (see Isle of Mann example in section 7.3.1).

During the process of interviews, the review team was informed that some sightings go unreported simply because the person involved did not want to be scrutinised, accused of fabrication or publicly embarrassed given their perception of events in the media. The sighting of the Lillico fox by a roadside contractor, which was not immediately reported, fits this category. This situation is unacceptable and the root cause must be remedied.

4.9 Hoaxing and Tomfoolery

Hoaxing by the public has the propensity to either exaggerate the situation with foxes in Tasmania and/or undermine the current work being carried out by the Taskforce and its programs. It can also divert Taskforce resources away from other more probable sightings and reports.

A case of hoaxing appears to have taken place at St Helens in 2001. A report was received in July 2001 from two persons claiming they had shot a fox in the area a month earlier. The matter was reported to a Tasmanian newspaper, The Examiner, with photos accompanying the story. Subsequent investigations revealed that two men had conspired in a hoax, and the issue of

a potential fox record was thus disproved.

The issue of hoaxing has often been portrayed in the media as a battle of wits between the Taskforce and the 'mischievous rogues' who initiated the hoax. Unfortunately with hoaxing, it is ultimately the Tasmanian taxpayer that becomes the loser. The antagonism which has been publicly displayed towards the efforts of the Fox Taskforce should be re-directed at those individuals responsible for hoaxing and in turn diverting the Taskforce members from following up reliable information. It may not be legislatively possible but it would be useful to consider introducing or increasing penalties associated with persons found guilty of deliberate fraud in relation to fox evidence. This of course carries the risk of deterring genuine but uncertain reports.

With the potential for such hoaxing, it is of paramount importance that each report or investigation of evidence (especially hard evidence) is clinically analysed and documented. Reports and evidence need objective assessment; everything from the integrity of the person making the report, to the feasibility of the circumstances surrounding the sighting or detection of hard evidence. It will take compelling evidence to convince the Tasmanian public that a fox or foxes may be present in Tasmania. A critical element for gaining public confidence will be a lack of negative or sceptical reporting in the media.

The Taskforce (and Government) have undoubtedly been distracted by the constant criticism of its activities, scepticism of evidence and a perception that it should not be a Government function. Similarly, the benefit of having credible individuals being reluctant to report evidence because of potential adverse media scrutiny or ridicule is alarming.

During the Review Team's visit to Tasmania in November 2005, a number of persons were interviewed to gain valuable background information and understanding of the Tasmanian fox situation. In summary, all were highly credible individuals, some of the opinion that the situation was a hoax, others with first hand and seemingly reliable accounts of foxes from various parts of Tasmania. It was interesting to observe that opinions were not even uniform within stakeholder groups let alone between groups. Circumstances surrounding some individual sightings, as presented to the review, and the background of the persons making those sightings made the evidence extremely compelling. Similarly, arguments that instances of reported evidence were fabricated or incorrectly interpreted also had credibility. However, on overall balance, the hoax theories were more subjective and may have simply portrayed an unfortunate series of errors and mistakes in the process of evidence collection or a pre-disposed view of Government activities. As noted previously, Tasmania is also in the unique situation of having an almost certainly extinct native carnivore, the thylacine, being reported with regularity; this without doubt sensitises the public to the possibility of hoaxes.

4.10 Taskforce Feedback

Persons interviewed by the review team indicated that while they had provided reports and information to the Taskforce, they had not received feedback or outcomes from their report as a result of subsequent Taskforce investigations. On the other hand, there may be a case whereby the investigation into a report was still being carried out or that there was no conclusive outcome from the investigation. As a public relations exercise such feedback should occur. However, the ability to do this may require resources which would diminish the field efforts of the Taskforce.

The possibility of having a system in place that provides feedback to those who report to the Taskforce should be investigated and if necessary resourced.

4.11 Summary Based on Evidence

In examining all of the available evidence on foxes we concluded that an unknown number of foxes has been deliberately and/or accidentally introduced into Tasmania and that some of these and possibly their progeny are still living in the wild in Tasmania. This should be the starting premise for the way forward; not arguing the merits of past actions or voracity of reports.

The likely density of these foxes is still at a stage where eradication is achievable provided the necessary resources are made available to the Taskforce.

A recent piece of evidence, a fox cub located at Lillico Beach (February 2006) raises the greatest of concerns that foxes in Tasmania are breeding.

A number of reported sightings and hard evidence of foxes in Tasmania since 1998 were no doubt hoaxes. These appear to have been perpetuated by individuals keen to embarrass or disrupt the Taskforce and its activities.

With hoaxing, it is ultimately the Tasmanian taxpayer that becomes the loser. The antagonism which has been publicly displayed towards the efforts of the Fox Taskforce should be re-directed at those individuals responsible for hoaxing and in turn diverting the Taskforce members from following up reliable information.

Tasmania is in the unique situation of having an almost certainly extinct native carnivore, the thylacine, being reported with regularity; this without doubt sensitises the public to the possibility of hoaxes.

During the process of interviews, the review team was informed that some sightings go unreported simply because the persons involved did not want to be scrutinised, accused of fabrication or publicly embarrassed given their perception of events in the media. This situation is serious and needs to be remedied.

On reviewing the hard evidence it was apparent that in some of the earlier fox events there was insufficient reporting and poor documentation of investigations (not always attributable to the Taskforce). This in turn created suspicions of veracity which were reported in the media and along with hoaxes, cast doubt on some of the highly likely reports. A rigorous, almost forensic approach to all aspects of Taskforces duties is required to support ongoing Government investment and so that the community can have total confidence in the fox management effort.

While we interviewed many who claimed that the evidence for presence of foxes has been the subject of continuous hoaxing and fabrication, not one person was prepared to match their conviction with the risk of doing nothing and seeing foxes become permanently established in Tasmania.

5. Risk Analyses

5.1 The Potential Cost to Tasmania

The fox is an enormously successful coloniser and has the largest geographical distribution outside Australia of any of its mammalian invaders (Forsyth et al. 2004). It is also ecologically flexible and survives well in a range of habitats as well as having no specific dietary requirements (Saunders et al. 1995). There is absolutely no doubt the foxes could establish and thrive in Tasmania, bringing with it a disastrous range of economic, social and environmental impacts.

The fox has long been recognised as a serious threat to populations of Australian wildlife (Marlow 1958, Finlayson 1961, Priddel 1989, Short and Milkovits 1990, Friend 1990, Kinnear et al. 2002). Native Australian fauna did not evolve with the fox and hence have few or no fox-specific predation avoidance strategies. Furthermore, the impact of the fox on wildlife has probably been exacerbated by habitat fragmentation and modification since European settlement (Mansergh and Marks 1993). The fox is also seen increasingly as a significant predator of livestock, although studies to determine the extent of this impact have produced highly inconsistent results (Saunders et al. 1995, Greentree et al. 2000). In 2004 foxes were estimated (albeit subjectively) to cost the Australian agricultural industries and the environment in excess of $227 million (McLeod 2004), topping the list of introduced vertebrate pest species.

Fox impacts on lamb survival can vary on a property basis by between 0 and 30% (Saunders et al. 1995). Greentree et al. (2000) estimated that fox predation was the probable cause of death for a minimum of 0.8% and a maximum of 5.3% of lambs in south-eastern Australia. Applied to the Tasmanian situation, a maximum loss of 5.3% in production would equate to $2.5 million per annum based on a total net value of lambs and sheep slaughtered in the State each year (ABS).

Ongoing costs of control would also apply. In NSW this comes to $7.3 million per annum (Saunders and McLeod in press). Total sheep and lamb numbers in Tasmania are 3.2 million, which is 9% of those in NSW (2004 agricultural census), so roughly $660,000 would need to be spent on ongoing fox control activities, probably more in the earlier years of a population eruption. If there is any doubt about what will become of Tasmania's need to implement ongoing fox control for the protection of lambs, Jones et al. (2004) estimated that public investment in regional fox control programs in NSW produced a cost:benefit ratio of 13:1. In time this would equally apply to Tasmania.

The tourism industry, particularly the ecotourism industry in Tasmania, plays a significant and increasing role in the State's economy and employment prospects. The industry was valued at $857 million in 2002 with an annual growth of 4% (Fox Free Taskforce 2004). It is estimated that 70% of all

visitors to the State participate in nature-based activities, much of which relies on abundant populations of native species that occur across the State. Fox predation on the more vulnerable and highly visible endemic species could see a dramatic down-turn, not only in Tasmania's wildlife, but also in the industry that it supports.

Tasmania is free of the hydatid parasite (Bryant 2002), which foxes often host. Species of roundworm and tapeworm are prevalent in fox populations in much of Australia (Newsome and Coman 1989) and have been recorded in many native mammals. Sarcoptic mange is also common in fox populations and can be transmitted to native species such as the wombat. Although highly unlikely to occur in Tasmania, rabies is an exotic disease commonly transmitted by foxes in the northern hemisphere.

Table 2: Summary of estimated costs of the establishment of foxes in Tasmania Figures provided by Nick Mooney (DPIWE).

Item	Cost/p.a. ($M)
Biodiversity: Costs of protection and recovery	5
Agriculture: Costs of stock loss and protection	8
Health: Costs of monitoring/treating	2
Wildlife Tourism: Reduced accessibility of wildlife, costs of protection	1
Wildlife Research: Reduced accessibility of wildlife, costs of protection	1
Wildlife Photography/Docos: Reduced accessibility of wildlife	1
Hunting: Reduced access to wallaby, quail and pheasant	1
TOTAL Potential Loss	**20**

5.2 Native Species at Threat

If foxes were to establish in Tasmania, 78 species of native terrestrial vertebrates (see Appendix B) in the critical weight range (35-5500 g) would be at risk from fox predation. Of the 78 species, 12 are listed as threatened under Commonwealth and/or State legislation, 16 are suspected as having declining distributions and 34 species have locally restricted ranges (http://www.dpiw.tas.gov.au/inter.nsf/WebPages/LBUN-5K43KE?open).

The species most obviously at risk are the Tasmanian Bettong, Eastern Barred-bandicoot, Eastern Quoll, Tasmanian Native-hen, New Holland Mouse, Spotted-tailed Quoll and perhaps the Tasmanian Devil considering their newly threatened status (Nick Mooney, DPIWE pers comm. 2006).

Species listed under the federal *Environment Protection and Biodiversity Conservation Act 1999* are also outlined in Appendix B.

In 1995, the Tasmanian Government reviewed the effectiveness of the

recovery process for 59 threatened species (out of 61) for which plans had been written. The outcome was that very few advances had been made and that possibly the recovery of any species was likely to be a long term process. Another review was conducted in 2005 to monitor progress. While gains had been made, 140 species are now listed as threatened while funding had not significantly increased from expenditure on the original 61 species (Bryant 2005). The establishment of foxes in Tasmania will no doubt place further pressure on many of these threatened species across the State.

Given the unique suite of native mammals in Tasmania that would be threatened by fox predation, there would need to be a substantial investment to protect conservation values against this new impact. In NSW, for example, predation by foxes is listed as a key threatening process in the *Threatened Species Conservation Act 1995*. This Act aims to conserve biological diversity, prevent extinction and promote recovery of listed species, populations and ecological communities. The Act provides for the preparation and implementation of a fox threat abatement plan. The annual cost to implement this plan is in the order of $1.5 mill. (Paul Mahon, NSW DEC pers. comm. 2006). As a site specific example, the costs of protecting the Penguin Parade at Phillip Island in Victoria from foxes is $160,000 to $200,000 per annum (McPhee and Bloomfield 2004). In the short term it may be necessary to set up many sites to protect the most vulnerable populations of Tasmania's endemic species.

Fox establishment could mean that certain areas/species would need to receive protection against the fox. It has been suggested that 10 fox exclusion sites would need to be established (Nick Mooney, DPIWE pers comm. 2006). Considering that the costs of protecting the Penguin Parade tourism industry of Phillip Island in Victoria is around $200k per year, 10 such similar sites would cost $2m per year to maintain once infrastructure and fences were put in place. This does not include initial set up costs, whether it be fencing or monitoring equipment such as still cameras etc.

5.3 Risk of Current Control Measures Against the Fox.

First and foremost, foxes are one of the most highly susceptible species to the effects of 1080. An array of pilot studies was carried out by Nick Mooney of DPIWE in winter 2001, winter 2002 and autumn 2002 to assess the likely take of a variety of surface and buried 1080 baits by Tasmanian wildlife and live stock. The trials initially focussed on free feeds (baits that did not contain 1080) then finally to baits that did contain 1080 by utilising operational baiting. In Tasmania, the results revealed little or no impact on native species using current baiting regimes (Mooney et al. 2005). Generally, wildlife only started to take baits once the bait started to degrade. Most of the baits at this point have a low residual dosage of 1080 present, which reduces the probability of native species consuming a lethal dose. Having said that, the amount of residual 1080 poison in degraded bait is still effective on any fox that were to eat the bait. Therefore, 1080 baiting has very minimal effects on wildlife populations, but the bait take by wildlife has a moderate effect on the 1080 fox baiting program in that they remove baits from the program thus

reducing the chances of a fox being baited in that particular area (Mooney 2004). It is therefore considered that the recent use of 1080 in fox control programs would have no regional population effect on any native species.

Landholders and the Tasmanian Conservation Trust (TCT) are concerned about 1080 baits being left in the ground. The public in general is averse to the use of 1080 – no doubt a spillover from controversy of its previous use in controlling native and introduced herbivores in farming and forestry situations.

5.4 The Tasmanian Devil Factor

The Devil Facial Tumour Disease (DFTD) is a term used to describe a fatal condition found only in the Tasmanian Devil (*Sarcophilus harrisii*). As the term suggests, tumours or cancers are found on the face of the devil, progressively increasing in size and restricting the devils ability to eat. Devils usually die within three to eight months from starvation and the breakdown of bodily processes.

The disease is now thought to be present across more than half of Tasmania, though mainly in the central and north east parts of the state. Best estimates indicate that devil numbers have dropped by 80% where the disease has been known to persist in the population the longest, with a lesser decline rate in other diseased areas.

While investigations have been mounted on the DFTD in an effort to reduce and stop the cancer from persisting in the devil population, an extensive survey and monitoring program is also underway, as is a program to identify ongoing research and management strategies in response to the disease threat. Unfortunately, despite these initiatives, the disease continues to spread.

The decline in devil populations occurs coincidently in the same area where most fox sighting reports have been received from the public. It is unknown what effect devils might have on foxes, and indeed what effect foxes could have on a recovering devil population. Less competition in the absence of devils could be advantageous for fox establishment which in turn may lead to a difficult long-term population recovery for devils.

5.5 Summary Based on Risk

On reviewing the situation elsewhere, particularly that on mainland Australia, there is absolutely no doubt that foxes are capable of successfully colonising Tasmania.

Were this to occur, the cost to Tasmania's agricultural production, principally sheep, would be in excess of $3mil. per annum (as calculated in this review). Losses to the tourism industry, based on the reduced visibility of Tasmania's unique wildlife, could be in the order of $1mil. per annum. The greatest loss from foxes would be to biodiversity; difficult to measure in dollar values but obviously devastating based on mainland experiences. Costs associated with

protecting any endangered or vulnerable species from ongoing fox predation would be greater than $2mil. per annum. Many other hidden costs eg. disease surveillance and research will add to the overall cost.

Any previous and ongoing expenditure by the Fox Free Taskforce and by external funding agencies is totally and absolutely justified. Any estimate of cost benefits would irrefutably support the need for ongoing investment to keep Tasmania free of foxes.

While concerns are often raised over the risks associated with the use of 1080 for fox control in Tasmania, we could find no evidence of any catastrophic non-target poisonings. The benefits to be gained from 1080 fox baiting programs far outweigh any risks to endemic species.

During the review it was frequently commented that the Tasmanian public as a whole does not fully appreciate the ramifications of foxes becoming established in their State. The small risks associated with the use of 1080 for fox control in relation to the enormous and obvious benefits from a successful outcome should be continually reinforced in ongoing education programs.

Given what is at risk as a consequence of foxes becoming established in Tasmania, contingencies should also be in place for worst case situations in which rare, vulnerable or endangered endemic species need to be protected from fox predation.

6. Fox Free Taskforce

6.1 Background

Events leading to the establishment of a Fox Free Task Force probably commenced with the 1998 Burnie incursion and subsequent search for evidence. Then, in mid 2001 the Nature Conservation Branch (NCB) of the government received several colour negatives of a fox supposedly taken near Wynyard in early 2001. A small number of staff from the NCB and the Wild Animal Management Branch of DPIWE came together to examine these photos. A week later a credible 'hearing' report came from Longford (from two English naturalists familiar with the vocalisations of foxes) followed two weeks later by a credible sighting report from near Longford at close range from one of the State's most highly regarded naturalists.

From this spate of seemingly reliable evidence, a group of PWS officers and Nick Mooney from the NCB got together as the beginnings of the Taskforce (not so named at this point) and started local monitoring and door-to-door enquiries. The NCB wrote the first Fox Action Plan.

Wildlife Rangers received reports of possible fox importations and were conducting separate investigations. Reports (including a hoax) came in from the St Helens area (July 2001) and other reports came in from the Longford area. The day DPIWE staff went to Phillip Island for training in fox management and control, the photo of the 'Longford' fox appeared in The Examiner (July 2001). Approximately one week later fox footprints were found near Longford. During September 2001 the 'Bosworth' fox (Symmons Plains) also came to light.

Tim Bloomfield from the Victorian Department of Natural Resources and Environment was subsequently contracted to review the evidence and situation with respect to a possible fox incursion and provide the Tasmanian Government with future management recommendations. The document became known as the 2002 Bloomfield Report.

The Hon. David Lewellyn announced on the 30 January 2002 that the Fox Free Tasmania program would be initiated with funding of $2.4 million over two years (Fox Free Taskforce 2004). The major change from the work carried out prior to this announcement was not so much numbers of staff or even resources allocated to the fox task, but changing from a localised PWS reaction to a dedicated state-wide program in recognition of the risks identified.

6.2 The Fox Free Taskforce

Terry Reid of PWS managed the Taskforce which expanded to its full extent during 2002. Peter Williams, the then General Manager of PWS through this period, largely shaped the development of the Taskforce.

On the surface, it appears that the Fox Free Taskforce was formed through the culmination of the information and evidence of reports and investigations collected over an 18 month period. Its formation was probably a precautionary measure based on the potential impact of foxes in Tasmania, more than on volumes of hard evidence. Tasmania would have a lot to lose if this form of management wasn't instigated in the early stages of any fox establishment. Doing nothing may have proved disastrous and would have been historically viewed this way in the event that foxes became established.

There were many issues that had to be weighed up when the Government entered into a state-wide program with minimal hard evidence:

1. If foxes established in Tasmania, and no action was taken in the early stages, the Government would be criticised for sitting on its hands and failing to prevent establishment when this was possible.
2. If foxes didn't establish in Tasmania, but with a huge dollar investment to counter such an eventuality, then Government could be criticised for spending money on an issue which was hard to prove beyond doubt when action was initiated.
3. When foxes are at negligible densities, they are extremely difficult to detect, let alone find and eradicate. In turn it would therefore be difficult to prove eradication.
4. How does a small number of foxes behave within a landscape devoid of other foxes? Designing an appropriate response to an undefined threat was always going to be extremely difficult.

Information gathered by the review team would suggest that government employees were already investigating and monitoring the fox situation in the State and that the Taskforce launch was nothing more than recognition of its functions at the state rather than at a regional or local level. Importantly, establishment of the Taskforce allowed for investment of supporting Federal funds.

6.3 Taskforce Staff

Initially, in January 2002 a management team of six and field teams, 22 staff in all, were employed in the Fox Free Taskforce based over four different sites across the state (Launceston, Burnie, Hobart and St Helens). Since inception, Taskforce staff numbers have gradually declined as follows:

2002/03 – 11 Full Time Equivalent (FTE) staff, 2 FTE contracted staff and 15 casuals
2003/04 – 9 FTE staff, 9 FTE contracted staff and 1 casual
2004/05 – 9 FTE staff, 9 FTE contracted staff and 1 casual
2005/06 – 9 FTE staff and 1 casual.

Staff levels are expected to drop to five FTE in 2006/07 (including three field staff) all based in Launceston, with the current commitment meaning that the Taskforce will be disbanded from July 2007.

Nominated State Government expenditure in 2006/07 will be $605,000 of which only 2% will be offset against baiting activities as opposed to 49% in the previous year. Monitoring activities (including report investigations and spotlighting) will account for 69% of expenditure in 2006/07 as opposed to 34% in the previous year.

Details of the activities of the Taskforce over this period are provided in the document 'Fox Free Tasmania – Fox Eradication Management Strategy 2004-2007'. Projected in appendix 12 of this document are the areas of strategic and tactical baiting. These were 450,000 ha. in 2004/5, 200,000 ha. in 2005/6 and an unknown area in 2006/7. Coverage in the latter will obviously depend on the availability of funds and hence staff.

6.4 External Funding

External funding via the Natural Heritage Trust (NHT) has been made available to assist Tasmania in its fox eradication program.

6.4.1 NHT

The following proposals have been made to the Federal Government via NHT for support to the Tasmanian government for expenditure on fox eradication. Although these funds were requested for 2005/06 it appears that they will mostly be carried over to 2006/07. Proposed tasks include:

Community Engagement ($50,000)

Employment of a part time community engagement officer,
Production and dissemination of promotional materials,
Maintenance of web site

Contractor Baiting ($100,000)

Supplement full time task force members and provide pool of expertise for future reactionary control programs
Deployment of 4500 baits across high risk areas

Scat Collection ($65,000)

Organisation of collection and submission of scats for DNA identification
Employment of project officer to coordinate

DNA Analysis of Scats ($30,000)

Costs of DNA analysis at University of Canberra at $20 per scat.

Risk Assessment ($80,000)

Determine genetic variability in key risk species, Tasmanian bettong, eastern quoll and eastern barred bandicoot, should the need arise to protect

populations from fox predation

6.4.2 Invasive Animals CRC

The IA CRC will be establishing a project aimed at providing the link between fox presence and control by undertaking a comprehensive survey of predator scats in Tasmania and using Polymerase Chain Reaction (PCR) species identification tests to identify scats that contain fox DNA. Scats identified as originating from foxes will serve as a trigger for fox control measures and increased surveillance in the surrounding areas. The ability to rapidly respond to fox positive identification of scats will be critical to the viability of this project and should be reviewed by IA CRC if any longer term investment is made in this area.

Selected local groups will be trained in the identification and collection of predator scats and then coordinated in a systematic collection across Tasmania. In addition, information on the distribution of Tasmania's other five top mammalian carnivores including wild dogs and cats will also be collected.

Funds to be allocated in 2006/07 include $65,000 for a project officer plus running costs to facilitate scat collection and training in Tasmania. An additional $80,000 will be provided for setting up and running the DNA laboratory requirements.

6.5 The Total Effort Beyond 2006

The combined input of funds from the Tasmanian Government, NHT and IA CRC should provide an adequate response to the fox problem in 2006/07, provided that no further positive evidence of new fox presence is obtained. The program is moving into a monitoring phase which is where most of the funding is directed. The ability to produce a reactive baiting response to quality sighting/evidence reports is supported through the provision of NHT funding. Using contractors to bait removes this burden from permanent staff especially with the restriction of having two members in each baiting vehicle. Of concern is the dramatic reduction in the area to be baited especially given the recent discovery of a fox cub at Lillico Beach. Should any further conclusive fox evidence be obtained in the coming year, sufficient resources will not be available to respond. This in turn will potentially negate the ongoing investment of funds by IA CRC and NHT. If the Tasmanian Government is not prepared to make any commitment to fox control activities beyond 2006/7 (should the need arise), external funding providers should re-consider the value of their investment.

The collection of scats and to a minor extent the use of automated cameras will be critical to the monitoring program. It appears that two project officers (funded by NHT and IA CRC) will be employed to facilitate this process. This may be necessary at least in the first year as many volunteers will be required if sufficient sampling intensity is to be reached (Sections 7 and 8). The most pressing need for 2006/07 is to get in place the correct sampling

and monitoring strategy and it is not clear if one has yet been considered. Scat collection should not be a public relations exercise but rather a science based effort to determine the probability of foxes being present or absent in Tasmania and in turn directing control efforts if the former. It is highly unlikely that monitoring will be of a sufficient scale or quality in its first year and should therefore run through to the end of 2007/08 (and beyond). Designing the sampling strategy, including the development of a GIS based data management system must be the first priority. Whether or not enough resources are then available to implement the strategy can then be assessed.

The continuation of community engagement is also imperative. Given the critical nature and risk of foxes ever establishing in Tasmania it is difficult to understand why this effort is not underpinned by long-term State funding rather than external funding. It should be no different to the promotion of key biosecurity risks by most Governments world-wide.

It was not possible for this review to determine what resources would likely be available beyond 2007. At this stage the only apparent guarantee is the continuation of the IA CRC funding which will be insufficient on its own, especially if fox scats are identified. That no mention is made of resourcing in any document or continuation beyond 2006/07 indicates that the Taskforce will be disbanded at this point of time. The review does not support this intention and strongly recommends that 2006/2007 staffing levels be maintained indefinitely to allow the monitoring program to be properly implemented. Only on the basis of outcomes from the monitoring program should staffing levels beyond 2008 be considered.

In Section 7 we discuss best practice for eradicating invasive species. Ongoing issues considered critical to eradication include:

- It must be kept in mind that it becomes progressively more difficult and expensive to remove the last remaining individuals of an invasive population. This will involve low visible returns for high investment late in the program.
- The eradication program itself needs to be an iterative process – modifications based on field experience and ongoing research should be regularly considered.
- Team management and motivation will be required - no single person can achieve an eradication success. A core of field and research expertise is needed to lead the eradication effort from beginning to end in order to maximize efficiency.
- It is important to maintain political and administrative support to complete the program.

Using the above factors as a guide, the review team believes it would be a major risk to completely disband the Taskforce in 2006/07. As mentioned, any eradication program must be an iterative process. The ability to respond to any new foci of reports must always be available. We reiterate that the monitoring program must of sufficient quality to provide such evidence and should be conducted at least until 2007/08 (and beyond if reports continue). It

will also be difficult and time consuming to initiate across such potentially large areas. The program may not be fully functional until early 2007. This in itself requires continuation of the Taskforce beyond 2006/07.

The next factor is maintenance of field expertise. Unless current (surplus) Taskforce members are re-deployed somewhere in DPIWE, the expertise to initiate a rapid response in any future incursions will be lost. We understand that there has already been a major loss of Taskforce staff and that redeployment is possibly not an option. Under these circumstances, permanent DPIWE field staff employed in other areas should at least be trained in the principles of fox control and in rapid response strategies should the need arise. Keeping fox expertise in Tasmania will be important to Tasmania's program into the future (active baiting and reporting, follow up roles, or just a monitoring roles) when/if future incursions occur.

It is impossible to predict what the fox situation will be at the end of the current monitoring phase. This obviously will make it very difficult for any Government to plan its investment in this area. How best to facilitate team management and motivation as well as maintaining political and administrative support is something everyone is struggling with including this review. One suggestion offered to the review was to give the Taskforce some new direction and function in terms of feral animals while at the same time maintaining its capacity to deal with ongoing Taskforce functions. This option should be considered by DPIWE. However, any new direction should not prohibit the ongoing supervision of fox monitoring programs or prevent the capacity to immediately respond to major fox issues as they occur. We also acknowledge that any diminution of the Taskforce as a publicly recognised entity risks losing hard earned public support.

In the document 'Fox Free Tasmania – Fox Eradication Management Strategy 2004-2007' were the only recommendations we could find for actions beyond 2007. These were:

"An effective monitoring strategy must be in place to assist in ongoing monitoring of areas where the evidence of foxes present in the landscape has been shown or strongly indicated. This effort will likely involve staff from the Nature Conservation Branch of DPIWE but could perhaps form part of a combined monitoring effort in conjunction with the devil facial disease project.

On the completion of the fox eradication program, identified monitoring areas must have recorded base line monitoring data for future reference. It is recommended that long term monitoring in these areas be undertaken by the department at random periods each year for at least 5-10 years from the completion of the project.

A response plan should be developed to carry out tactical baiting operations in future if required. As part of this plan a supply of fox poison baits needs to be kept available for immediate use if required. A list of contractors trained to carry out fox baiting operations needs to be maintained."

This would appear to be the only developed exit strategy. It implies that resources for monitoring and emergency response must be maintained which is supported by this review. This in turn indicates that existing personnel and more importantly their expertise should be absorbed and hence maintained within other functions of DPIWE. If this is not possible, a skills base for managing fox emergencies must be maintained as suggested above.

A critical recommendation in this exit strategy which we fully support is the development of a response plan for future incidents. No reference is made to who should prepare such a plan or strategy but this is obviously a task to which DPIWE needs to allocate the necessary resources. Such a strategy should contain clear triggers, as agreed to be the Technical Committee, which determine whether a response is upgraded or downdgraded. As mentioned by Jack Kinnear in his review of 2003, foxes in Tasmania should be treated in the same way as would an outbreak of an exotic disease like FMD. A plan of sufficient detail must be developed for this purpose and we suggest that the AUSVETPLAN Wild Animal Response Strategy (http://www.animalhealthaustralia.com.au/) could be a useful guide. This manual was written specifically to deal with wildlife disease emergencies and is based mostly on wildlife management skills. As with most disaster plans they need to be occasionally tested in the field. This also serves as a means of training staff in response techniques, such as baiting foxes and containing localised fox populations.

6.6 Fox Taskforce Steering Committee

The Fox Free Taskforce Steering Committee formed following the announcement of the operation of the Fox Free Taskforce in January 2002. The committee included stakeholders with a focus on community engagement for the program. The early role of the steering committee was to assist the General Manager of the PWS in the implementation of an agreed fox program for the State of Tasmania. Three main aims initially addressed were to:

1. monitor and evaluate the progress of the Taskforce in implementing an approved program,
2. make amendments to the program in light of any new information and progress in the field; and
3. communicate the progress of the program to the stakeholders

Besides Taskforce representation and other scientific, game management and other advisers from State and the Federal governments forming the basis of the committee, external stakeholders included the Tasmanian Farmers and Graziers Association; the Tasmanian Conservation Trust and the Tasmanian Field and Game Association.

The Steering Committee has met infrequently on 14 occasions since its inaugural meeting on 29 April 2002. Over time, the group has more become a stakeholder advisory group and provides limited guidance to the Taskforce.

Some members suggested that while the steering committee was an attempt to bring together stakeholders it was merely 'lip service' and that the decisions arising from the meetings had little bearing on duties carried out by the Taskforce.

It would be more appropriate to utilise a formal Fox Technical Committee comprising fox experts within Tasmania and across Australia which could provide the Taskforce with positive direction on its activities. The Steering Committee in its present form would be better recognised as a stakeholder group.

6.7 Summary Based on the Fox Free Taskforce

Actions taken to remove the threat of foxes establishing in Tasmania have been extraordinary and the Taskforce (past and present members) should be officially commended for their dedication.

Taskforce staff levels are expected to drop to five FTE in 2006/07 (three field staff) with the current commitment meaning that the Taskforce will be disbanded from July 2007. This review does not support this intention and strongly recommends that 2006/2007 staffing levels be maintained indefinitely to allow the monitoring program to be properly implemented. Only on the basis of outcomes from the monitoring program should staffing levels beyond 2008 be considered. If incoming reports escalate, greater resources will be required to upgrade control efforts.

If the Tasmanian Government is not prepared to make any commitment to fox control activities beyond 2006/7 (should the need arise), external funding providers such as the Invasive Animals CRC and NHT, should re-consider the value of their investment which is mostly aimed at assisting with monitoring activities.

The proposed scat collection program should not be a public relations exercise but rather a science-based effort to determine the probability of foxes being present or absent in Tasmania and in turn directing control efforts if the former.

It is highly unlikely that monitoring will be of a sufficient scale or quality in its first year and should at least run through to the end of 2007/08 (and more like well beyond this time). Designing the sampling strategy which would include the development of a GIS based data management system must be the first priority. Whether or not enough resources are then available to implement the strategy can then be assessed.

The continuation of community engagement is imperative. Given the critical nature and risk of foxes ever establishing in Tasmania it is difficult to understand why this effort is not underpinned by long-term State funding rather than external funding.

Unless current surplus Taskforce members are re-deployed somewhere in

DPIWE, the expertise to initiate a rapid response in any future incursions will be lost. We understand that there has already been a major loss of Taskforce staff and that redeployment is possibly not an option. Under these circumstances, permanent DPIWE field staff employed in other areas should at least be trained in the principles of fox control and in rapid response strategies should the need arise.

It is impossible to predict what the fox situation will be at the end of the monitoring phase. This obviously will make it very difficult for any Government to plan its investment in this area. How best to facilitate team management and motivation as well as maintaining political and administrative support is something everyone is struggling with including this review.

One suggestion offered to the review was to give the Taskforce some new direction and function in terms of feral animals while at the same time maintaining its capacity to deal with ongoing Taskforce functions. This option should be considered but only at completion of the monitoring phase of the program.

The review recommends the utilisation of a formal Fox Technical Committee comprising fox experts within Tasmania and across Australia which could provide the Taskforce with positive direction on its activities. The Steering Committee in its present form would be better recognised as a stakeholder group.

A critical recommendation in the current exit strategy, which we fully support, is the development of a response plan for future fox incidents. Such a plan should contain clear triggers, as agreed to be the Technical Committee, which determine whether a response is upgraded or downgraded. This strategy, based on much experience, would be beneficial to other areas and situations which might in future be subject to an invasive predator like the fox.

7. Fox Biology and Management

7.1 General Biology

A number of qualities have helped the fox to successfully colonise mainland Australia and elsewhere in the world. These include a wide dietary range with the rabbit in particular being a major food source. With the possible exception of mange and distemper (and potentially rabies), the fox has few serious diseases and it has even fewer natural enemies. The fox also has a high reproductive rate. Although litters are small, and females only breed once per year, cub survival is high and most adults appear to breed. Females are reproductively active from July to October with a peak during August in south-eastern Australia Gestation lasts 51–53 days with most cubs born during September (after Saunders et al. 1995).

Fox movement patterns vary throughout the year depending on the breeding cycle. Itinerant foxes are continually seeking opportunities to establish permanent territories. Resource hungry foxes will also take over part or all of recently vacated adjacent territories. Dispersal in particular results in the regular mixing of fox populations. The majority of dispersal occurs in sub-adult foxes commencing in late summer and continuing through to the onset of breeding in winter. Harris and Trewhella (1988) found that approximately 30% of all foxes dispersed in any one year. In a recent Australian study (Saunders et al. 2002), some extreme dispersal distances were observed. The longest of these was a straight-line distance of 300 km. Another animal was shot 260 km away from its site of release only one month after being released.

With such inherent abilities to rapidly establish new territories over both short and long distances, the fox is perfectly adapted to compensate for any form of population reduction. An innate drive to seek out new territories and mates and an ability to rapidly move over large distances also makes it an extremely successful invasive animal. In recognition, the IUCN has included the fox in its list of the world's worst 100 invasive species (Lowe S., Browne M., Boudjelas S., De Poorter M. (2000) *100 of the World's Worst Invasive Alien Species A selection from the Global Invasive Species Database*.).

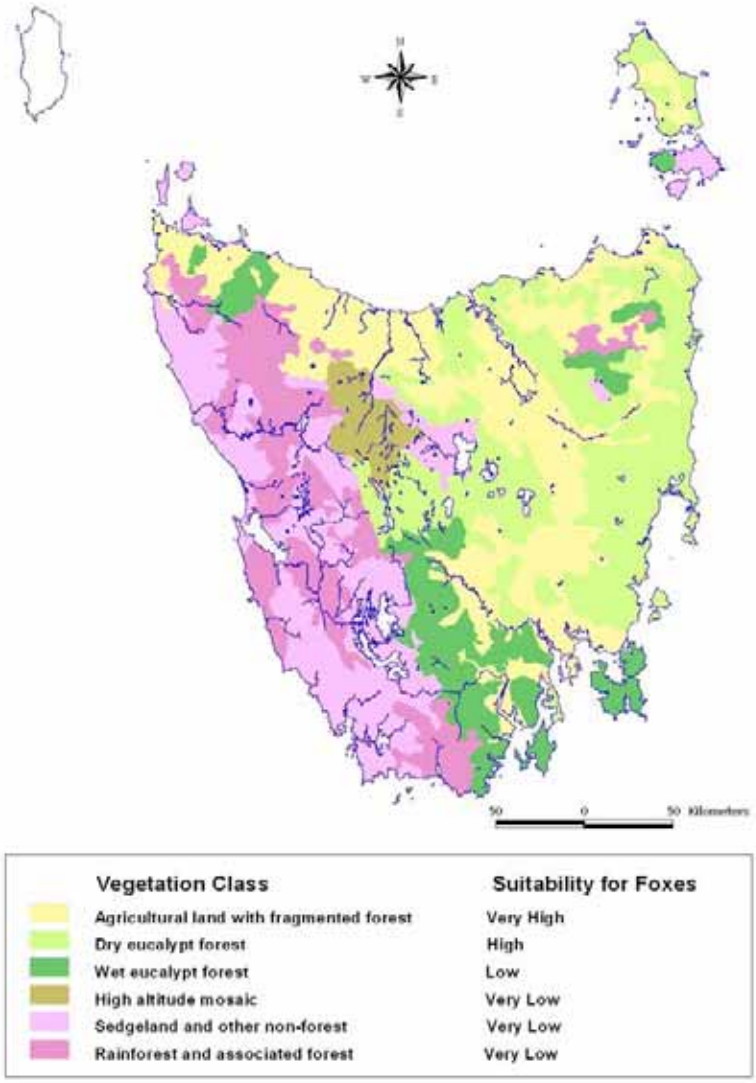
7.2 Fox Releases on Mainland Australia

Foxes were initially brought out to Australia by huntsmen in the 1840s and in sufficient numbers to become established in Victoria in the 1870s (Rolls 1969). Although not clear from historical records, the numbers of foxes shipped out from the UK, surviving the voyage and successfully released appeared to be low. Nonetheless, in the space of 20 years they were considered abundant in Victoria, sufficiently so to be considered as vermin rather than an object of the hunt. Foxes then spread across the continent at an annual rate of up to 140 km, reaching their furthest point nearly 4000 km away from the original releases within 100 years (Jarman 1986). Jarman went on to describe the pattern of local eruption after foxes entered a district as

peaking within 5-15 years then declining to what was probably a stable density for the region. Foxes were initially released into partly tree cleared country carrying cattle and sheep and where rabbits were also just becoming established. Dingoes, the only likely competitor for the fox, at the same time were being exterminated. From his examination of historical records, Jarman (1986) concluded that foxes dispersed the fastest in areas that carried rabbits and sheep.

Figure 3 and Table 3 below provide the extrapolated Tasmanian situation of what is known about fox biology on the Australian mainland. It provides a worse case scenario of where and how many foxes may establish within the State if eradication of an incursion was not achieved (Nick Mooney, DPIWE unpublished data).

Figure 3: Vegetation Class and Fox Suitability Map



Source: DPIWE

Table 3. Habitat versus Fox Density

Habitat	Area (km^2)	Likely foxes/km^2	Likely no. of foxes
Agricultural with Fragmented forests	17,021	8	136,168
Dry eucalypt forests	16,520	5	82,600
High altitude mosaics	1,997	2	3,994
Wet eucalypt forests	7,307	2	14,614
Rainforests and associated forests	9,168	0.5	4,584
Sedgelands and other non-forests	12,090	0.5	6,045
TOTAL			**253,321**

7.3 Lessons from Elsewhere

The spread of invasive species is internationally recognised as one of the greatest threats to native biological diversity (IUCN 2000). In response to this threat, the Global Invasive Species Program (GISP) was established in 1997 in collaboration with many partners including the World Conservation Union (IUCN). The program has since produced a number of guiding documents and case studies which describe strategies for dealing with invasive species (eg. McNeely et al. 2001, Wittenberg and Cock 2001). These documents provide useful options and actions and are used here as a check list for activities undertaken in Tasmania against foxes. Importantly, they are accepted as world's best practice and are based on the international experience of scientists and agencies working in the field of invasive species management.

First of all, the potential impact of invasive species should be dealt with by prevention. If it is assumed the alleged fox incursions are real, this policy can be said to have failed. This being the case, the next phase required is mitigation. This can consist of eradication, containment or suppression. Eradication aims to completely remove the invasive species; control aims for long-term reduction in abundance. The latter can include containment within regional barriers or suppression to an ecologically acceptable threshold.

The potential irreversibility of the costs of a successful biological invasion favour a precautionary approach to their management, tempered by a realistic appraisal of the costs and benefits of the options. However, the lack of scientific certainty should not be used as a reason to postpone measures to avoid or minimise a threat of significant reduction or loss of biodiversity (McNeely et al. 2001).

Although perhaps delayed, the response to initiate a fox eradication program in Tasmania was therefore the most appropriate. McNeely et al. (2001) and Wittenberg and Cock (2001) go on to describe the guiding principles for designing a successful invasive species eradication campaign. These are:

1. base the program on science
2. ensure that eradication of all individuals is achievable
3. build support from the public and all relevant stakeholders
4. ensure that the legal and institutional framework is sufficient for dealing with the issue
5. secure sufficient funding
6. ensure all individuals of the target population are susceptible to the eradication technique being used
7. ensure that techniques and methods are environmentally, socially and ethically acceptable
8. ensure through prevention measures that further immigration or introductions of the target species is zero
9. put in place a method to detect the last survivors
10. include a subsequent monitoring phase to ensure that eradication has been achieved and to prevent re-invasion
11. include any necessary measures to restore ecosystems after eradication

Ongoing issues considered by the above authors include:

- To address points 2 and 6 it must be kept in mind that it becomes progressively more difficult and expensive to remove the last remaining individuals. This will involve low visible returns for high investment late in the program.
- The eradication program itself needs to be an iterative process – modifications based on field experience and ongoing research should be regularly considered.
- Team management and motivation will be required - no single person can achieve eradication success. A core of field and research expertise is needed to lead the eradication effort from beginning to end in order to maximise efficiency.
- It is important to maintain political and administrative support to complete the program.

Without going in to critical analyses of how well all of these principles and issues were followed, measures were instituted which addressed principles 1-8. At the time of this review, the program appears to be moving in to the implementation of principles 9 and 10. Hopefully, the restoration of ecosystems (11) will not be required. If it does, eradication will have failed and control options will need to be considered.

The following examples of island introductions of foxes are presented as examples from the literature.

7.3.1 **Isle of Mann**

Foxes became extinct on the Isle of Mann during the last ice age but in the late 1980s were rumored to have been re-introduced to the island (Macdonald and Halliwell 1994). The events as reported by Macdonald and Halliwell were:

- four adult foxes were taken from the mainland and released in 1986
- live and dead foxes were subsequently reported on the island
- controversy, hoaxing and subterfuge surrounded these reports
- after a few initial reported sightings, in 1989 the number of reports rapidly increased as did media coverage
- in separate incidents 2 dead foxes were found on roads
- doubts grew about reliability of reports
- in 1990 a litter of six cubs, 2-3 weeks old, were found at an earth (den)

Macdonald and Halliwell (1994) instituted a survey of the island for sign of foxes. Scats were collected of which 140 were confirmed as fox (the method of this confirmation was not described). These were found in survey squares which covered 50% of the island. Foot prints of foxes were also observed in all of the squares containing scats. The authors concluded that 5 years after their introduction, foxes were widely distributed on the Isle of Mann and were present in numbers ranging from 120-300. They also concluded that any attempt at eradication would likely fail.

As time went on it became apparent to residents of the island that nothing like this number were present. Only one young vixen was reportedly shot in 1997 with 25 unsubstantiated reported sightings made between 1990 and 1999. Once again a survey was initiated, this time using spotlighting (Reynolds and Short 2003). This survey covered a transect length of 852 km (surveyed over 4 consecutive nights) which represented 28% of the islands surface area. The authors believed that their survey effort would be sufficient to detect foxes if densities were above 2.5 foxes per 100km^2 or only 15 foxes over the entire island. No foxes were seen.

Reynolds and Short (2003) concluded that despite their survey, it was impossible to ‘prove’ that foxes were indeed absent from the Isle of Mann. Reliable sightings suggested otherwise. However, unless substantiated, sightings can be prone to subjective bias arising from mis-identification, memory or reporting errors, delusion or deliberate falsification. Transect surveys, even at a coverage of 28% can still miss large areas of preferred fox habitat. The authors then went on to investigate other potential indicators of fox presence on the island. These included the observations of rural workers, incidences of predation (livestock and wildlife) which could be linked to foxes, ground searches in areas of reliable sightings, surveys of hunters etc. None of these sources revealed evidence of foxes. In the end, Reynolds and Short concluded that the previous survey mistakenly confused fox scats with those of cats (feral cats were commonly sighted over the entire island during the spotlight counts) or that fox scats were mischievously introduced for the researchers to find. A decline of at least 120 and up to 300 foxes in the 9

years between surveys would have to have resulted in sightings or discovery of carcasses. No further evidence of foxes on the Island has been published since the Reynolds and Short paper.

7.3.2 Anglesey Island

The fox was present on Anglesey (716 km^2) until some time in the mid 19^{th} century when it mysteriously disappeared (Lloyd 1980). In 1960, three foxes were re-introduced. Within a year, reports of foxes killing poultry were followed by the killing of 10 foxes (indicating that more than 3 were released). Lloyd went on to observe that fox predation or sightings went quiet for a number of years but in 1967 this changed with numerous reports and killings. By 1974 over 340 foxes were known to have been killed on the island and by 1975 they were considered as having permanently re-established.

7.3.3 Dolphin Island

The Dampier Archipelago in Western Australia was separated from the mainland some 8000 years ago. Dolphin (33 km^2) is one of the islands in this chain and is separated from the mainland by only 200m but can be connected at low tides (Keith Morris, WA CALM pers. comm. 2006). Foxes arrived in the area during the 1930s. Kinnear et al. (2002) reported on the efforts to eradicate foxes from the island for the recovery of resident rock wallaby populations. This effectively required a 10 year baiting operation using 1080 for the removal of a population estimated at only 30 foxes (Courchamp et al. 2003).

7.3.4 Summary of Literature Examples

The Isle of Mann episode demonstrates that scientists and well intentioned residents can get it wrong when it comes to foxes. There are many parallels with Tasmania in the manner of reporting, hoaxing and presentation of just enough evidence to support anecdote. However, the recent advances in DNA analyses of scats would mean that if the Isle of Mann fox scats were indeed those of cats, such an error would not be made today.

Foxes can be eradicated from islands – Krajick (2005) puts the count of successful fox removals from ecologically important islands at 39. However, the majority of these were relatively small and mostly uninhabited. For larger Islands such as Dolphin in WA, the effort required is substantial even with the ability to control immigration. It is unrealistic to compare Tasmania (68,400 km^2) with small offshore islands like Dolphin (33 km^2) in terms of the ability to eradicate foxes. Once established, Tasmania will simply add to the foxes' permanent global geographical range of 182 million km^2 (after Forsyth et al. 2004). The area of Tasmania is sufficient that overcoming immigration into controlled areas will make eradication impossible to achieve.

7.4 Control Methods

Despite intensive control efforts, the fox is still to be found in high numbers throughout most of mainland Australia. For the fox, human "predation" has long been the most important mortality factor both here and across its natural distribution and the species has adapted well to this situation.

The scale of problems involving fox predation, ranging in size from a small poultry shed to a large national park or agricultural region, can determine the most appropriate means of control or conversely the effectiveness of control in individual situations. For example, aerial baiting is the most cost-effective strategy over large areas whereas the use of guard dogs would only be suitable on a property basis.

Strategies and techniques used in agricultural protection have mostly been determined by the biology of the livestock being protected rather than the biology of the fox. As such, these techniques have been employed on a reactionary or short-term basis, with little consideration for sustained reduction of fox populations. Conservation management strategies focus on alleviating fox predation on wildlife species by culling foxes from an area using poisoned baits and exclusion fencing (Kinnear et al. 1988, Burbidge and Friend 1990). By necessity, such control effort needs to be sustained.

Several control methods are employed against foxes in Australia. These are described briefly below.

7.4.1 Lethal Baiting

Lethal baiting is considered to be the most effective method of fox control. Since the late 1960s, sodium monofluoroacetate (compound 1080) has been the poison of choice. Meat has been the preferred substrate for baits due to its palatability to foxes and relatively high target specificity (Kinnear et al. 1988). Many bait types used in Australia, including fowl heads or wings, fresh and dried pieces of meat, offal, lamb tongues and commercially produced baits such as Foxoff® (Animal Control Technologies). Lethal baiting programs when conducted properly are extremely effective. The following table highlights programs that have been fully evaluated.

Table 4. Effectiveness of Fox Baiting Programs (after Saunders and McLeod in press).

Bait density (per km^2)	Initial fox density (per km^2)	Duration (days)	Population reduction (%)	Location	Reference
6	?	1 (air)	86	WA wheat belt	Algar and Kinnear 1992
12	7.2	10 (ground) 10 (free feed)	70	NSW tablelands – farm land	Thompson and Fleming 1994
1.7 -3.1*	.05 -.2*	10 -14 (ground) 9 -14 (free feed)	91	NSW tablelands – forest	Fleming 1996a * pers. comm.
4.4	1.3 -1.9	2 (ground) 16 free feed	50	NSW tablelands – farmland	Fleming 1997
0.14	?	10 (ground) 13 (free feed)	97	NSW coast	Dexter and Meek 1998
5	0.5 -1.0	1 (air)	79	WA wheat belt and rangelands	Thomson and Algar 2000
10	0.5 -1.0	1 (air)	82	WA wheat belt and rangelands	Thomson and Algar 2000
5	0.5	1 (air)	95	WA rangelands	Thomson et al. 2000

Lethal baiting is the only practical technique available for broad-scale application. Perhaps the best example is Western Shield (Western Australia) which is a large-scale wildlife recovery program based on fox baiting. It was initiated in 1996 and has expanded to cover nearly 35,000 km^2, primarily conservation estate situated in the south-west of the State, including forests, coastal areas, the margins of farmed areas and inland arid regions (Armstrong 2004). The program is coordinated by the Department of Conservation and Land Management (CALM) and public sector participation is encouraged. Fox control is achieved by regular baiting with 1080 dried meat baits. These baits are laid by aerial or ground operations at least four times a year at an intensity of 5 baits per km^2 (Orell 2004). The impact of baiting is monitored by regular trapping, field counts and radio-tracking studies of foxes and native animals. Results from this baiting program, along with previous experiments conducted by CALM over the past two decades, indicate significant increases in many native wildlife populations (eg. Burbidge and Friend 1990, Friend 1990, Kinnear 1990, Orell 2004), and the successful reintroduction of some species (eg. Bailey 1996, Orell 2004).

7.4.2 **Trapping**

Trapping (leg-hold, snare or cage) is an inefficient method for large-scale fox control (Saunders et al. 1995). It is perhaps only useful when other means of control are inappropriate such as in urban areas, where non-target species can be harmed by baiting, or when live capture is required for research purposes (Saunders et al. 1995, Fleming et al. 1998). Even under these circumstances, with trapping efficiency ranging in the order of one fox every 40 -150 trap nights where foxes are abundant (Meek et al. 1995, Kay et al. 2000), the labor resources required to reach a desired outcome should be carefully considered before implementing any trapping program for foxes. Non-target and animal welfare issues would also be problematic with Tasmania's unique, abundant and widespread native mammals.

7.4.3 Shooting

The shooting of foxes has been a popular control technique used particularly by the agricultural community. It is ineffective in significantly reducing fox population numbers, is highly biased towards naïve juveniles and sub-adults and not suitable where dense cover is available for foxes (Coman 1988, Saunders et al. 1995). Shooting is usually done at night from a vehicle with the aid of a spotlight. This method relies on the ability of the shooter to approach the animal until it is in shooting range. Some shooters try and lure animals into range by using whistles. Coman (1988) reported that as the season progressed, fewer foxes could be shot due to either the removal of naïve foxes or learned avoidance of shooters. Shooting has the advantage of producing evidence of the kill. Shooting is often promoted as an effective control technique to perpetuate access to lands for the purpose of hunting. Debating the merits or disadvantages of using shooters to remove foxes from Tasmania is probably counterproductive. Examination of historical attempts at fox bounty systems is sufficient to realise that shooting alone is not an eradication tool. Where used opportunistically and in association with normal recreational activities, the removal of individual foxes, as seen, may be appropriate. This would particularly apply in remote areas where a rapid follow-up response will be difficult. However, reliance on shooting as the primary technique, either by professional or recreational hunters will fail. Responding to individual reliable sightings of foxes by hunting alone should also be discouraged. Baiting should always be the primary strategy. The risk of a failed shot and subsequent change in the behaviour of the fortunate fox will also make subsequent efforts to kill it even more difficult.

7.4.4 Dogging

A technique used in some parts of Australia is dogging. This involves the use of small terrier dog breeds to flush foxes from dens. The dislodged animals are either killed with shotguns or coursed with large ‘lurcher’ dogs. Dogging, along with any kind of hunting of foxes with dogs has some animal welfare concerns and is considered as a sport rather than a control tool in Australia (Saunders et al. 1995). Dogging as a means of following up on reliable reports is a separate issue and is discussed below.

7.4.5 Fumigation

The introduction of a lethal gas into fox natal dens is sometimes employed to destroy young cubs. The only registered fumigant for foxes is carbon monoxide (CO) which is highly toxic to mammals, leading to oxygen depletion of the brain, unconsciousness and death (Savarie et al. 1980). Unless used to treat localised fox problems such as active dens within lambing paddocks or near poultry, fumigation, like many other techniques, cannot be considered as a cost effective measure for broad-scale application. Further, dens are difficult enough to locate in fox country even though vixens tend to create up to 2-3 different den sites, regularly moving cubs from den to den. In the absence of territorial competition from other foxes at extremely

low densities, traditional dens may not even be utilized. However, should an active fox den be positively identified in Tasmania, it should be fumigated by qualified staff before being excavated for evidence of foxes. Care would be needed in the identification process as devils and quolls can both use dens with similar characteristics to those of foxes.

7.4.6 Other Techniques

Strategies currently under development or used elsewhere in the world include fertility control; the M44 ejector, a spring loaded device which upon being pulled, ejects a lethal toxicant into the mouth of the fox and; livestock protection collars which are impregnated with a toxin which again is released into the mouth of the predator as it attacks its prey. None of these techniques are suitable for broad-scale application although the M44 may be useful in prescribed areas.

The alleged release of foxes in Tasmania has also resulted in the suggestion of a number of novel approaches to fox control, specifically aimed at removing individual foxes rather than populations. Professor Roger Short proposed the use of 'lure' vixens which were to be given an oestrogen implant to keep them in continuous oestrus. These animals would also be surgically sterilised to prevent them from adding to the population, fitted with satellite tracking collars and released. The principle applied would be similar to that of the 'judas' goat technique (Henzell 1987) where tracked animals move to the previously unknown locations of others. Goats as herding animals are strongly suited to this technique. Foxes being more solitary and wary of humans as well as being highly cryptic would limit, if not preclude, any chances of success since it would be extremely difficult to detect (and hence kill) any animals attracted to the marked fox. The technique would also be biased towards attracting males. What might be a positive outcome of releasing radio collared sterile foxes would be a greater understanding of their behavior under Tasmanian conditions and a means of verifying sighting data.

Sentinel traps are also being investigated and would utilise lures to attract foxes. These have to be considered as highly unlikely to trap foxes at such low densities as in Tasmania. Trapping foxes with leghold traps as conducted by expert trappers and with the aid of lures can be effective but is still very labour intensive. Foxes are regularly caught using cage traps in urban environments where foxes move through man made constructions without fear and are overwhelmed by human scent. In the absence of these factors, cage traps are not efficient in rural landscapes.

7.5 Current Legal Status of Fox Control in Tasmania

Foxes are declared 'vermin' under the *Vermin Control Act 2000* and their destruction can be ordered by the secretary of the DPIWE. They are also prohibited animals under the provisions of the *Nature Conservation Act 2002.*

All leg-hold traps are banned in Tasmania under the *Animal Welfare Act 1993*. Padded leg-hold traps may be used with ministerial approval, and large

cage traps may also be used as part of the fox eradication program.

The use of 1080 in Tasmania is regulated under the *Police Offences Act 1935, Agricultural and Veterinary Chemicals (Control of Use) Act 1995*, the *Poisons Act 1971 and* the *Animal Welfare Act 1993*. Until the recent fox incidents it was not legal to use 1080 in Tasmania for any form of predator control other than dogs. A code of practice for the use of 1080 against foxes under the current emergency situation and within the responsibilities of the above legislation was released in June 2002.

An amendment to the *Agricultural and Veterinary Chemicals (Control of Use) Act 1995* was passed by the Tasmanian parliament in 2004, making it unlawful for government agencies to poison native wildlife using 1080 beyond December 2005. A separate sunset clause, which expires in October 2006, provides an exemption to any person employed as part of the Fox Taskforce, ensuring that fox control can continue for a short time longer.

To deal with the current situation in Tasmania, 1080 concentrate may be either stored or used only by officers authorised as Competent Officers by the Registrar of Chemical Products, or the Secretary of DPIWE, under the provisions of the *Poisons Act (1971).* Locally produced baits containing less than 0.04% 1080 are registered for sale under conditions specified by the APVMA. In addition, Foxoff® baits and West Australian Dried Meat Baits can be used in Tasmania under a APVMA permit. A poisoning service will not be supplied until the landholder or their agent has completed and signed an 'Application to Use Poison' form. Where baits are employed, an Authority to Purchase and Use 1080 Bait must be issued under the provisions of the *Poisons Act (1971)* by the Competent Officer. The Competent Officer may impose any conditions deemed necessary. Landholders using 1080 poison must give written notification of their intention to lay poison, with the proposed date, to all adjoining neighbours of the property, as well as to all neighbours whose property boundary lies within 500 metres of the intended poison line at least four working days prior to the poison being laid. The *Police Offences Act (1935)* requires the occupier of property where 1080 poison is used to display on gates and other conspicuous places on the property notices advising that 1080 poison has been laid. These notices are to be in a format approved by the DPIWE and will be issued by them and must be displayed for a minimum of 28 days. Uneaten baits must be collected and removed from the property within 21 days, or as instructed by the Competent Officer.

7.6 Best Approach to Fox Control For Tasmania

No single control technique for fox populations is effective against 100% of a population – yet total effectiveness is an obvious pre-requisite for eradication. In a classic sense this is not an issue in Tasmania at the moment assuming at worst, fox numbers are still extremely low, are widely dispersed and hence don't constitute a breeding population. While the stated objective must remain as eradication, this will be achieved by removing foxes at an annual rate greater than their intrinsic rate of increase (r_m) – otherwise known as extinction. However, if foxes are present and increasing, the clock is ticking

for the time when removal of foxes cannot keep up with r_m and the fox population will become permanently established as it did on mainland Australia within 20 years of its introduction (See Section 1). The decision on which is the most appropriate management strategy ideally would be best made on cost benefit analyses. Unfortunately, while data are rarely available to conduct this type of comparison, it is probably by a similar, but less systematic, process of selection that results in nearly 80% of all fox control activities conducted on mainland Australia being carried out via broad-scale 1080 baiting programs. The other techniques discussed above, even in areas with established fox populations, are at best, marginally cost-effective and should only be used opportunistically if at all.

The broad-scale baiting approach is the one already adopted by the Taskforce as recommended in previous reviews conducted by Tim Bloomfield (2002) and Jack Kinnear (2003). Nick Mooney (2004) also reported on studies of bait selectivity and non-target uptake. As far as this current review is concerned, the Taskforce has adopted and modified its baiting strategy to best suit its requirements and available resources. We do not suggest the need for any basic techniques to be changed such as method of placement, location, density etc. The current baiting strategy with dry kangaroo meat to our knowledge has not resulted in any catastrophic non-target poisonings and there is no need to reiterate the safety aspects of 1080 to native Australian wildlife. 1080 should remain as the toxin of choice. Alternatives currently available such as cyanide are not acceptable for non-target and OH&S reasons (other than perhaps for very localised efforts). Complete alternatives to 1080 which offer the same degree of non-target safety are currently under investigation but are many years away from release.

7.7 What Could Be Improved?

Issues in relation to baiting which require further consideration are:

- the need to retrieve baits at the conclusion of a program,
- the number of times an area should be baited, and
- the OH&S requirement that two Taskforce members have to be always present when baits are being laid.

7.7.1 Requirement to Retrieve Baits

Removing baits places significant limitations on control effort (almost double the area could be baited if removal of baits wasn't a requirement of the Taskforce.)

The temporal decline of 1080 concentration in fox baits is considered to be an advantage in terms of non-target risk. However, one of the most common concerns of land managers after each bait application is the length of time to elapse before it is safe for potential non-targets e.g. unmuzzled working dogs. Non-target poisoning in areas of resident native carnivores such as the tiger quoll (*Dasyurus maculatus*) and eastern quoll (*D. viverrinus*) is also seen as a potential impact resulting from fox baiting programs (Belcher 1998) although

these concerns are not necessarily realised (Körtner et al. 2003). Other issues associated with bait degradation include environmental persistence of 1080, reduction in bait toxicity and the non-target risk posed by cached baits.

The decline of 1080 concentration in baits is known to occur as a consequence of seepage of 1080 solution, defluorination by microorganisms, decomposition by invertebrates and leaching by rainfall. Thus rainfall, soil moisture and temperature play an important role in the longevity of 1080 in baits, both directly and by indirectly affecting the activity levels of microorganisms and invertebrates. Bait type has also been found to be an important factor with 1080 persisting longer in baits that offer some protection from water infiltration and microbial activity, such as the 'crust' on dried meat baits, the shell of egg baits, or to a lesser extent the skin surrounding a chicken wingette (McIlroy et al. 1988, Fleming and Parker 1991, Saunders et al. 2000, Twigg et al. 2000, Twigg et al. 2001, Gentle 2005, Mooney et al. 2005).

The degradation of 1080 in buried Foxoff® baits containing 3.0 mg of 1080 was investigated by Saunders et al. (2000) in central New South Wales. Baits were exposed to 5 different treatments: shelf-stored controls, prevailing weather, no rainfall, average weekly rainfall and twice average weekly rainfall. Baits began to physically degrade from week 3 onwards, mostly due to fungal activity. The concentration of 1080 in baits from the 'no rainfall' treatment was highly variable over the duration of the experiment but importantly, even after 11 weeks in the soil some baits still contained enough 1080 to kill a fox or dog. Modeling of the 1080 decay rates in baits suggested that under mean rainfall conditions for central New South Wales, baits would become non-lethal to working dogs at 2.2 weeks and foxes at 2.8 weeks. Similarly, for an LD_{50}, adult tiger quolls would need to consume 2.8 baits at day zero while eastern quolls would reach their LD_{50} per bait within 1 week of burial.

Gentle (2005) also studied the persistence of 1080 in buried Foxoff® baits, as well as chicken wingettes under two different climatic and three rainfall regimes. He found that the rate of 1080 degradation did not change significantly between the two climatic sites (central tablelands and the warmer western slopes of NSW), however Foxoff® remained lethal for longer than the wingettes under all conditions. The Foxoff® baits remained lethal to a 5kg fox for an average of 2.1 weeks, with some baits remaining lethal up to 5 weeks. On average wingettes remained lethal for 1.1 weeks, the longest lasting 2 weeks. Under the no rain treatments, the degradation of the Foxoff® baits was highly variable, a similar finding to that of Saunders et al. 2000). Mooney et al. (2005) reported that after two weeks less than 20% of dried kangaroo meat baits contained an LD_{50} for foxes in a trial in Tasmania.

Studies on unburied dried meat baits for foxes (Kirkpatrick 1999) and wild dogs (McIlroy et al. 1988, Fleming and Parker 1991) in temperate areas showed that, depending on rainfall, these baits remained potentially lethal for up to 1-2 months. If moderate rainfall was received, and the baits were buried this could decline to as little as one week (Kirkpatrick 1999). In arid parts of

Australia, in the absence of rainfall, unburied dried meat baits can remain lethal for at least 8 months (Twigg et al. 2000). These results would suggest that at any time of the year when drought conditions occur or in arid to semi-arid regions where negligible rainfall can be common, baits should be treated with caution in respect of potential, long term, non-target losses.

Bait degradation associated with fox control programs needs to be considered as an important component of any associated non-target risk analysis. Given the relatively temperate conditions that prevail in Tasmania it would appear from the above that buried baits would become non-toxic after a relatively short period of time. Perhaps the only issue that needs to be addressed is the difference in decay rates between the preferred kangaroo meat bait and the commercially produced Foxoff baits (which have been the subject of most previous evaluations). Although there seems to be some resistance to leaving baits in the ground at the conclusion of baiting programs in Tasmania, the freeing up of resources would be substantial if this requirement is withdrawn.

Convincing landholders of the safety of such an action would be necessary and requires a plain English explanation of the above mainland studies. Throughout the review it also became apparent that the Tasmanian public is highly suspicious of 1080 mainly as a consequence of poisoning programs for native wildlife. The safety aspects of 1080 baiting for foxes should be effectively re-enforced through an expanded education program.

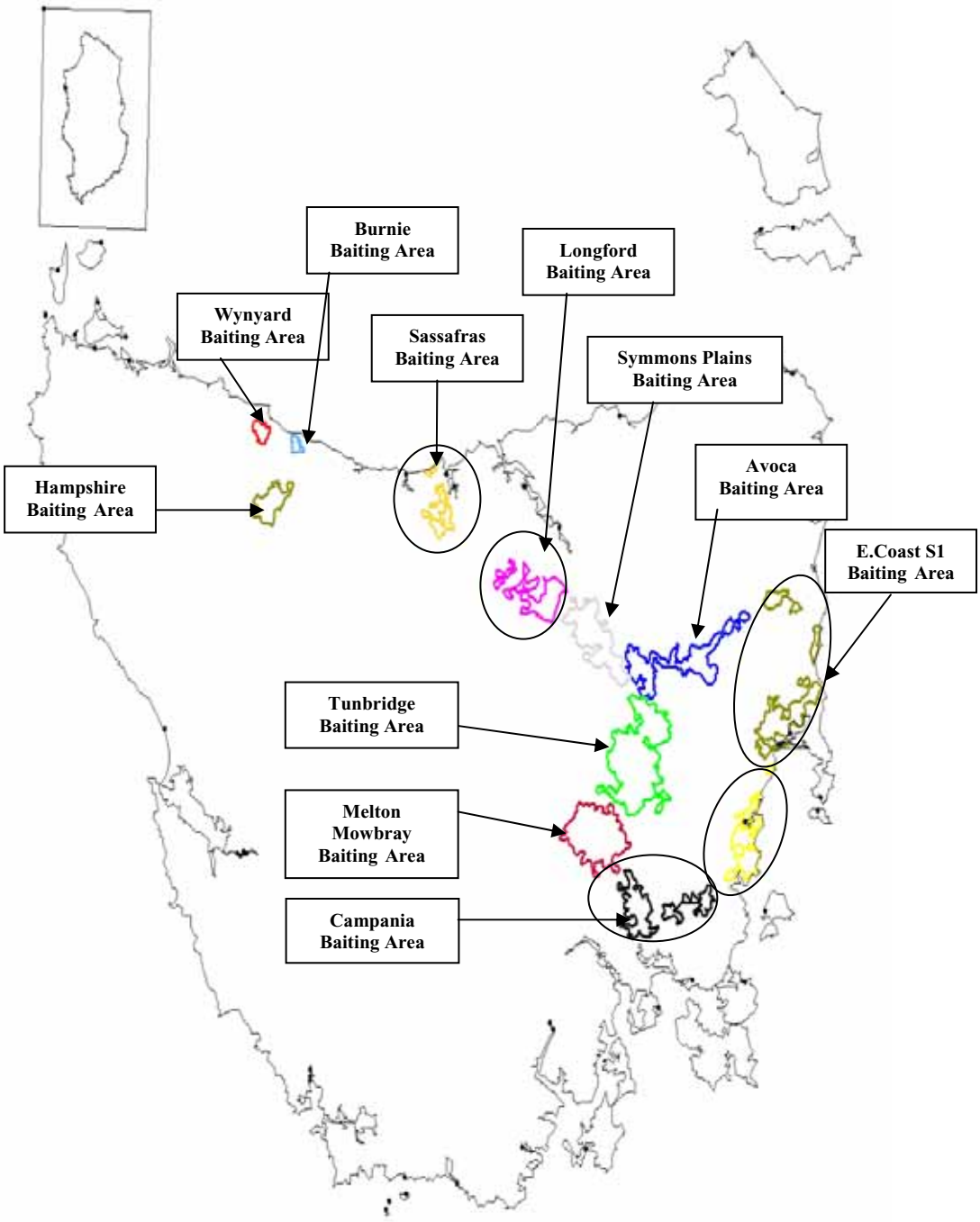
7.7.2 How Many Times to Bait an Area?

In his report of November 2002, Tim Bloomfield states that the Fox Task Force mission was to bait all fox hotspot areas and adjoining sites 3-4 times within a year and that the ability to meet this target had been severely compromised by budget shortfalls. Instead of within a year it appears that all hot spots have been multiple baited across years (July 2002 to December 2005) (Table 4). Further baiting may have also occurred after these data were obtained. A map of the baiting areas (Figure 4) then follows.

Table 5. Multiple Baiting of Defined Baiting Areas Within Tasmania

Area	1st baiting	Last baiting	Total and duration (yrs)	Avg. baitings per year
Burnie	Jul 02	Dec 04	4 (2.5)	1.6
Wynyard/Oldina	Jan 03	Sep 05	6 (2.75)	2.2
Hampshire	Jul 03	Sep 03	1 (.25)	0.3
Sassafras	Oct 03	Dec 04	4 (1.25)	3.2
Longford	Jul 03	Sep 04	2 (1.25)	1.6
Symmons Plains	Jul 02	Jun 05	5 (3.0)	1.7
Avoca	Jan 03	Sep 05	5 (2.75)	1.8
East Coast I	Oct 04	Dec 05	3 (1.25)	2.4
Turnbridge	Apr 03	Sep 05	4 (2.5)	1.6
Melton Mowbray	Jul 03	Jun 05	3 (2.0)	1.5
Campania	Jul 02	Sep 04	5 (2.25)	2.2
East Coast II	Jan 04	Dec 05	3 (2.0)	1.5
Mean			3.75 (2)	1.8

Figure 4. Fox Baiting Areas within Tasmania



Source: Chris Emms, PC and Database Designs.

The locality of Conara (Symmons Plains area) where the recent fox scat was positively identified (See Section 3) had been baited five times (i.e. a fox outside the baiting area had moved into the baiting area after control had been carried out or a fox within the control area had not taken a bait over five baiting programs). Foxes can also quickly travel distances larger than the width of any baiting area. What is the optimum number of times an area should be treated with baits?

Using examples from smaller islands such as Dolphin Is. off Western Australia, it would appear that baiting may only be necessary once per year but over multiple years. However, small islands offer the advantage of minimal movement across the landscape. In Tasmania, each of the treated regions could be considered as an 'island' but with immigration and emigration uncontrolled there is a much greater need to implement multiple baitings over shorter time-frames. Thomson et al. (2000) aerially baited an area of 3180 km^2 in Western Australia. Of 45 collared foxes living within this area, half died within 3 days and all died within 44 days. Re-invasion of the treated area occurred mostly in autumn when juvenile foxes were dispersing. This study found that a buffer zone of 15 km wide was insufficient to protect the core area from re-infestation without repeated baiting. However baiting in the buffer zone once or twice during the autumn, when the greatest influx of immigrants was expected, effectively reduced any invasion into the core area (Thomson et al. 2000).

Like so many issues associated with efforts to eradicate reported introductions of foxes to Tasmania, outcomes are nearly impossible to define and any assessment of effectiveness must by definition be subjective. If there was sufficient justification to approach the above regions as 'hotspots', regardless of available resources and given what is at stake, areas should be treated at minimum twice per year. There is no real proven justification for this minimum other than the assumption that foxes are likely to move in to or out of an area once a year during dispersal. This assumes that dispersal under Tasmanian conditions is the same as that on the mainland i.e. during one peak period of the year. Foxes may well be making multiple long distance movements across the Tasmanian landscape throughout the year so ideally the more baiting is repeated the higher the probability a fox will encounter a bait. Using our minimum standard it would appear that the intensity of baiting is probably only adequate at one third of the regional hotspots. This also assumes that the region ceased to be considered a hotspot at the time of the last baiting.

7.7.3 Occupation Health and Safety (OH&S)

While many OH&S issues exist for any organisation, this review has picked up one particular issue that warrants comment. This is where Fox Free Taskforce officers must enter any field work in no less than pairs due to perceived OH&S requirements.

While OH&S in the workplace is of paramount importance, the need for two officers to enter the field together to carry out duties (for example when laying 1080 baits) appears to be unnecessary and at the same time ties up valuable resources that could effectively double the effort of fox baiting that is carried out across the State. Many States across Australia have similar, if not the same type of legislation with regards to OH&S, but have handled the situation differently. Firstly, many have carried out specific training in the area of duty which provides them with the necessary skill to carry out those duties alone. A procedure already in place for the Taskforce is that when entering remote areas to carry out fox baiting, field officers contact the

departmental office to notify them that they are about to enter the field. Once the officers have completed the work, they again contact the office to let them know that they have completed work in the field for the day. If contact isn't established at a predetermined time/s, then steps are put in place to make contact with the officer. This review feels that these procedures are sufficient to ensure the safety of one officer in the field.

Alternatively, the higher level duties (which may be onerous or identified as high risk for the department, but not onerous or high risk for skilled operators from outside the department) could be outsourced. It is recognised that the Taskforce has trained up private operators to carry out some fox baiting activities already.

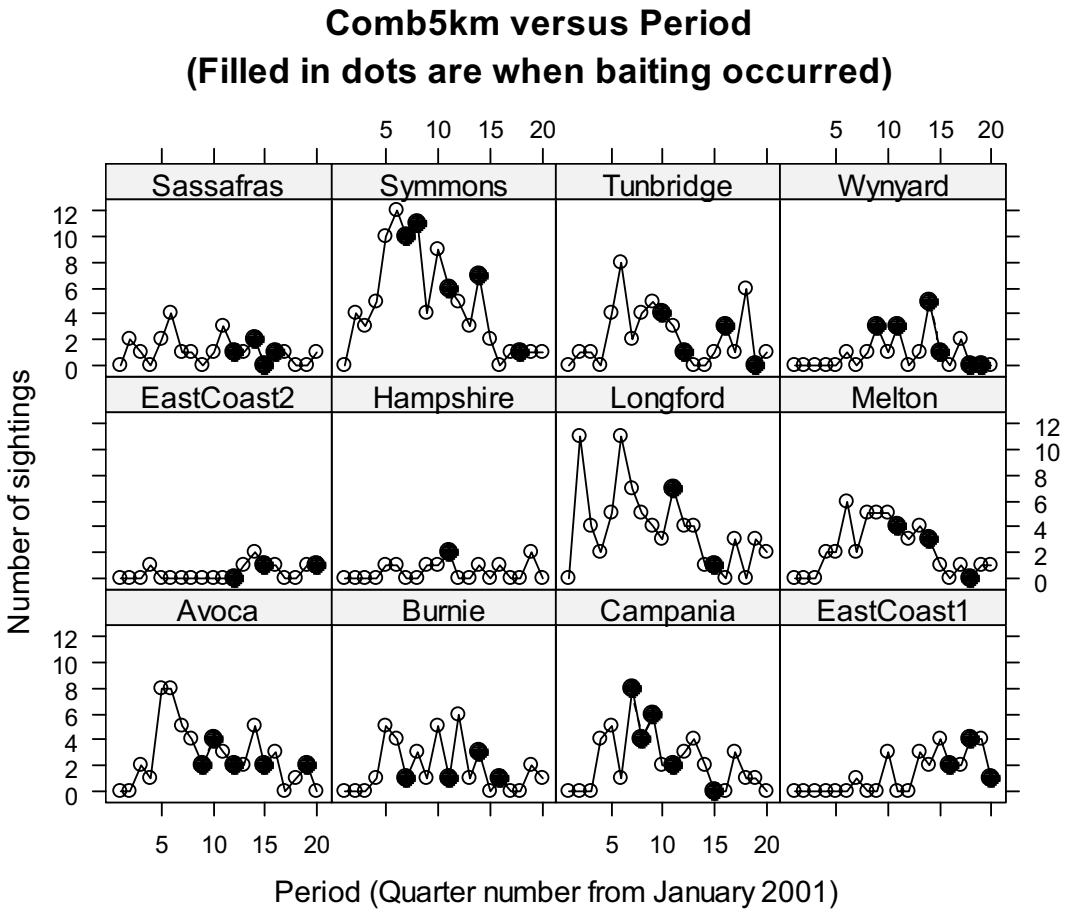
If trends of sightings suddenly increase for no apparent reasons, increasing the intensity of baiting must be considered. Ways of achieving this should include not retrieving baits, using private contractors to lay baits and, at worst, training land managers to lay their own baits.

7.8 Reporting Versus Baiting Data

(Based on data provided by Chris Emms of DPIWE and analyses provided by Remy van de Ven of NSW DPI)

One means of evaluating the effectiveness of baiting programs is to examine the sequence of reported sightings per region over time. The assumption is that if baiting is effective, the number of reports would decline. This of course assumes a cause and effect whereas in reality the level of reporting may be partly or even totally unrelated to baiting effort.

Data were examined for the above twelve sites that were baited during the five year period 2001 – 2005. The sighting numbers are given for each quarter over this period for the 5 km region around the baiting zone (Comb5km). A plot of these data for each region is given below.



This plot indicates that sighting numbers usually but not always declined after baiting. To examine this trend we extracted the data from the first baiting at each site and formed two new time co-variates, these being the number of periods since first baiting (PSFB) and the number of periods since most recent baiting (PSLB).

To model the number of sightings at each site we use a generalised linear mixed model (GLMM) assuming that Comb5km at any time is a Poisson random variable with logarithm of the mean a random regression model on PSFB and PSLB. The model has random regressions across sites. Formally we write this as

log(Comb5km) = baseline + PSFB + PSLB + ***Site*** + ***Site: PSFB*** + ***Site: PSLB***

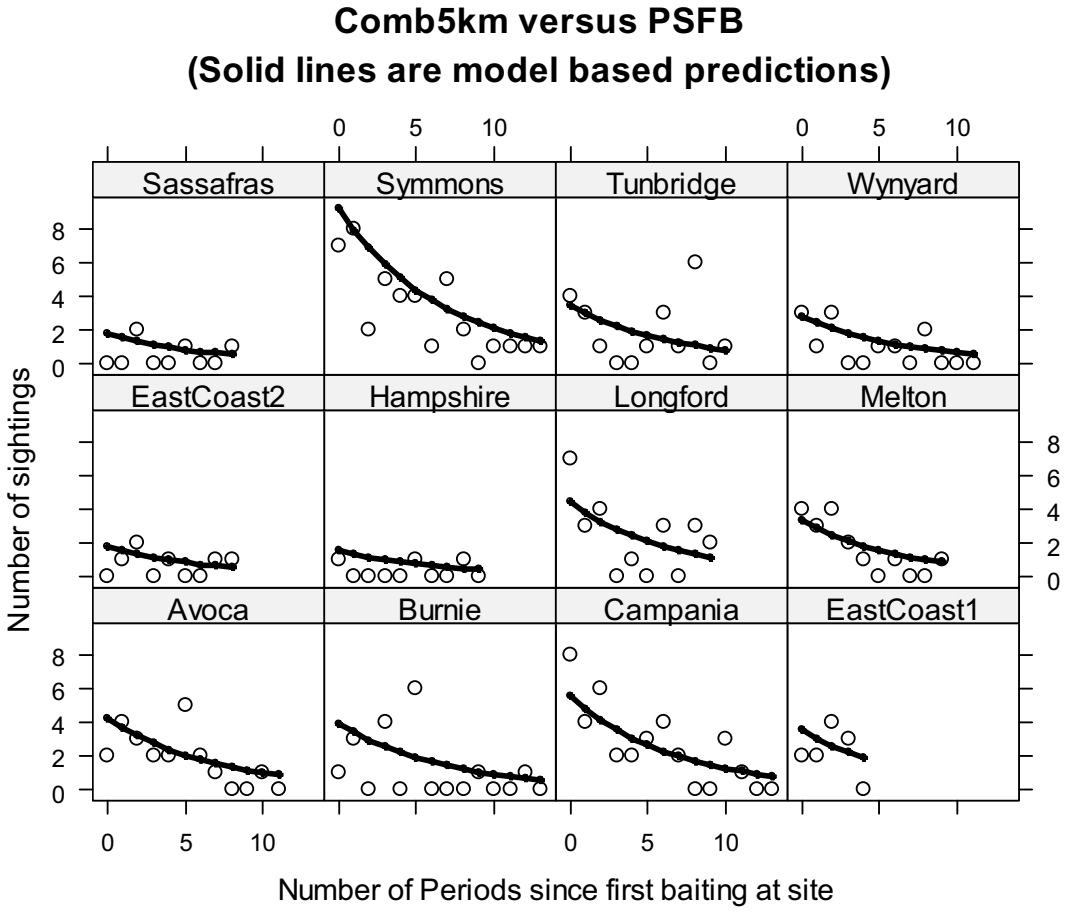
The terms in bold italic are fitted as random. Actually, when fitting this model we centred the covariates PSFB and PSLB and treated the random effects as independent.

Omitting non-significant terms we are left with the model

log(Comb5km) = baseline + PSFB + ***Site***

The regression coefficient equals -0.147 (se = 0.019) which is significant (p-

value < 0.001). Hence on the log scale the decline in total sightings after first baiting is equivalent across sites. A plot of the decline at each site after first baiting is given below.



As before, these results must be treated with caution. The decline in sightings could also be the result of waning public interest and/or a reduced level of reporting in the media. Superficially at least, they support the observation that baiting is having an effect on foxes and is resulting in a decline in sightings.

We have assumed that baiting once will remove a resident fox and twice will remove any fox that might replace that fox or at least increase the opportunity of a resident fox finding a bait. Realistically, this is a minimum standard because the probability of any fox finding a bait laid in its present territory will never be 100%. It will however, increase with each subsequent baiting unless a fox is totally adverse to eating a bait - perhaps the case with the Conara fox. Suggesting 3-4 times a year would be a more satisfactory outcome but must be balanced with available resources. The analyses of sightings versus baitings may not necessarily be a reliable indicator of baiting effectiveness. However, the consistent trend downwards at least indicates that an upwards reversal of this tend in one area compared to all others could be used to indicate the need for an increased baiting effort. Such trends should therefore be monitored regularly.

7.9 Monitoring Foxes

As the fox is such a secretive animal that often occurs at low densities, obtaining accurate estimates of its abundance remains a challenge (Caughley and Sinclair 1994, Vos 1995). On the mainland, enumeration methods for monitoring population abundance fall broadly into two categories: complete counts and incomplete counts. Complete counts directly measure the total population size, or density, either within a study area or within a sub-sampled part of the study area (eg. a quadrat or strip transect). Incomplete, or partial, counts mean that not all individuals within the sampled area are counted. Such counts can be further partitioned into methods that do not attempt to correct for incomplete detection (relative estimates or indices) and those that do. For the latter, statistical methods are most commonly employed to account for incomplete detection. Unfortunately, techniques available for both complete and incomplete counts are unsuitable in situations where the fox is extremely rare as might be the case in Tasmania. The following descriptions of monitoring techniques are therefore presented as means for establishing the presence or absence of foxes within a particular area.

7.9.1 Spotlighting

Foxes are searched for with the aid of a spotlight from a slow-moving vehicle following a fixed route (transect) at night. Spotlighting typically involves using a 4-wheel drive, tray-top vehicle, travelling at 5-10 km per h along set tracks and with a 100-W spotlight. Field et al. (2005) suggested that because of the low detectability of foxes even at normal densities, at least five, and as many as nine repeat visits might be required to establish a reliable count. The advantages of this method are that it is relatively quick and simple, large distances or areas can be sampled and many different habitats types can be covered. Several studies have found no significant difference with time of night and counts of foxes, therefore the starting time of these counts (provided it is dark) is not as significant as for other species. Disadvantages of this technique include (e.g. Ables 1969, Stahl 1990, Weber et al. 1991, Mahon et al. 1998, Molsher 1999, Field et al. 2005):

- counts can be highly variable when using different observers,
- fox activity from one count to the next can be affected by weather and seasonal conditions, and prey availability (foraging behaviour),
- sightability can be affected by vegetation or habitat type,
- sightability can be affected by fox behaviour (spotlight-shy foxes), age structure (young foxes are likely to be less shy of a spotlight) and abundance (foxes are difficult to detect in low density populations),
- sampling rate is disproportionate to activity time, and
- counts tend to use formed roads and tracks for vehicular access which can also limited the likelihood of sighting foxes.

Going back to the Isle of Mann experience, Reynolds and Short (2003) calculated sighting probabilities based on their sampling intensity (164km^2 or 28%) for the entire island (588 km^2) using a formula based on a Poisson

distribution (see paper for full formula). This also allowed them to calculate the probability of observing zero foxes, as they did, which would have required the density to be below 2.5 per 100km^2 or 15 foxes over the entire island. The area so far baited in Tasmania (assumed to be that part at greatest risk to foxes) is 450 km^2. Using the same calculations and the assumption that the Task Force has seen no foxes in spotlight counts, the 450 km^2 would contain less than 12 and possibly zero foxes. We do not know what sampling intensity the Taskforce has used for spotlighting over this area, but understood it to be mostly reactive in response to reported sightings rather than by formal survey with set transects. Hence the sampling intensity would probably be orders of magnitude lower than that for the Isle of Mann.

Taking all these factors into account, routinely using spotlighting to detect very rare foxes in the Tasmanian landscape would have to have an extremely low probability of success. Given also the fact that it requires two operators working long hours at night, the efficiency of using limited resources in this way must be questioned.

There is however a public relations spin-off at work while Taskforce staff carry out spotlighting duties. Feral cats are a major concern to farmers and they don't seem to mind (in fact seem to welcome) the Taskforce officers culling some feral cats while spotlighting for foxes. But does shooting feral cats while spotlighting for foxes create a conflict of tasks? For instance if a feral cat is shot in a fox 'hot spot' area, would there then be a smaller chance of a fox staying in the vicinity of vehicle noise, vehicle lights and a loud bang! i.e. would foxes become spotlight/gun shy?

The public relations role the Taskforce plays in the spotlight exercise shouldn't be under played as it could lead to farmers reporting or providing strong or physical evidence of foxes in their area at a later stage. What needs to be weighed up is whether the public relations component is worth the resources put into it.

7.9.2 DNA Sampling

Recent advances in molecular biology have allowed the use of genetic material from faeces to be used in auditing individuals within a given area (see Kohn et al. 1999, Wilson and Delahay 2001). There are still a number of problems associated with this technique such as the collection and storage of fresh samples, inherent error rates in the PCR process and inappropriate sampling strategies. The cost of both sample collection and DNA analyses makes the technique prohibitive in more routine population assessments.

Despite these problems, DNA sampling has considerable appeal in the study of fox populations. Preliminary Australian studies have already indicated that polymorphic canine microsatelite loci can be successfully used in studying fox population structure (Lade et al. 1996, Robinson and Marks 2001). Foxes employ scent marking as an aid to food scavenging and as a means of olfactory communication (Henry 1977, Bullard 1982). Scent marking involves the deployment of urine and faeces (Macdonald 1980), a feature

commonly observed by the deposit of scats at bait stations and sand plots used in fox studies on the mainland.

7.9.3 Scat Detection and Survey

(Based on details provided by Phillip Baker of the University of Bristol)

Sampling of animal faeces in the Tasmanian wild for confirmation of presence of foxes via DNA analyses has some additional difficulties. The main problem is associated with the probability of being able to find faeces on a basic sampling unit. The sampling unit could be a 1 km^2 in area or a transect of defined length. The key question to address is how many units need to be sampled to ensure that the surveyor has a 95% chance of finding fox faeces?

Let *P* be the probability of finding faeces on the sampling unit and N be the number of sampling units surveyed, then the basic relationship is:

$0.95 < 1 - (1-P)^N$

The second part of this equation indicates one minus the probability of not finding any faeces (i.e. 1-P) in any of the N sampling units surveyed. Variable *P* is determined by (1) quantifying the number of faeces associated with linear features (assuming that these are going to form the basic sampling unit e.g. the linear features in a 1 km square or a transect of a given length along linear features) and (2) dividing by the total number of 1 km squares/length of linear features to be surveyed (T). The number of faeces associated with linear features is, in turn, determined by fox density (F), the defaecaction rate per fox per day (S), the proportion of faeces associated with linear features (L), and the number of days faeces persist in the environment (D). The total number of faeces in the environment that can be detected by the sampling strategy is therefore given by:

F*S*L*D.

Fox density (F) in Tasmania is unknown, so a range of values was modelled i.e. a total population of 10, 50, 100, 200, 500, 1000, 5000, 10000, 50000 and 100,000 foxes. A defaecation rate (S) for foxes was estimated as 6.00 scats per fox per day based on available literature. Proportion of scats deposited within linear features (L) was previously measured in the UK (Webbon et al 2004) as 5.7% or 0.057. The number of days that fox faeces persist in the environment (D) is unknown. For the initial calculations it is assumed to be 30 days.

Total area to be surveyed

The total area of Tasmania is approximately 60,000km^2. To estimate the total area or transect distance that would need to be surveyed for scats would require knowledge of the length of linear features per 1 km square. In this instance, T is the total number of transects that could be undertaken e.g. if the total length of linear features is 100,000 km and transect length is 10 km then

T = 10,000. For this exercise a transect length or value of 16km is used (this is the average for the 444 squares originally surveyed for fox scats in the UK (Webbon et al 2004)).

Assumptions

First, faeces are as spaced out as much as possible with no clumping of faeces. This has two related implications. First, at low fox densities, the value of *P* will indicate the number of 1 km squares/number of transects containing fox faeces (i.e. a maximum of one scat per square or transect). The validity of this assumption will, of course, be dependent on the behaviour of the foxes but also the number of faeces relative to the total number of 1 km squares and the total length of linear features. For example, it is not possible to have a maximum of one scat per square if F*S*L*D>T.

Second, and related to the first point, this is the best scenario for detecting fox faeces from the surveyor's point of view, as it will maximise the number of squares containing scats. A more clumped distribution of scats will increase the number of squares containing no scats at all and will, by implication, increase the number of squares that would need to be searched. Therefore, at the outset, the calculated *P* value will indicate the maximum value: any sensitivity analysis (see below) should examine values smaller than the calculated *P* value.

Sensitivity analysis

All of the parameter values outlined above are estimates and variation in their true values will affect the outcome, and a sensitivity analysis is therefore required. The basic calculation is:

P = (F*S*L*D) / T

The relative importance of the individual variables in this equation will be dependent on their magnitude. Overall fox density is the largest variable (range 10-100,000), but at low fox densities the magnitude of some of the other variables is comparable (S=8, D=30).

Table 6 summarises the approximate minimum number of transects that would be required to have a 0.95 probability of detecting fox faeces throughout Tasmania keeping all variables constant except fox density (F) and transect length. The default values as discussed above are S = 6 scats/fox/day; L = 0.057; D = 30 days; average linear features per 1 km square = 16.

Table 6. Fox Density versus Transect Length

Fox density	Transect length		
	5 km	**10 km**	**15 km**
10	5603	2801	1867
50	1120	559	373
100	559	279	186
200	279	139	92
500	111	55	36
1,000	55	27	18
5,000	10	4	2
10,000	4	-	-
50,000	-	-	-
100,000	-	-	-

7.9.4 Remote Cameras

Remote surveillance methods using photographic or video equipment are popularly used to examine behaviour of individual foxes around bait stations and interactions with non-target species (e.g. Glen and Dickman 2003). Although there seems little application of these methods to any form of population analysis, Vine et al. (2005) reported that the use of remote cameras was the only systematic method they could find to detect collared foxes at very low densities. Vine (2004) also observed that cameras are less open to observer bias, and provide irrefutable evidence which can be reviewed by others. Cutler and Swann (1999) warned that the usual assumption of equal detectability for all individuals has been rarely tested and is probably not true.

7.9.5 Den Counts

As mentioned for the technique of den fumigation, dens are difficult enough to locate in fox country even though vixens tend to create up to 3-4 different den sites and move cubs from den to den. Dens are only used for a small period of the year. In the absence of territorial competition from other foxes at extremely low densities, traditional dens may not even be utilised. For extremely low densities as would prevail in Tasmania, den searching would be a completely inappropriate use of resources unless perhaps a breeding vixen was known to be in a defined area.

7.9.6 Use of Dogs in Tracking Foxes

It would seem that the use of well trained sniffer dogs has been under utilised. Experience from numerous island eradications of introduced pests has highlighted the advantages that such dogs offer in locating the last remaining animals. It would appear that the cost of training and providing a full time

dog handler has been considered prohibitive although we were also informed that trained dogs are used to detect foxes for quarantine purposes. The cost prohibitive assumption may not take in to account the potential return on investment. We suggest that this technique still requires investigation and that advice should be sought from organisations in New Zealand such as the Department of Conservation and Landcare Research which both have experience in this area. There are also companies on mainland Australia which trains dogs for specific purposes as was recently pursued by the Western Australian Government for detecting cane toads. Re-deployment of dogs used in quarantine work may also be a suitable compromise.

7.10 Imports of Exotic Species, Biosecurity and Future Incursions

There have been many occasions when AQIS and DPIWE Wildlife Officers have found, seized or confiscated imports to Tasmania of exotic animal species imports. In the past few years DPIWE has detected cats, various marsupial species, birds, various fish, reptiles, amphibians, spiders, crustaceans, snails and insects. Sometimes they come in as undeclared or falsely declared pets, and at other times they are unintended stowaways.

Due to above actions, the probability of detection for a fox at the quarantine barrier is high. Also worth noting is the additional effort put into detecting foxes compared to most other species (e.g. detector dogs trained on foxes and specific instructions to barrier officers to target vehicles of suspect profile) (Alex Schapp, DPIWE pers. comm. 2006).

While there are many exotic species detected and seized each year, there is always a chance that foxes could be imported or become stowaways. The critical point is that foxes illegally or unintentionally imported into Tasmania will have a greater chance of being detected at the barrier than may have been the case prior to the existence of the Taskforce. This capacity and public awareness that is now in place needs to be maintained and possibly strengthened. Perhaps the most effective biosecurity measure would be to have the public totally aware of its advantages and to ensure public intolerance of foxes in Tasmania.

Regardless of the above, the best biosecurity system in existence would not prohibit deliberate introductions due to the considerable unregulated access to Tasmania (boats/aeroplanes).

A further biosecurity measure would be to re-establish links with the Port of Melbourne (Webb Dock) to emphasise the risks to Tasmania, to encourage ongoing fox control programs and thus reduce the likelihood of further accidental incursions via this source.

7.11 Stakeholders Involved in Fox Control and Monitoring

There is certainly merit in landholders being involved in carrying out group fox control programs as well as recreational hunters, farmers, bush walkers, field naturalists etc being involved in fox monitoring activities. Various

stakeholder groups, such as some hunters, conservationists and farmers have also supported such measures and have suggested that assistance could be provided on a voluntary basis.

What could make the involvement of stakeholder groups in monitoring activities difficult to achieve is the many reports and suggestions of hoaxing. Resources will be needed to accredit individuals providing 'evidence' in monitoring activities, as well as providing some type of training for those wanting to assist in monitoring. For instance, if scat collecting is considered to be the most appropriate method of monitoring then training in scat identification and collection would be required. Other issues would need to be considered such as insurance, the levels of DPIWE staffing required to supervise and train volunteers and permits for handling of 1080.

The amount of hoaxing that has occurred may make the use of volunteers as a means of assisting in monitoring activities a difficult proposition.

7.12 Summary Based on Fox Biology and Management

An innate drive to seek out new territories and mates and the ability to rapidly move over large distances makes the fox an extremely successful invasive animal.

A review of the literature on fox introductions to islands suggests that eradication is possible but that evidence for fox presence can be easily mis-interpreted. The effort required is substantial even for relatively small islands.

Despite intensive control efforts, the fox is still to be found in high numbers throughout most of mainland Australia. For the fox, human "predation" has long been the most important mortality factor both here and across its natural distribution and the species has adapted well to this situation.

Lethal baiting of foxes is the most effective means of control. Other techniques such as trapping, fumigation, shooting and dogging are inefficient on their own and can only be viewed at best as supplementary to lethal baiting.

1080 should remain the preferred toxin for the lethal baiting of foxes. The phasing out of 1080 in Tasmania, specifically as used for control of herbivores, must not affect the ongoing availability of this poison for fox control. An amendment under the *Agricultural and Veterinary Chemicals (Control of Use) Act 1995* should be sought to allow this practice to continue indefinitely.

There are sufficient data available from mainland experiments to indicate that leaving 1080 baits in the ground at the conclusion of a control program does not constitute a significant risk to non-target animals. Such a change in the baiting strategy currently employed in Tasmania would greatly free up limited resources and allow greater coverage for baiting programs. This has major implications for cost-efficiency of Taskforce activities. Regardless of

perceived public reactions to such a proposal, it should be considered along with an appropriate public education program.

The existing baiting strategy should be maintained with some modifications. If there was sufficient justification to approach the current baiting regions as 'hotspots', regardless of available resources and given what is at stake, areas should be treated at minimum twice per year. There is no real or proven justification for this minimum other than the assumption that foxes are likely to move in to or out of an area once a year during dispersal.

Tracking reports against control activities, while subject to many caveats, are a useful indicator to monitor upward trends and hence the need for increased control effort.

Given OH&S requirements for Taskforce members to travel in pairs while conducting 1080 baiting, which the review team considers to be unnecessary, the most cost-efficient alternative is to employ private contractors to undertake any baiting program.

As the fox is such a secretive animal that often occurs at low densities (currently even lower in Tasmania), obtaining accurate estimates of its abundance remains a difficult, if not impossible challenge.

Spotlighting should be limited to instances where reliable fox sighting reports in an area are being investigated and not be used as a routine surveillance technique. Even then, the probability of detection will be extremely low and it will be a more cost efficient use of resources to invest in passive indicators such as cameras.

The utilisation of DNA detection in scats as a means of monitoring for the presence of foxes in Tasmania is rightly becoming the focus of monitoring activities. There should be no misunderstanding that this will be a highly labour intensive activity and that sufficient resources (Government, community and voluntary) should be allocated to account for probability of detection.

The use of dogs to track and detect foxes (as opposed to using dogs for control purposes) appears to have been under-utilised perhaps on the basis of perceived high cost. Based on overseas experience where dogs have been shown to be highly effective, we believe this option must be re-considered. If dogs are trained to a sufficient standard in fox detection for quarantine purposes, occasional re-deployment of these animals could be considered.

Perhaps the most effective biosecurity measure would be to have the public aware of its advantages and to ensure public intolerance of foxes in Tasmania

There is merit in landholders and volunteers being involved in control and monitoring activities. How this can be best integrated into the current program, and taking into consideration issues surrounding hoaxing, supervision and training needs to be fully explored.

8. Community and Communication

8.1 Background

The public of Tasmania plays an integral role in the Fox Free campaign. Without their vigilance and assistance in providing information and reports to the Fox Free Taskforce, much of the planning and subsequent actions for fox management across the State would not have been implemented. Public reports provide the impetus for focusing Taskforce management activities, so it is important to engage the public in such a way that they feel part of the program and provide accurate and timely information on sightings and sign of foxes.

On the other hand, as outlined in Section 4.9, hoaxing or even the perception of hoaxing by the public has the propensity to either exaggerate the situation with foxes in Tasmania and/or undermine the current work being carried out by the Taskforce and its programs. It can also divert Taskforce resources away from other more important, even critical aspects of the program. The challenge is to reduce, stop or divert such hoaxes.

Communication is a major component of any successful management program. It is vitally important that the key stakeholders, in this case the Tasmanian public, are informed of the fox situation, are updated on the project on a regular basis, and are encouraged to actively participate in the program in a helpful manner.

8.2 Tasmanian Fox Free Communication Strategy

The communication strategy provides the framework and direction for government and the Fox Free Taskforce allowing information flow to appropriate audiences or stakeholders at timely intervals and by the most efficient and effective means. It is also a means of raising awareness of the issue or situation and facilitating adoption of a program. The communication strategy may include a combination of elements such as media campaigns, advertising materials, public launches and public participation activities. In this instance it also provides the government with a leading role in the communication process, rather than risking a reactionary stance. An *ad hoc* reactive communication process can often devalue the messages, the program and the government's reputation in conducting its affairs, leading to public scepticism.

The aim of any communication strategy is to ensure ongoing commitment and support by all key stakeholders for all aspects of the project. The strategy needs to recognise principles that will assist in meeting the collective objectives of the community with regard to fox eradication within their State. Information needs to be timely and relevant and suited to individual needs and circumstances, new knowledge and ideas should be canvassed, trialled and assessed using expertise from within and outside of the State; above all, communication needs to be a two way process. The objectives are relatively

simple; create awareness, encourage participation and influence decisions with sound knowledge.

Like any strategy, there is a need for it to be flexible enough to accommodate change and for it to undergo an evaluation or review stage allowing for an assessment of the communication exercise and contributing to improvement along the way.

8.3 Community Engagement

Approximately 12 months after the establishment of the Fox Free Taskforce, a Community Engagement/Liaison Officer was appointed to the Taskforce. The position was federally funded for twelve months and primarily looked at engaging the community on the Tasmanian fox problem. Other issues addressed included fostering change in community attitudes (that foxes are not acceptable in Tasmania now or at any time into the future), encouraging people to actively look for foxes and to provide an education and broader awareness of potential fox impacts on fauna in the State (Steve Welsh, TFGA pers. comm. 2005). A list of community engagement activities appears in Appendix D.

The continuation of community engagement is imperative. As outlined in Section 6.5, given the critical nature and risk of foxes ever establishing in Tasmania it is difficult to understand why this effort is not underpinned by long-term State funding rather than external funding.

8.4 Has the Strategy Worked?

A state-wide community survey was initiated by DPIWE in September 2002 to gauge the Fox Free Program's performance against stakeholder attitudes and beliefs, and to further develop the Department's public education communications strategy. The survey by Myriad Consultancy took the form of a structured questionnaire conducted over the telephone. Eight hundred respondents were sampled and all of them were 18 years old or above.

Myriad Consultancy initially asked the respondents to rate the importance of key sector areas in terms of their value and importance to Tasmania's future. Table 7 shows that the respondents rated the agricultural sector, environmental tourism industry and native wildlife as the top three sectors.

Table 7. Sector Ratings Gauging Attitudes to Key Areas for Tasmania

	Average	% rating 4 or 5
The mining industry	3.7	57.6
The agricultural sector	**4.5**	**89.6**
The manufacturing industry	4.1	72.6
Our native wildlife	**4.4**	**84.1**
The building industry	4.1	75.2
The fishing industry	4.1	75.6
Forestry	3.9	69.3
Our environmental tourism industry	**4.5**	**87.3**

Other key findings by Myriad Consultancy were:

- 48% of all respondents were aware of the Fox Free Program without being prompted, with a further 42% professing awareness once prompted;
- 60% of respondents believed that foxes definitely or probably are in Tasmania (farmer groups surveyed higher – 72%);
- 91% of all respondents indicated that an established fox population in the State would be a major concern;
- reasons given for the above concern were for native wildlife (93%), farming sector (85%) and environmental tourism (61%);
- 96% of respondents definitely or probably agreed that measures should be taken to eradicate foxes in Tasmania;
- 75% of respondents believed that the current coordinators (PWS) should continue (this was rated lower by farmer and hunter groups – 65%);
- 41% of respondents rated the job carried out by PWS as 'good or better' (considered lower by farmers and hunters – 25% and 23% respectively).

(Myriad Consultancy 2002).

This survey provides baseline information regarding Tasmanian community attitudes on issues relating to the Fox Free Program. The survey particularly focused on:

- The attitudes of residents living in regional and rural areas;
- Prevailing attitudes that may be a barrier to the success of the program;
- Prevailing attitudes that may assist the success of the program.

Now would be a good time to build on that survey by following up community attitudes four years down the track. The IA CRC will instigate this project to gain an understanding of the current level of awareness of the Tasmanian community about the existence and extent of the threat posed to Tasmanian environment and industry by foxes. The outcomes of the project will be:

- set out the current state of Tasmanian public awareness of the issues, and the public's views on the necessity to reduce the threat posed by foxes;
- provide a decision framework which the Tasmanian Government can use to assess future management of introduced foxes in the State, and
- provide an independent insight as to how public attitudes are used to shape the actions/inactions of a Government in relation to important wildlife issues.

The project is expected to take place in mid 2006.

8.5 Barriers

The PWS, then the Fox Free Taskforce which employed some ex-PWS staff, has found it difficult in some instances to encourage landholders (especially those that had been prosecuted for wildlife offences in the past or those

opposed to 1080) to:

- allow staff onto their land to monitor foxes, and
- support the eradication of foxes on their land.

Previous issues of contention between shooting and hunting groups and the Government, such as firearm reforms in the State, also hindered cooperative support of the fox eradication program (Szell 2002).

8.6 Communication and the Media

The media in all its forms can be an ally and an adversary. Many people can take the printed word or a television interview as fact when, in some cases, situations have been overstated, misrepresented, or simply beaten up. There are also many occasions when the print media can assist in presenting the necessary information and assist with public education.

During 2001, over 300 media interviews were conducted with local, national and international media. These ranged from daily newspapers to national current affairs and science programs, magazines and television. In 2002 there was a similar level of media interest but focussed more on local and national media. Approximately 200-250 interviews were conducted in 2003. This was again mainly with local and national media. National media interest then began to slow apart from the occasional interest in a "quirky" story from Tasmania.

In 2004, interest declined to 100-150 hits of mainly local media. As local media also started to lose interest, linkages between the Devil Facial Tumour Disease problem and foxes were made e.g. declines in devil numbers and fox presence were critically linked. Interest in devil disease enabled the fox issue to again link into national and international coverage.

In 2005, there were an estimated 100-120 media hits. As the devil disease issue gained momentum it became the focus for Tasmanian environment stories, making it difficult to give any profile to the continuing fox situation. Further, the media do not like running too many environment-type stories at once. Devils, whale strandings, forestry and other major environmental stories in Tasmania now received higher priority in reporting.

The early part of 2006 was quite slow in terms of media hits until the discovery and subsequent positive identification of the fox found dead on a road near Lillico Beach.

Early comments concerning a fox report or incident, provided by media commentators, or indeed by a Taskforce spokesperson or government official, can also cloud or create expectations on a particular circumstance. In hindsight some media reporting, particularly in relation to the photo of a fox supposedly taken at Wynyard in 2001, would appear to have been rushed; further investigation into this and other such incidents have fuelled doubt as to the authenticity of some events. Such reporting was no doubt the origin of

many conspiracy theories and may have in turn encouraged others to perpetrate similar hoaxes. There must be a sensible balance between the need to release information as it arrives and the need to secure a site for investigation and interpretation of all the facts before details are released to the public.

Use of the internet as a source of information and public opinion is rapidly expanding. As for more traditional forms of media, there is a need to review such information with caution and provide constant updates.

8.7 Fox Free Taskforce Website

The general aims of a website are to provide information to clients, members or the public about the activities and or services of the company or organisation. In this instance, the Fox Free Taskforce website is about education. It provides the public with good information about foxes, their potential impacts to the Tasmania environment and economy, and provides guidance on what should be done if a fox is seen or suspected in Tasmania.

While background information and educational materials that appears on the Fox Free Taskforce website are good, there is a need to regularly maintain the information to ensure that it is up to date. The six-monthly newsletter produced and placed on the website partly fills this void, however, there is considerable scope for the website to maintain a brief monthly report (for example) that provides the public with dot-point information on numbers of reports received, investigations carried out by staff, baiting information (where this is currently occurring) etc. An interactive website, where the public could be encouraged to report a fox incident (as well as the fox hotline which is currently promoted), should also be considered.

8.8 Summary Based on Community and Communication

The Taskforce needs to maintain healthy, established links with all media outlets.

The Government and the Taskforce should continue to ensure that information provided to the public is true, correct and validated to avoid misinterpretation and to reduce public scepticism.

Continuation of community engagement is imperative.

The Taskforce website is an important means of communications and should continue to be constantly updated and upgraded.

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Appendix A

Tasmanian Native Species with Locally Restricted Ranges (Source: Bryant 2002)

Native Species	Distribution and Habitat in Tasmania*
Ground Dwelling Mammals	
Eastern barred bandicoot	**Threatened**** – native grasslands and pasture complex
Southern brown bandicoot	Locally rare and declining in forests and woodland
New Holland mouse	**Threatened** – coastal heathland
Broad toothed rat	Locally rare in western moorland and sedgeland
White footed dunnart	Locally rare in forest, woodland and heath
Tasmanian bettong	Locally rare and declining in dry forest – extinct on mainland
Long nosed potoroo	Locally rare in wet forest complexes
Spotted tailed quoll (young)	**Threatened** – in wet forest complexes
Ground Dwelling/ Nesting Birds	
Cape barren goose (eggs and young)	Locally rare in grassland and pasture but mainly on islands
Dusky moorhen	Locally rare in wetlands and swamplands
Baillon's crake	Locally restricted to wetlands and marshland
Australian spotted crake	Locally restricted to wetlands and marshland
Hardhead (eggs and young)	Locally restricted in deep wetlands and lakes
Blue billed duck	Locally restricted in deep wetlands and lakes – ground nesting
Brown quail	Locally restricted to grassland and grassy woodland
Spotted quail thrush	locally rare and declining grassland species
Painted button quail	Locally rare and declining forest species
Orange bellied parrot	**Threatened** – heathland, saltmarsh, ground feeding
Banded lapwing	Locally rare in open country
Hooded plover	Declining on sandy coastal beaches
Black fronted dotterel	Locally rare farm dams, wetlands. Mudflats and waterways
Fairy tern	**Threatened** – coastal and breeding on sand spits
Little tern	**Threatened** – coastal and breeding on sand spits
Sooty oystercatcher	Locally restricted coastal species, breeding on cobble
Reptiles and Amphibians	
Chappell Island tiger snake	**Threatened** – grassland Chappell Island
Mountain dragon	Locally restricted to eastern dry forest and grasslands
Tussock skink	**Threatened** – eastern grasslands and woodlands
Glossy grass skink	**Threatened** – wetlands and swamps
White's skink	Locally restricted in eastern and northern forests

Bougainvilles skink	Very restricted to coastal sandy habitats
Delicate skink	Restricted to northern lowland forest and scrubland
Pedra Branca skink	**Threatened** – rock crevices on islands
Green and gold frog	**Threatened** wetlands and constant water pools
Striped (Peron's) march frog	Locally restricted lowland marshes and ephemeral water

* Does not include seabird species breeding on Macquarie Island

** Under the Tasmanian *Threatened Species Protection Act 1995*, a "threatened species" means: a taxon of flora or fauna that is listed in Schedule 3, 4 or 5 of the Act. These species are listed as being 'rare', 'endangered' or 'vulnerable'.

Appendix B

Species listed on Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* for which foxes are a known or perceived threat. (Highlighted species are those found in Tasmania) (Source: Department of Environment and Heritage 1999)

KNOWN THREAT	
Scientific Name	**Common Name**
Birds	
Leipoa ocellata	Malleefowl
Sterna albifrons	Little Tern
Mammals	
Dasyurus geoffroii	Western Quoll
Lagorchestes hirsutus	Rufous Hare-wallaby
Macrotis lagotis	Greater Bilby
Myrmecobius fasciatus	Numbat
Perameles gunnii	Eastern Barred Bandicoot
Petrogale lateralis	Black-footed Rock-wallaby
Potorous longipes	Long-footed Potoroo
Reptiles	
Caretta caretta	Loggerhead Turtle
Chelonia mydas	Green Turtle
PERCEIVED THREAT	
Amphibians	
Philoria frosti	Baw Baw Frog
Birds	
Geopsittacus occidentalis	Night Parrot
Neophema chrysogaster	Orange-bellied Parrot
Pezoporus wallicus flaviventris	Western Ground Parrot
Stipiturus malachurus intermedius	Mount Lofty Southern Emu-wren
Turnix melanogaster	Black-breasted Button-quail
Mammals	
Pseudomys fieldi	Djoongari
Bettongia lesueur	Burrowing Bettong
Sminthopsis douglasi	Julia Creek Dunnart
Bettongia tropica	Northern Bettong

Burramys parvus	Mountain Pygmy-possum
Dasycercus cristicauda	Mulgara
Dasyuroides byrnei	Kowari
Leporillus conditor	Greater Stick-nest Rat
Onychogalea fraenata	Bridled Nailtail Wallaby
Parantechinus apicalis	Dibbler
Petrogale penicillata	Brush-tailed Rock-wallaby
Potorous tridactylus gilberti	Gilbert's Potoroo
Pseudomys oralis	Hastings River Mouse
Zyzomys pedunculatus	Central Rock-rat
Reptiles	
Delma impar	Striped Legless Lizard
Dermochelys coriacea	Leathery Turtle
Pseudemydura umbrina	Western Swamp Tortoise

Appendix C

Table: Summary of possible contradictions in documented evidence of foxes in Tasmania as proposed by Dr. David Obendorf.

Date	Incident/Allegation	Claim (or Counter Claim)
Prior to mid 2001	A varying number of foxes(9-20) covertly or illegally imported, possibly hand reared and released in one to several sites across Tasmania	Investigations by a Tasmanian Police Taskforce in mid-2001 found that the original source of the information could not be collaberated by police. The allergations were unproven claims (by Police).
Late 2001	Information supporting the above incident/allegation came to light.	Police Taskforce has not reconveined. No charges laid against alleged persons involved (though statute of limitations for procecution for the incident/allegation, if proved, had lapsed).
January 2002	Establishment of the Fox Free Taskforce	Was the establishment of the Taskforce (or long term plan to eradicate foxes from Tasmania) a precaustionary measure or based on convincing evidence?
July 2001 (Longford) Sept 2001 (Symmons Plains), Oct 2003 (Burnie)	An anonymous photo of two men with faces partly hidden holding a dead fox next to a well known road sign near Longford (the 'Longford' fox) appeared on the cover of the Launceston Examiner newspaper Hunter from Perth (Tasmania) claimed to have shot a fox near Symmons Plains. Burnie police were	In relation to the three incidents, there are thought to be inconsistencies in written documentation relating to evidence streams, leaving reasonable grounds to consider hoaxing, falsification or fabrication of the incident. General conclusions drawn from these incidents may be seriously flawed and could not be confidently supported by careful assessment (see Section 4.7 Processing of

	informed by a bicyclist that a fox had been found dead on the Bass Highway roadside near Burnie Wharf and across from the Burnie Mitsubishi dealership	Evidence)

Appendix D

Summary of Fox Free Taskforce Community Engagement Activities

Publications:

- Regular Fox Free Tasmania Newsletter. Next edition to be produced in June 2006.
- *Country Tasmanian:* a new publication which appeared in Tasmania as of March 2006. Advertisements run in their 06/07 "calendar and rain chart"; a 200 word editorial (with logos) in the first edition of the magazine plus a 13 x 18 cm ad; a 200 word editorial for their "Seniors" calendar as well as a 9 x 13 cm ad in the same publication. A 13 x 18 advertisement will appear in their upcoming Winter edition.
- *The Examiner Newspaper*: Northern Tasmania's daily paper - regular advertisements run, FFT appear weekly in the rural pages, and feature in any special editions such as those produced for Agfest, or "Our Life on the Land" and similar industry based features. Text regularly updated to ensure that the information is relevant for the part of the fox's cycle/season (dispersals, territories, conception, birth) and the emphasis is on public vigilance - this is true of all publications. Next feature will be the "Farming our Future" publication.
- *Game Tracks* is the annual official publication of the Game Management Services Unit of DPIW, and FFT always place feature article/s.
- *In Business Tasmania:* place one large half page ad in this publication, focussing on public vigiliance and also outlining how sightings are graded and recorded.
- *National Emergency Response Journal* is a publication the FFT will advertise in for the first time in the near future, it is produced to support local emergency volunteers.
- *Neighbourhood Watch*: Advertised 2006 and will advertise in the 2007 calendars produced, as well as in their "Official Journal".
- *Police Association Journal:* As above. Advertised in the 2005 and will advertise in the 2006 publications. Focus here is on making police members aware of who the FFT is and what functions are carried out, and that they may be the people that members of the public turn to with a sighting report or to report possible evidence.
- *NTFL Record* the official programme of the Northern Tasmanian Football League is produced weekly during the football season. FFT running three weeks of ads beginning May 27th.
- *Tasmanian Country* is an established newspaper, produced weekly and widely distributed in the rural community. As with other publications the focus is on public vigilance but with a rural "slant" - ie, advising landowners what to look out for on their properties and what to do if anything suspicious is sighted.
- *Tasmanian Farmer* is an established publication posted out free to more than 24,000 rural addresses, and produced seasonally. FFT run an ad in each edition.
- *Trading Post* is a publication with which FFT have just started advertising - FFT have advertised in their special "Bumper" issue for the Launceston area, which was delivered free to 29,700 homes in addition to their 52,000 weekly readers statewide. The same will occur for their Bumper issue in the south. The Launceston ad was particularly prominent, placed on the 3rd page and being at least twice as large as most other advertisements on the page.

- *The Advocate:* The North - West region's daily paper - FFT advertise in their special features but not on a weekly basis as with the Examiner.

Engagement Items (e.g: handouts and merchandise)
- Fox Taskforce Keychains
- Fox Taskforce fridge magnets
- High quality Fox Taskforce pens
- Acrylic Fox Taskforce coasters
- Fox Taskforce Rulers
- Fox taskforce bumper stickers
- Highway signs - 20 aluminium 1200mm x 1200mm and 3 corflute of the same size. These have been placed at strategic locations around the state. The corflute signs were placed at NW entry points such as at TT line. 20 smaller versions (500mm x 500mm) were produced after the "Lillico" fox incident, and these are currently being placed at locations, such as the entrance to the Lillico Conservation area, around the state. With all these items - bumper stickers, highway signs, keyrings, etc, the move has been to ensure that the design and message are exactly the same, so that each sighting of any of these by a member of the public is a reinforcement of the same message.
- Hunter and farmer packs (containing information, fox whistles etc) provided at many events.

Educational Activities:
- Educational booklet (based on Tasmania's "Essential Learning" curriculum) and CD, with accompanying set of four posters, produced and sent to every school library. Education Officer Ingrid Albion was responsible for the production of this item. It was also sent to all councils, Parks and Wildlife Service (PWS) offices and Field Officers hand them out at any talk given or event attended.
- Assist in the production of the "Foxout" video and mobile display (5-6 venues for two years) in conjunction with Australian Wool Innovations.

Liaison:
- An ongoing relationship is maintained with PWS offices, with engagement items regularly sent out. Over the coming year it is hoped to formalise this with a meeting or forum of some kind, to ensure all are kept up to date with all issues, how to deal with reported sightings, etc.
- Field Officers annually attend the popular Inland Fisheries gala weekend at Liawenee in the highlands, held each May; FFT Field Officers observed how interested people were in the Taskforce's activities for this year. "Hunter Packs" with information about foxes, the Taskforce and engagement items, were handed out, as was the education booklet mentioned above.
- A field officer attended the two day Devonport Apex show in February
- The PWS featured FFT signage and handed out engagement items at the April Tourism Expo, over two days at Launceston's Albert Hall - all items were handed out.
- Field Officers give talks to schools and community groups when requested,– unfortunately due to low staff numbers in 06/07 this will probably not be able to occur.

- Attendance at yearly local shows – eg. Devonport, Burnie, Oatlands, Launceston, Hobart, Campbell Town

Source: Fox Free Taskforce 2006