

## Trap, neuter and release programs for cats: A literature review on an alternative control method of feral cats in defined urban areas

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### Background

The population of free-roaming cats is composed of two groups of cats from different origin. Wild cats are cats whose ancestors were never domesticated and they have little or no contact with people ([en.wikipedia.org/wiki/Feral\\_cat](http://en.wikipedia.org/wiki/Feral_cat)). Feral cats are unwanted cats (and their descendants) that are abandoned or neglected by their owners for various reasons and became attached to a stray cat colony ([en.wikipedia.org/wiki/Feral\\_cat](http://en.wikipedia.org/wiki/Feral_cat)), for social interaction and reproduction. Free-roaming cats (wild and feral) are distributed all over Australia and many other countries in the world. According to the NSW National Parks and Wildlife service there are about 12 million wild and feral cats distributed throughout Australia. Several specific problems have been attributed to the presence of free-roaming cats both in urban and rural areas. For example, several authors have described that some repopulation programs of endangered species have failed due to the presence of wild and feral cats (Gibson *et al.*, 1994; Christensen and Burrows, 1995, Friend and Thomas, 1995). There are also concerns about the impact of cats on public health and animal welfare as cats may transmit disease, parasites and inflict injuries to pets and people (Carter, 1990). These concerns have led to several attempts to reduce the number of free-roaming cats. Several methods of population control have been described by the World Society for the Protection of Animals (WSPA) (Anon., 2001). These include re-homing (eg. to a human household), relocation to another protected area, shelters and extermination. The most common method for population control, and arguably the most successful, has been trapping and euthanasing untamed cats (Carter, 1990). However, all of these methods are controversial since none has had a significant impact on the cat population other than on small and isolated islands (Gibson *et al.*, 2002). In general, the removal of the original cats resulted in an influx of a similar number of cats within a relative short period of time to replace those that were removed (Neville and Remfry, 1984). In addition, attempts to exterminate wild and feral cats raise animal welfare issues, since the methods used include poisoning, hunting, trapping and introducing infectious feline disease. However if the source of food can be removed, trapping and permanent removal may be effective in certain circumstances (see Winter, 2004).

Some members of the general public, via their membership of a number of animal protection organisations, have expressed concerns about the welfare of wild and feral cats. These organisations promote a non-lethal method for the control of free-roaming cat populations called TNR (trap, neutering and release). TNR programs consists of trapping feral cats, desexing them by surgical methods and returning them for release in their original territory or into "managed" colonies. The most important advantages of this method are that animals returned to their territory after the surgery are unable to reproduce and their infertility is irreversible. However, the TNR method has both advocates and detractors. For example, Levy *et al.* (2003) reported successful results in reducing the stray population of free-roaming cats by 66% in a small colony that was living in a small university campus. In this study, adoption of kittens and tamed cats by households played an essential roll in reducing the population of cats. Zaunbrecher and Smith (1993) proposed that the TNR method can succeed in controlling cat populations in enclosed areas, such as hospitals and aged care centres, where the benefits of the presence of the cats is well known.

Cats kept in small groups had positive therapeutic effects in hospitals with patients with mental illness (Remfry, 1996). In contrast, Storts (2003) argued that TNR advocates disregarded public health and the threats to wildlife posed by millions of free-roaming cats and that TNR methods do not satisfy guidelines for animal welfare in the USA. Moreover, the implementation of TNR programs encouraged owners to abandon cats and the population neither decreased nor increased over time in some cases, or even increased in some others, although the number of original cats decreased in both cases (Castillo and Clarke, 2003). Levy *et al.* (2003) suggested that there is insufficient information on the long-term effects of controlling free-roaming cat populations by TNR programs. No information on TNR programs was found related to rural areas.

### The effectiveness of TNR programs in reducing cat numbers

TNR programs help to control the increasing numbers of free-roaming cats. For example Stoskopf and Nutter (2004) found an average decrease of cats in desexed colonies of 36% over 2 years, while at the same time an average increase of 47% was found in 3 control colonies. Centonze and Levy (2002) also reported a reduction of 26% in cat numbers after implementation of a TNR program in 132 colonies. However, TNR programs are often inefficient in reducing the numbers of cats because the only cause of reduction is adoption and natural mortality, and migrating and abandoned cats replace those that die (Castillo and Clarke, 2003). As mentioned above, the success of TNR programs in reducing the feral cat population relies in part on the success of adoption programs. Although the aim of TNR programs may be the extinction of the colony in the long term due to adoption and natural mortality, it is more realistic to aim for large reduction of cats and establish permanent small, managed colonies (Levy and Crawford, 2004).

Another issue with TNR program is the age at which the kittens are neutered. Neutering kittens before they are 2 months old is currently being studied as an option, but some veterinarians refuse to use this method due to the lack of scientific evidence on the long-term effects of this practice on the animal (Roken, 2002). However, neutering kittens between 3 and 5 months of age is becoming more common amongst private veterinary practices (Mahlow and Slater, 1996). Some advantages have been described for neutering at 2 months of age; neutered kittens show less stress and quicker recovery from the surgery, therefore less time and effort is required from the surgeon, reducing the costs of the surgery (Lieberman, 1987). In addition, the kitten as a pet may become more socialised towards humans and is less likely to be aggressive to its owner. Kittens which are adopted or re-homed from shelters at about 2 months of age are usually not sterilised. The new owners do not always take the animals to be neutered at an age before they are fertile (Lieberman, 1987; Carter, 1990). This may result in unwanted litters that are subsequently born from these kittens which may be abandoned on public lands, compromising the welfare of those kittens and contributing to an increase in population size.

Remfry (1996) reported that 70% of the cats in 17 TNR programs remained in the colonies 5 years after the program commenced. However the fate of the other 30% of cats was unknown. Centonze and Levy (2002) reported similar disappearance rates. Regardless of the effectiveness of the TNR programs, migration of cats from other colonies to the "managed colony" is unavoidable. Incoming cats can carry parasites (eg. internal and external) and a range of diseases (eg. Feline Leukemia Virus, Feline Immunodeficiency Virus, Feline Infectious Peritonitis and Feline Enteritis) that may affect cats in the colony. Even when the TNR programs include worming and vaccination animals are at risk because in most cases both worming and vaccination only cover the animals for a limited period of time. In addition, it has been reported that the incoming cats, particularly entire males, are extremely aggressive towards the de-sexed members of the colony, posing a considerable threat to the welfare of those animals. There is some evidence that neutered cats have been both injured and even displaced by incoming entire cats (Bradshaw, 2002). Steen-Ash (2004) studied the roaming areas of feral and stray cats within the Texas A&M University campus and found no significant differences in the roaming areas between the two classes of cats. However, a problem becomes evident when the areas occupied by 2 or more colonies overlap because of fighting and more effective disease transmission.

### Attitude of the general public towards TNR programs

TNR programs are generally well accepted by the general public and it has gained official approval from the RSPCA in the UK. Stray and feral cats are not always unwelcome. In some places such as factories, depots and other buildings, cats in limited numbers are accepted to help with the control of unwanted rodents. In addition, in hospitals and aged-care centres, stray cats have shown positive therapeutic effects on long term and disabled patients. In these cases TNR programs can succeed if the population of free-roaming cats is under control and cats are well looked after by committed volunteers. TNR programs may have a better chance of succeeding in certain circumstances since methods such as extermination and relocation have not been shown to be effective. Moreover, these methods have low acceptance amongst the general public and are often boycotted by individuals who oppose such methods. However, public education is essential to decrease the number of abandoned cats. One of the sources of increase in the population of stray cats is abandonment and the release of unwanted pets on public lands. To a lesser extent, run-away cats that are not desexed also increase the population.

### The effect of TNR programs on wildlife

One of the main concerns of the opponents of the TNR method is the detrimental effect of the presence of free-roaming cats on the local fauna and public health (Mahlow and Slater, 1996). Mahlow and Slater (1996) suggested that feral cats should not be treated differently to other pest animals such as foxes. Hawkins (1998, cited by Castillo and Clarke, 2003) found that areas without cats had twice as many native rodents compared to an area supporting a cat colony. In a study about the interaction between hunger and preying behaviours, a live mouse was released within a cage where the cat was being fed. All cats but one stopped feeding to kill the mouse, returning to their feed without eating the mouse (Adamec, 1976). This raises concerns about wildlife welfare, because even cats which are provided with enough food would perform preying behaviours. While predation is an environmental issue, it has welfare implications if the prey species are not instantaneously killed. In addition, there are risks of disease transmission between species.

In an extensive study about the impacts of feral cats in mainland Australia, Dickman (1996) reported that mammals under 2,000 g and birds under 1,000 g were at risk of predation by cats. The impact on native species was greater as the size of the predated species decreased, and especially deleterious to species weighing less than 220 g. Biben (1979) found that it is possible to predict 95% of the variability in the killing response based on hunger and prey size. Moreover, an impact is still possible in areas of long-term apparent coexistence, because some cats may develop hunting skills for particular species at any time (Dickman, 1996). Feral cats were reported to be a threat to native species in Australia but the different levels of threat varied depending on the region. The areas where the removal of cats should be a priority include coastal Victoria (Dickman, 1996). In some areas feral cats have extensively contributed to the extinction of local species by predation but more importantly by transmission of parasites (eg. *Toxoplasma gondii*, *Spirometra erinacei*), while there are others where the presence of feral cats has had little impact on the population of local fauna (Dickman, 1996). Considering that all methods of cat control are ineffective in areas where cat populations can not be controlled, TNR programs would not be an option for wild cat populations in nature reserves.

### Welfare issues for wild and feral cats

There are a series of welfare concerns related to free-roaming cat populations. Stray and feral cats are constantly exposed to infectious disease, parasitological disease and malnutrition that consequently produce loss of body condition and in many cases pain and even death. Lifespan of feral cats is estimated to be up to 5 times shorter than owned cats and mortality rates can be as high as 80% (Jessup, 2004). Observations on feral cats indicated that 75% of kittens born had died or disappeared before the age of 6 months (Nutter et al., 2004a). In addition, feral female cats are pregnant most of the time contributing to a decline in body condition and increased susceptibility to disease. Increasing numbers of stray and feral cats facilitate disease transmission, thus increasing mortality levels. TNR programs that include vaccination and worming help to improve the welfare of some cats. However, neutered stray and feral cats cannot be monitored regularly and may be exposed to post-operative complications and metabolic and other associated diseases that may cause discomfort, pain and death. In addition, vaccination and worming coverage last for a limited period of time and those cats may be at risk of becoming ill. Nevertheless, the welfare of cats that have no complications seems to improve in well-managed TNR program compared to most cats out of the programs.

### The cost of TNR programs

While TNR programs are costly even with the participation of large numbers of volunteers in the trapping and transport activities, other forms of control (predominantly killing) by commercial pest control companies are also expensive and often not effective. A site that provides adequate shelter and food sources will not remain free of cats for long. Non-neutered cats will migrate to these areas and breed at a high rate. Therefore the number of cats and the costs of control are likely to be relatively constant over time. In TNR programs though, the greatest costs are faced at the beginning of each program. As neutering all the animals in the original colony is crucial for the success of the program, the provision of materials such as traps and transport cages, human resources and the costs of surgery to neuter large numbers of animals elevate expenditure. In the long run however, the costs decrease substantially, as the only cats that need to be neutered are those that migrate from other areas to the "managed" colony (Zaunbrecher and Smith, 1993). Thus, regular monitoring of the colony is required to avoid breeding by incoming cats within the colony area.

In some cases, due to the limited financial resources and volunteers' time on some programs, monitoring has failed, contributing to the overall failure of the program. Although some feral cats may be wary of traps and may be hard to catch, Nutter *et al.* (2004b) found that 98% of cats in 9 colonies could be trapped over an average of 9 trap-nights/cat. This study examined the option of including an acclimatising period to improve trapping efficiency, but found this to be unnecessary and would only add to the costs.

## Conclusions

While the TNR method still has unresolved issues regarding its welfare implications for feral and stray cats, it seems to be the most effective non-lethal method to partially control small populations of free-roaming cats. However none of the groups of people interested in controlling wild and feral cat populations will succeed if they act autonomously, regardless of the system used. Without the support and help of the community, veterinarians, animal welfare organisations and adequate legislation, efforts will be fragmentary and probably without effective results. Education programs for responsible pet ownership are needed to reduce the abandonment and neglect of pets. Neutering, periodical vaccinations and worming are fundamental for the welfare of these animals. Reducing the numbers of abandoned kittens would not only help to control cat populations but would also increase the welfare standards of existing cats.

An effective TNR program requires desexing of both sexes and of most animals within a population (between 71-94%, Foley *et al.*, 2005). Neutering dominant males would simply provide an opportunity to non-dominant males to mate. Therefore, most of the males should be castrated to reduce the wild and feral cat population. Moreover, desexing only females will reduce the availability of females in oestrus, increasing fighting amongst male cats and harassing of neutered females. Indeed, the welfare of these cats would be at increased risk.

All the adverse consequences of castration (surgical and non-surgical) are possible in any cat but wild and feral cats cannot be periodically monitored, raising concerns about their welfare. However, without any control plan the mortality rate of free-roaming cats is very high, rising up to 50% in young kittens. Thus, TNR programs may serve to reduce mortality in cats, although this is yet to be determined.

TNR is a suitable method to control small cat colonies located in defined areas. However, cats need to be intensively removed from areas where they represent a real threat to local wildlife and public health, while TNR methods can be used in areas where cats have low impact on other species. Research is needed on methods that help to control feral cats in rural and coastal areas, where the impact on wildlife seems to be higher. Furthermore, research to find alternative control methods should be encouraged since none of the available methods have demonstrated long-term efficacy in controlling large numbers of free-roaming cats.

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