

## Scottish Wildcat Conservation Action Plan – Steering Group

### Responsible domestic cat ownership and reducing the threat to Scottish wildcats: Paper to Scottish Government

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#### Summary

1. This paper provides an update on issues relating to the threat to Scottish wildcats posed by disease transmission and hybridisation with domestic cats (including pet domestic, feral domestic and hybrid cats), and recommends new necessary measures. The Steering Group believes that the conservation status of the Scottish wildcat will be extremely difficult to improve significantly, and is likely to further decline, unless further measures are attempted in order to address these key threats. Such measures, if designed carefully and in collaboration with key partners, would also improve the long-term welfare of domestic cats.

#### Action

2. The Scottish Government (SG) is invited to note some recent work on Scottish wildcat conservation action relating to pet domestic cat ownership and feral domestic and hybrid cat management, to note the significant practical challenges and costs involved in such work based on our recent experiences, to consider the potential legal options put forward relating to pet domestic cat ownership, and support recommended new measures.

#### Preparation of Paper

3. This paper has been prepared by the Scottish Wildcat Conservation Action Plan (SWCAP) Steering Group.

#### Background

4. The wildcat population is not at a favourable level in Scotland, with a recent estimate using identification based on pelage (fur) patterns suggesting there may be as few as 115-314 individuals present. It is likely that new genetic scoring methods, in combination with morphological characteristics, will indicate an even lower number of animals.
5. The Scottish wildcat is a separate species to the non-native domestic cat which originated in the Middle East. Domestic cats may live as pets in and around homes, or as wild-living, feral cats, or a combination of both (e.g. feral domestic cats that are sometimes fed by people).
6. The overarching aim of the [Scottish Wildcat Conservation Action Plan](#) is that “within six years to have implemented conservation action to halt the decline of the Scottish wildcat”. The current main phase of work is based around the multi-partner ‘[Scottish Wildcat Action](#)’ (SWA) project, funded primarily via the Heritage Lottery Fund, which is running from April 2015 to March 2020. The SWA has been largely focussed on six ‘Priority Areas’ (PAs) in northern Scotland, with wider and coordinated work underway to underpin wider wildcat conservation, in particular a conservation

breeding programme that may form the basis of future releases. Work at one PA has now stopped as no remaining wildcats could be detected (Strathavon).

7. Two main threats to Scottish wildcats are hybridisation with domestic cats (including pet domestic, feral domestic and hybrid cats), and the transmission of diseases such as Feline Leukaemia (FeLV) and Feline Aids (FIV). Pet domestic cats are the original source of the large feral domestic cat population in the Scottish countryside, estimated to be up to 100,000 individuals (Annex 1, section 1.4). Therefore the [Scottish Wildcat Conservation Action Plan](#) lists a number of specific actions designed to address the threats to wildcats arising from the presence of domestic cats in the Scottish countryside. These include actions 2.4.1-2.5.1 which all relate to 'responsible cat ownership and management of feral domestic cats' within the SWA Priority Areas.
8. Available domestic cat management options were assessed and discussed early in the SWCAP process. The decision was made that the SWA would use a coordinated programme of Trap-Neuter-Release (TNR), rather than lethal control for feral domestic cats. This was based on a number of reasons, including the reported efficacy of the technique in the field, and the need to engage the support of key partners and the wider public community (set out in a paper produced for the SWCAP in July 2015 by Jenny Bryce, SNH, entitled *Feral cat management: Justification for proposed wildcat action approach*). The need to combine this with an appropriate communications package was agreed, including the requirement to encourage and promote the responsible ownership of pet cats.
9. As a result the SWA is currently running a TNVR programme (Trap-Neuter-Vaccinate-Release, an improved version of TNR) in the five PAs. This involves targeting and trapping feral domestic and obviously hybrid cats (i.e those resulting from interbreeding between wildcats and domestic cats where significant domestic cat ancestry is likely), neutering and ear-tipping them at a local veterinary practice (i.e. removing the tip of the left ear to allow future identification, following standard international practice), vaccinating them against diseases, including those harmful to wildcats, and then releasing them at their point of capture. The release of such animals requires a 'non-native species licence' from SNH. The methods follow a similar approach used by cat welfare organisations, such as Cats Protection, who operate more widely across Scotland. Efforts are made to avoid the accidental capture and neutering of pet domestic cats, primarily through a range of local communication methods. The SWA does not use lethal control.
10. Lethal control of feral domestic and obviously hybrid cats is legal within Scotland. Although this is not a method SWA employs, it has provided land managers with wildcat identification guidance to reduce the risk of wildcats being killed by accident.
11. In June 2016 Professor Anna Meredith submitted a paper for the SWCAP Steering Group entitled *Proposal for additional control measures on domestic cat ownership in Scotland as a conservation action to protect the Scottish Wildcat*. It is included in Annex 1 – it provides a detailed background and assessment of the issues relevant to this paper, and recommendations for additional statutory control measures on domestic cat ownership. Prof Meredith's paper highlighted the fundamental problem that pet domestic cats, feral domestic cats and hybrid cats pose a serious and continuing threat to the conservation status of wildcat in Scotland. Intensive, expensive and continuing action can help address local impacts but such work is

likely to be unsustainable in the longer term and at the wider scale. The SWCAP Steering Group supported the proposals, although it was recognised there would be political sensitivities. The paper was subsequently forwarded to Scottish Government.

12. A campaign to promote and encourage voluntary responsible cat ownership to support wildcat conservation, called '[Supercat](#)', was launched in January 2017. It was designed to encourage cat owners to micro-chip, neuter and vaccinate their cats. Those living in SWA PAs have been targeted in particular, although the campaign has been promoted across Scotland. No data are available so far on the effectiveness of this campaign.
13. The issues of responsible cat ownership and the adverse impacts of domestic cats, have recently received further attention following the submission of petition PE1674 [Managing the cat population in Scotland](#) by Elspeth Stirling. The petition calls "...on the Scottish Parliament to urge the Scottish Government to review the Code of Practice under the Wildlife and Natural Environment (Scotland) Act 2011 and to identify measures which could be introduced to control the soaring domestic cat population and protect the existence of the Scottish wildcat.". A [SPICE briefing](#) is available. The Parliamentary Petitions Committee discussed the issues on 7 December 2017, since when there have been a number of further written submissions and responses which can be viewed [online](#). The petitioner has argued that suitable cat management will benefit domestic cat welfare as well as wildcat conservation.
14. The IUCN SSC (International Union for the Conservation of Nature Species Survival Commission) Cat Specialist Group has recently agreed to undertake an independent review of wildcat conservation work in Scotland, to be completed by autumn 2018. This will help inform decision-making on where wildcat conservation activities can be most effectively and efficiently targeted in the future. It is anticipated that the management of the domestic cat population will be a fundamental consideration.

### **New information and experience from ongoing wildcat conservation work**

15. The SWA completed one full survey season for five of the initial six PAs during the 2015/16 winter and a full survey for the remaining PA during winter 2016/17. Further survey work is continuing. The wildcats were detected using camera traps, and given a score based on their pelage markings. Those animals that reached a certain score are classed as wildcats based on an agreed protocol developed by specialists. If they do not reach that score, but show some wildcat characteristics, they are classed as hybrids. The results are provided in Annex 2, and this first phase of survey demonstrates the low number of wildcats recorded, and the much higher numbers of domestic cats and hybrid cats at all sites.
16. However, it has also been possible to use new genetic tests on a small number of dead animals that have been found in the wild (road kill etc.). The initial results of these tests suggest that even wild-living animals from Scotland with a high pelage score have some significant domestic cat ancestry, and some have been heavily hybridised with domestic cats. Although there is debate over the importance of the genetic purity of a wildcat, and whether this matters so long as the animal looks and behaves like a wildcat, it does demonstrate at a biological level the impact domestic

cats are having. The more visible result of this interbreeding, from camera trapping, is that we have found that hybrid cats outnumber wildcats in all the PAs.

17. The SWA programme of TNVR work started during the 2016/17 winter field season and continued, where there was a minimal risk of accidental trapping of wildcats, in summer to autumn 2017. As of 31<sup>st</sup> Dec 2017, TNVR by staff, volunteers and contractors resulted in 134 cats being captured. As of 31<sup>st</sup> Jan 2018, the project has invested £11,217 in vet fees for neutering; £15,381 in contractors for combined survey and TNVR in Morvern; £27,626 in contractors fees for TNVR in the Angus Glens; plus SWA staff and volunteer time and expenses across all areas, plus equipment costs. During winter 2016/17 alone, we estimate that 826 hours of SWA staff time and 747 hours of volunteer time were invested in TNVR (roughly equivalent to one person-year of work time, with contractor time in addition to this). Note that this work focussed on known feral domestic cats, including cats living around farm buildings, which do not live in homes, rather than on pet domestic cats. The majority of these cats were from around farms where it was relatively simpler to catch large numbers of animals within a short period – this contrasts with the sometimes extensive resources need to TNVR feral cats living wild in remote areas. This effort has covered 1735 square kilometres/ 670 square miles (2% of the total land area of Scotland).
18. As stated in section 3.3 of Anna Meredith's paper (Annex 1), for TNR to be effective in reducing populations, it has to successfully target 71-94% of the domestic cats present on a sustained basis. SWA did not achieve this during their first year of TNVR but may achieve this target in future years. TNVR work is continuing during the SWA and will continue up to 2020 during the current phase of work. However the figures to date demonstrate the significant practical challenges and costs of dealing with feral and pet domestic cats in PAs. It is worth highlighting some examples of these practical challenges, based on continuing SWA work:
  - TNVR sites within the PAs can be remote, which can add significant time for the personnel managing the traps. Cat welfare is a priority so traps have to be checked 12-24 hours after setting, and if an un-neutered cat is caught then they need to be transported to a vet – this may involve round distances of up to 95 km for a single cat. In the Morvern PA, no vet is available at a reasonable distance for transporting a feral cat and therefore SWA must bear the cost of bringing vet contractors into the area and setting up a field clinic.
  - Winter is the most effective time to capture wild-living feral and hybrid cats. The core winter field period for TNVR runs from January to mid-March, which means sites can often be particularly difficult, or even impossible, to access during bad weather conditions.
  - The numbers of potential volunteer support workers may be lower in more remote areas, requiring increased input of salaried personnel (staff or contractors).
  - The need to check traps 12-24 hours after setting, or around every eight hours if there is a risk of capturing a wildcat, means personnel may have to work long work days, which has to be balanced with suitable levels of leave within the core winter field period to ensure health, safety and staff welfare.
  - There are increased numbers of pet domestic cats around communities. The SWA endeavours to avoid neutering pet cats without owners' permission (it is not always straight forward distinguishing between a pet cat and a feral cat) – this is done through local communication programmes. This is necessary but adds significantly to the resources required to run TNVR programmes.

19. The last bullet point above highlights the challenge of dealing with pet domestic cats within the PAs. There is a perception in some quarters that wildcats only live in areas remote from human settlements. However it is very important to emphasise that some of the PAs include communities of varying sizes, some of them with populations of hundreds or even several thousand people – this also applies across the wider wildcat range in northern Scotland. Inevitably this means there are also substantial numbers of pet domestic cats, a significant proportion (possibly up to a third, see Annex 1 section 1.6) of which will be un-neutered/un-vaccinated, and which therefore present a range of threats to the local wildcat populations. The challenge is how to balance the welfare of pet domestic cats with the need to remove the threat to wildcats, and engage the support of local people.
20. A further complication in ensuring pet cats are identified, and owners and the local community engaged, is that it can be difficult to define 'ownership'. The SWA has had experience of dealing with situations where domestic cats appear to be feral and never enter a house, but may visit a garden and take food from someone who perceives some degree of 'ownership' over the animals. Farm cats may also have varying degrees of interaction with the farmers, sometimes living entirely outside and being effectively 'feral'. Project staff always try to identify, engage with and get the support of the people concerned, which is a time-consuming process, but in some cases it can be difficult to gauge the extent to which permission/support is needed or required.
21. Disease transmission is a key threat. SWA has detected FIV (Feline Immunodeficiency Virus) for the first time in a wildcat hybrid, and FIV, FeLV (Feline Leukaemia Virus) and 'cat flu' in the wild-living cat populations in four PAs, including FIV in a male hybrid that scored very close to our threshold for wildcat (close enough that SWA initially assumed it was a wildcat). Following veterinary advice, this individual was recaptured and euthanized both on welfare grounds and to avoid transmission of FIV to any wildcats in the area. The action would have had to be taken whether the individual was a hybrid or a wildcat, because of the unacceptable risk to other wildcats. There is no vaccine for FIV and once contracted the disease is incurable. SWA also encounters FIV and FeLV and high levels of 'cat flu' pathogens regularly in farm cats and it is likely that domestic cats are a significant reservoir for these serious diseases. Neutering reduces the risk of disease transmission from feral cats or hybrids because the main routes of transmission are through territorial conflict and mating.
22. It is too early to assess the extent to which the SWA campaigns (such as 'Supercat') have resulted in an increased number of pet domestic cats that are voluntarily neutered, vaccinated and chipped within the PAs (and indeed more widely). We anticipate that they will have some positive effect, and the SWA will continue to promote responsible cat ownership. Eleven free neutering vouchers have been handed out by SWA to members of the public to date, although we believe 'Supercat' is prompting others to neuter their cats without the need for vouchers. However, we also recognise that such campaigns will always have limitations, and that there will be a range of reasons why a proportion of pet domestic cats will not be taken to vets, and therefore will remain a threat to resident wildcats.
23. Therefore the presence of pet domestic cats has a major impact on wildcat conservation through hybridisation and disease. This currently requires an extremely

high level of resources to address - through dealing with feral domestic cats (that ultimately are sourced from the pet domestic cat population), in ensuring that pet domestic cats are not trapped/neutered without owner permission, and in running campaigns that encourage owners to take their pets to the vets. In order for the SWA to have a longer-term legacy we require almost 100% neutering rates. Without some form of continuing cat management in PAs after SWA and beyond, feral domestic cat populations in the PAs may simply revert to previous levels. It is questionable whether this can be achieved through the establishment of self-motivated teams of volunteers after the project alone. Therefore we recommend other measures are required.

### **Next steps – Minimising the domestic cat threat to wildcats**

24. We are currently considering the necessary action required beyond the end of the SWA that finishes in March 2020. Discussions are underway that will help focus action during a further phase of work, to be informed by the planned IUCN SSC Cat Specialist Group review. In the shorter term (up to 2025) we anticipate action will remain focussed on discrete geographic PAs, but in the longer term our vision is to restore the Scottish wildcat more widely across Scotland. A workable, effective and achievable solution to domestic cat management is therefore fundamental.
25. Our experience to date has shown that the practical difficulties and costs associated with managing the domestic cat problem are even more challenging than first thought. We remain convinced that it is possible to restore the conservation status of wildcats given appropriate resources, but in order to make this more realistic and achievable, it is now necessary to employ new statutory measures that will help reduce the threat posed by domestic cats. The SWCAP Steering Group believes that without such measures the chances of saving the wildcat in Scotland in the longer term will be greatly diminished. However we believe such options should also improve the welfare of domestic cats both immediately and in the longer term and be acceptable to, and supported by, the wider community.
26. Some options are presented below relating to responsible pet domestic cat ownership (the inter-related issue of feral domestic cat ownership will continue to be dealt with by SWA through TNVR). Most of these will help to remove the direct threat posed by interbreeding and disease transmission between pet domestic cats and wildcats, but also help to ‘turn off the tap’ of further pet domestic cats bolstering the large feral domestic cat population. Many of them overlap with those presented by Anna Meredith (Annex 1) and Elspeth Stirling for petition PE1674 (see follow-up note produced 9 February 2018). Note that the following are very much focussed on the aim of wildcat conservation, which is the remit of the SWCAP Steering Group. However we emphasise again that we believe domestic cat welfare will directly benefit from improved cat management measures, and we would welcome the input of animal/cat welfare and veterinary organisations in refining the design of management tools, and in contributing to coordinated activities on the ground.

The short-term aims (i.e. running up to the end of a second phase of anticipated wildcat conservation work, 2025) are:

- To remove the threat of pet domestic cats present within discrete PAs (and any buffer areas) hybridising with, or spreading disease to, wildcats, and acting as a source of more feral domestic cats in the wild.

- To ensure feral domestic/hybrid cats present within PAs (and any buffer areas) are captured and processed during the TNVR programmes

The longer-term aims beyond 2025 are the same as above, but to cover wider geographical areas, and ultimately all of Scotland. This would enable wildcats to recolonize larger areas and establish larger, viable populations, and reduce the overall, long-term risks associated with a reliance on small discrete PA-sized populations.

#### Options - legal measures for responsible pet ownership:

- (i) No change to current arrangements.
- (ii) Amendment of the INNS (Invasive Non-Native Species) Code to highlight best practice to neuter/vaccinate/chip all pet domestic cats (with some exceptions\*). Could be applied at different geographical scales e.g.:
  - PAs (and buffer zones)
  - Regional e.g. Local Authority
  - National
- (iii) Compulsory legal measures that would prevent ownership of pet domestic cats unless they were neutered/vaccinated/chipped (with some exceptions\*). These could include a Ministerial Order/(prohibition of) Keeping Order as set out in the Wildlife and Countryside Act 1981 (as amended) – these can be used to prohibit the keeping of certain types of non-native species and can be applied over different geographic areas. This approach could be applied at different geographical scales as described in option (ii) above.
- (iv) A combination of the above, which could be phased over time.

(\*Exceptions may include provisions that apply to registered cat breeders, professional veterinarian discretion in employing vaccinations etc.)

27. We consider that option (i), based on our recent and increasing experience, is not viable if we are to have a realistic and reasonable chance of conserving the wildcat in Scotland. The numbers of un-neutered domestic cats are currently too high, current voluntary schemes are clearly inadequate, and pet domestic cats will continue to bolster the feral domestic cat population.

28. Option (ii) by itself will inevitably have some appeal to decision makers as it presents a less heavy-handed approach than option (iii). SNH has said that it understands amending the INNS Code would not make neutering/vaccinating/chipping cats compulsory, although the application of this recommended best practice by any person could be used in a court of law as evidence. The amendment of the Code could also provide a useful 'hook' to promote and explain the rationale of responsible pet ownership. However, ultimately we have concerns that this would be regarded as guidance, rather than a compulsory requirement, and would not result in the level of action by cat owners that is required.

29. Option (iii) applied successfully at the national scale would significantly reduce the risk to wildcats into the longer term. We appreciate that further discussion will be

required with SNH and SG over how appropriate legal measures could be applied. We acknowledge that careful and sensitive communication and education would be required to minimise some shorter-term risks such as a possible increase in abandoned pet domestic cats in the countryside immediately after such legislation came into force, and a negative response from some of the public who might consider this heavy-handed. . We recognise the value of maintaining and increasing public support for wildcat action.

**30. The SWCAP Steering Group recommends that a version of option (iv) should be applied.** We continue to believe that the broad recommendation set out in Anna Meredith's June 2016 paper (Annex 1) still applies, summarised as option (iii) above, **namely compulsory legal measures across the whole of Scotland that would prevent ownership of pet domestic cats unless they were neutered/vaccinated/chipped (with some exceptions). As a minimum this should start with the application of option (iii) as soon as possible within the PAs and surrounding buffer zones up to 2025 and beyond, extending to the whole of Scotland after 2025.**

31. If option (iii) starts within the PAs and buffers first, then this phase could be used as an opportunity to further monitor and learn more about responsible cat ownership and public attitudes. A coordinated, parallel programme of education and communication would be run prior to, and during, the launch of any change to the legislation. It is anticipated that over time the public will become more aware and supportive of the aims and benefits of responsible cat ownership measures to domestic cat welfare, and wildcat conservation.

32. We appreciate there would also need to be a range of technical issues and details that would need to be dealt with to enable option (iii) to be progressed (e.g. improved legal definitions of what constitutes ownership and control of a domestic cat, pet cat registration, registration of breeders etc.). To support this process we would welcome opportunities to collaborate and liaise with animal/cat welfare and veterinary organisations, including those who have contributed views to the petition PE1674 process (British Veterinary Association, British Small Animal Veterinary Association, British Veterinary Zoological Society, Scottish Society for the Prevention of Cruelty to Animals and the Cat Population Control Group members), and Scottish Government officials.

Scottish Wildcat Action Steering Group  
27 March 2018



## **Annex 1**

*(submitted by Anna Meredith to SWCAP Steering Group, June 2016)*

### **Scottish Wildcat Action**

#### **Proposal for additional control measures on domestic cat ownership in Scotland as a conservation action to protect the Scottish Wildcat.**

##### **1. Introduction and background**

1.1 The Scottish Wildcat Conservation Action Plan (SWCAP), launched in 2014, is an evidence-based national activity plan that aims to deliver a comprehensive programme of actions over five years to reverse the decline of the Scottish Wildcat and secure its future as an iconic Scottish predator species. The Action Plan represents the contributions of leading wildcat experts from over 20 key organisations and focuses on land management, responsible domestic cat ownership, feral cat control, and conservation breeding, underpinned by rigorous scientific and technical oversight and ongoing reactive monitoring of wildcat populations. Effective communication, with stakeholder and public engagement, are recognised as key to the success of the Action Plan, and for its legacy to continue beyond its five year scope.

1.2 The Scottish wildcat faces a unique threat among endangered species in Scotland in that one of the key factors contributing to the species' decline is dilution of its genetic integrity by hybridisation with the domestic cat. This situation is rarely encountered in species conservation, whereby a closely related non-native domesticated species has largely unhindered access to opportunities to interact and interbreed with a wild-living endangered species.

1.3 The threat of ongoing hybridisation is posed by both un-owned feral domestic cats, and from un-neutered owned domestic cats, due to the potential ability of both categories to roam freely in wildcat habitat. Domestic cats have retained the innate ability to hunt live prey (e.g. rodents and birds) and are thus able to utilise and survive on a wild diet, competing with the wildcat for food, and straying into wildcat territory where hybridization can then occur between the two species.

1.4 There are estimated to be at least 100,000 feral cats (defined as being un-owned) in Scotland (Cats Protection). Feral cats vary from truly free-living and independent of man, relying solely on predation for food, to being partially or wholly dependent on man via food sources that are either deliberately or unintentionally supplied.

1.5 Owned domestic cats may also be under varying degrees of human control and either wholly or partly dependant on man for food and shelter. Although some are kept solely as house pets and never have access to the outdoors, cats are unique among domestic pets in the UK in that most are allowed to have unlimited free access to the natural environment (urban or rural) without any direct physical control or confinement, and without the owners being aware of their whereabouts or interactions with other animals. Despite this, the expectation is that an owned cat will return and is dependent on its owner for (most of its) food and other requirements.

1.6 In 2015, 25% of UK households owned a cat and there are an estimated 11.1 million pet cats in the UK (PDSA 2015). Numbers of owned pet cats in Scotland are not known. Current estimates of levels of neutering of pet cats in the UK range from 64.8% in a survey of 4009 cats with known causes of mortality in England (O'Neill 2015), to 92% in a survey of 12,334 cat owners (PDSA 2015). In the same survey, the PDSA (2015) found that 46% of cats were microchipped and 74 % vaccinated; but 9% of owners reported their cat has had one litter, and, of these, 65% report their cat's pregnancy was unplanned. However, levels of neutering and microchipping in Scotland are not known, and feral cat populations remain large, due to continuing reproduction and influx of new animals, e.g. unwanted or abandoned (stray/previously owned) cats, as well as ongoing opportunities for existing feral cats to mate with un-neutered owned cats. This is also due to the high reproductive rate of domestic cats (one female cat, a mate, plus their kittens can produce up to 400,000 kittens<sup>a</sup> in seven years, even accounting for only 25% of the kittens surviving to reproductive age).

1.7 Due to their ability to roam freely, both feral cats and owned cats have the potential to encounter wildcats or already existing hybrids, and if un-neutered, breed. In addition, direct and indirect contact with wildcats is a pathway for disease transmission. Common pathogens of domestic cats have been identified in wildcats, and the scientific assumption is that these have been acquired from the domestic cat (Leutenegger *et al.* 1999; McOrist *et al.* 1991; Millan & Rodriguez, 2009).

1.8 In addition to the threats of hybridisation and disease to wildcats, both feral and owned cats are known to predate significant numbers of wild species. Globally, there is increasing evidence of the ecological impacts of free-ranging cats via direct predation on native prey (Crooks & Soulé 1999; Baker *et al.* 2005; Slater, 2005; van Heezik *et al.* 2010; Loss *et al.* 2013), and they are listed as one of the 100 worst invasive species in the world (Lowe *et al.* 2000). For example, one UK study over a five month period estimated that nine million cats predated 92 million prey items (Woods *et al.* 2003), consisting of 57 million mammals, 27 million birds and five million reptiles and amphibians. Domestic cats therefore pose a potential conservation threat to many wildlife species, not just Scottish wildcats, although the extent of the impact on Scottish wild animal populations is unknown.

1.9 A recent study (Gramza *et al.* 2016) highlights that long-term solutions to the issue of free-ranging domestic cats will necessitate human behaviour change, and indicates that changes in risk perceptions may result in behaviour change. Public awareness of cat-related risk perceptions and attitudes such as to native species conservation and disease risks could be used to develop communication programs aimed at promoting risk-averse behaviours among cat owners and cat-management strategies that are both acceptable to the public and directly advance conservation of native species (Gramza *et al.* 2016).

## **2. Legal considerations**

2.1 In Scotland, feral cats and hybrids are considered as a non-native species under the Wildlife and Natural Environment (Scotland) Act 2011, which significantly amended the provisions under Section 14 of the Wildlife and Countryside Act 1981. These aim to prevent the release and spread of non-

native animals (and plants) into areas where they can cause damage to native habitats and species or economic interests. In Scotland, there is a presumption of 'no-release' for species that are outwith their 'native range'. Under this legislation a 'release' offence for a non-native animal constitutes releasing, allowing to escape from captivity, or causing to be outwith the control of any person, at a place outwith its native range. An animal is considered to be 'released' when it is no longer under human control (SNH Native Range Guidance 2014).

2.2 Circumstances in which animals are not considered to be 'released' include: animals kept in enclosures from which they cannot escape; free-range livestock which can be gathered for husbandry purposes; and pets or working animals that are expected to return to their owners. Therefore, owned cats that roam freely are not normally considered 'released'.

2.3 Release of a feral cat or hybrid may be allowed under a non-native species licence from Scottish Natural Heritage (e.g. after being temporarily captured for neutering purposes (see section 3)).

2.4. Currently there are no requirements for pet cats to be registered or individually identified. In contrast, compulsory microchipping of pet dogs and registration on one of the authorised commercial databases was introduced in the UK in April 2016. There is also no requirement for an owner to be aware of their cat's whereabouts, but to be not considered non-native, it must be expected to return. A time frame for or frequency of this expectation is not defined. In contrast, it is still a legal requirement under the Control of Dogs Order 1992 for a dog to wear a collar with the owner's name and address on it when in a public place. Both the Dogs Act 1871 and the Dangerous Dogs Act 1991, require an owner to have proper control of their dog.

2.5 The Animal Health and Welfare (Scotland) Act 2006 requires that cat owners have a duty of care to ensure that the welfare needs of an animal are met. This applies to all owned cats, (i.e. considered under human control), even if they live wholly or partly in a free-ranging state e.g. farm cats. Under this Act, the Scottish Government Code of Practice for the Welfare of Cats, recommends that owners consider neutering their cat to prevent unwanted kittens, reduce wandering behaviour and for numerous health benefits, including the limiting of spread of infectious disease. It also recommends individual identification of cats by microchipping, or alternatively by the wearing of a collar, but this is considered a less secure method and has the potential for causing injury.

2.6 There are currently no requirements for compulsory neutering of owned pet animals not required for breeding. Although the breeding of dogs, where they produce more than five litters per year, is controlled (The Breeding of Dogs Act 1973 and the Breeding and Sale of Dogs (Welfare) Act 1999) this does not cover neutering and there is no similar legislation for cats. Many other countries have now adopted, or have under consideration, legislation requiring compulsory neutering of both cats and dogs, with an exemption system for licensed breeders e.g. Australia, certain areas of the USA, Belgium. These schemes have arisen out of the recognition that there is an urgent need to control and reduce the high numbers of unwanted cats being abandoned and requiring euthanasia or continuously contributing to the feral cat populations, rather than for conservation of a closely related wild cat species. Such schemes have varying degrees of compliance and success.

### **3. Current and previous control measures to prevent hybridisation of domestic cats with wildcats**

3.1 Voluntary neutering of owned cats will prevent breeding with feral, hybrid or wildcats and cut off a source of unwanted kittens that may be abandoned or released. Neutering also reduces roaming and fighting behaviour that contributes to interactions that promote the spread of feline infectious diseases. Levels of neutering of owned cats in Scotland are not currently known.

3.2 Trap, neuter, release (TNR) or trap, neuter, vaccinate, release (TNVR) programmes are recognised and recommended in international studies and guidelines as a valid option for unowned cat management (ISFM, 2013; WSPA, 2011) and are carried out by some charities and voluntary organisations, e.g. Cats Protection. TNVR is a key action of the SWCAP to reduce the threat of hybridisation and spread of disease, and will be carried out in combination with existing schemes.

3.3 For TNR to be effective in reducing populations, sustained levels of at least 71-94% of the population being neutered are required (Natoli *et al.* 2006). However, the authors of one study (Natoli *et al.* 2006) Authors concluded that, in the absence of a public education campaign to stop people from abandoning cats, i.e. to 'turn off the tap', TNR efforts of feral cats are "a waste of money, time and energy." In addition, these figures of >70% are derived from defined urban populations, whereas required levels and effectiveness for more diffuse rural populations are not known, but are likely to be higher.

3.4 A targeted TNR programme in the Cairngorms National Park (Cairngorms Wildcat Project) between 2005 and 2011 resulted in seven veterinary practices neutering >7500 cats (2005-2011), and Cats Protection neutering 3200 cats, both feral and owned. However, this has been discontinued, and any lasting effect on cat populations in this area is not known.

### **4. Key issues surrounding feral and un-neutered domestic cats**

4.1 Although feral cats that are not reliant on humans for food or shelter, they are clearly non-native, the degree of control and declaration of 'ownership' considered necessary to mean that a free-ranging cat is feral (unowned) or owned is ill-defined and subject to interpretation. For example, a person may state that they 'own' a cat even if they did not originally acquire it, do not feed it, and it lives entirely in a free-ranging state with no human control over its movements; whereas, in other situations a clearly unowned or previously-owned 'stray' cat may be fed by a person, either regularly or occasionally, but they clearly state that they do not own that animal.

4.2 Owners of un-neutered domestic cats that are allowed to range freely have no control over where they go, or their reproductive activity (if un-neutered), either with other domestic cats, or with hybrids or Scottish wildcats.

4.3 Advocates of responsible pet cat ownership, such as the veterinary profession and animal welfare charities, widely promote routine neutering and vaccination against common infectious diseases.

### **5. Proposal**

5.1 Scottish Wildcat Action (SWA) proposes that, due to the unique threat posed by feral and un-neutered domestic cats, effective conservation of the Scottish wildcat requires urgent introduction by the Scottish Government of additional statutory control measures on domestic cat ownership. Current voluntary schemes are clearly not sufficient to reduce and ultimately prevent the recruitment of free-ranging and unowned fertile cats that are able to hybridise with Scottish wildcats and pose the major direct threat to its conservation and survival. In combination with the existing conservation interventions in priority areas described in the SWCAP, we propose these measures are necessary to ensure the continued effectiveness of conservation measures across the whole of Scotland after the five year scope of the current Action Plan.

5.2 It is proposed that these additional measures are:

- **A clear and unambiguous definition of what constitutes ownership and control of a domestic cat, and the responsibilities of such ownership. These will include:**
- **Compulsory neutering of all\* owned cats in Scotland to prevent hybridisation with wildcats or existing hybrids, and to minimise the threat from feline infectious diseases. \*A licensed exemption scheme will allow continued responsible breeding of domestic cats.**
- **Compulsory identification of all cats by microchipping and their registration on an authorised commercial database.**

5.3 The proposed measures are applicable to the whole of Scotland. Restriction to the currently identified wildcat priority areas or other areas where Scottish wildcats may exist would be almost impossible to define and discriminate against cat owners within such areas. The additional significant benefits to domestic cat welfare and health (as defined in the Code of Practice for the welfare of cats), and potentially other wildlife species, mean that these measures are equally applicable to all domestic cat owners

5.4 Neutering and microchipping provides the opportunity for consideration and direction of an appropriate preventive medicine programme (e.g. vaccination, anti-parasitic treatment, etc.) of all cats by a veterinary surgeon. Exact requirements, such as diseases included, age of vaccination, exemptions, and frequency of vaccination should be determined by the veterinary surgeon.

5.5 Consideration will need to be given to subsidised neutering, microchipping and vaccination schemes to promote and encourage compliance. Emphasis on the conservation rationale to save the Scottish wildcat from extinction, in addition to the health and welfare benefits to domestic cats, should be encouraged.

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## **Annex 2**

*(submitted by Roo Campbell to SWCAP Steering Group, August 2017)*

# **POPULATION ANALYSIS ON FORMAL SURVEY DATA**

## **Summary**

Based on the formal surveys conducted in winter 2015-2016 or 2016-2017 (Morvern), population estimates for the five priority areas where wildcats were detected were 31-36 (95% CIs 14-100, mean per PA 6-7). Combined wildcats and hybrids estimated a mean of 20 per PA while we estimated a mean for all cat types of 37 per PA indicating most of the PAs have the potential to support viable wildcat populations. Ranging parameters (sigma values) were high, especially for wildcats, suggesting long-range movement by individuals. Wildcats moving into the priority areas may contribute to the long-term viability of wildcat populations within the priority areas.

## **Methods**

We analysed the data from five of the priority areas (PAs). No wildcats were detected in Strathavon and therefore no analysis has been conducted for this report. Summary statistics on the number and mean spacing of cameras are provided in Table 1.

### **Cat pelage scores**

Cats were scored as wildcat if the pelage was  $\geq 17$ , hybrid if it was 11-16.5 and domestic of  $\leq 10.5$  (i.e. a hybrid must score more than 1.5 per pelage character on average).

In practice, cats are scored often within a range of possible pelage scores due to the quality of images and differences between scorers. Previously we have used the upper estimate of this score to define a wildcat following a cautionary approach to applying TNVR (if in doubt, we do not neuter). *Here, we use the median score if a range of pelage scores are given.* This means that our starting values in the model are lower than those provided before (see MNA in Table 2).

For the Angus Glens, a large proportion of the cats were near the threshold between wildcat and hybrid. We therefore used two separate scores for defining wildcats and hybrids: the highest score the cat could achieve ('high pelage') and the lowest ('low pelage'). Using high pelage leads to more wildcats and low pelage to more hybrids.

## Statistical analysis

Analysis was conducted in the R package *secr*. Cats from the three different groups were analysed together within each priority area and also separately. We ran homogenous models following the methods set out in Kilshaw 2015<sup>1</sup>. A buffer is used around cameras to allow the home range of cats detected on the cameras to centre outside the surveyed area. The buffer around the cameras was set to 12,000m following preliminary analyses that found a minimum buffer of 11,304m for wildcats in Strathbogie (the maximum recommended buffer for any cat-type in any area) and we only modelled the data within suitable habitat. We tested eight models on each group of cats<sup>2</sup> and assessed support for the best model based on AICc value (Akaike Information Criteria, corrected for small sample size). If a model provided obviously erroneous results (very high population estimates or failure to compute confidence intervals) then this model was removed from the candidate list. Population estimate were calculated within *secr* and are based on the area of suitable habitat within the priority area, at a cell resolution of 250m. Data were based on 98 detected cats, of which 18-24 were classed as wildcat, 33-39 as hybrid and 41 as domestic. The number of detected cats is provided in Table 2 as MNA (Minimum Number Alive).

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<sup>1</sup> Kilshaw K, 2015. Introgression and the current status of the Scottish wildcat (*Felis silvestris silvestris*). DPhil Thesis. University of Oxford. 232 pages.

<sup>2</sup> BASE g0~1 sigma~1; SEFT g0~k sigma~1; SRSP g0~K sigma~1; STRP g0~bk sigma~1; STTR g0~Bk sigma~1; TIME g0~T sigma~1; TRN g0~B sigma~1; TRP g0~b sigma~1



Table 1: Number of cameras and area covered. Mask area represents all suitable accessible habitat within 12,000m of the cameras and can be larger than the priority area (exc. water).

Area	Angus	Morvern	Northern Strathspey	Strathbogie	Strathpeffer
Cameras	63	142	69	79	82
Mean camera spacing (m)	900	885	899	1113	858
Mask area (km <sup>2</sup> )	1,070	642	838	1,372	989
PA size (km <sup>2</sup> )	372	483	205	347	325

Table 2: Modelled results and density estimates. Number of individuals detected are provided under MNA. The population estimate is calculated on the priority area.

Area	Cat type	Best model	Min suggested mask buffer (m)	Probability of detection (g0)	sigma	95% HR (km <sup>2</sup> )	Cats (MNA)	Density km <sup>-2</sup>	LCL	UCL	Population (E.N.)	LCL	UCL
Angus	All	STRP	5,041	0.013	1,435	32.6	23	0.104	0.065	0.167	35	21	56
	Wild (high pelage)	TRN	3,333	0.075	907	13.0	<b>8</b>	<b>0.037</b>	<b>0.018</b>	<b>0.074</b>	<b>13</b>	<b>6</b>	<b>25</b>
	Wild (low pelage)	TRN+ <sup>1,2</sup>	335	0.098	85	0.1	<b>2</b>	-	-	-	-	-	-
	Hybrid (high pelage)	STRP	6,832	0.007	1,943	59.7	6	0.024	0.009	0.066	8	3	22
	Hybrid (low pelage)	STRP	4,625	0.021	1,302	26.8	12	0.052	0.028	0.095	18	10	32
	Domestic	STRP	9,981	0.002	2,854	128.9	9	0.041	0.012	0.141	35	22	57
Morvern	All	STRP	7,983	0.008	2,260	80.8	13	0.030	0.018	0.052	12	7	21
	Wild	SEFT <sup>1</sup>	9,674	0.007	2,723	117.4	<b>3</b>	<b>0.007</b>	<b>0.002</b>	<b>0.019</b>	<b>3</b>	<b>1</b>	<b>8</b>

Northern Strathspey	Hybrid	STRP <sup>1</sup>	7,156	0.009	2,033	65.4	4	0.010	0.004	0.025	4	2	10
	Domestic	STTR	4,858	0.013	1,395	30.8	6	0.017	0.008	0.037	7	3	15
	All	STRP	2,631	0.007	793	10.0	13	0.595	0.118	3.009	35	15	78
	Wild	SEFT <sup>1</sup>	2,363	0.029	682	7.4	2	0.016	0.005	0.060	3	1	11
	Hybrid	BASE	1,310	0.044	386	2.4	7	0.097	0.041	0.229	18	8	42
	Domestic	BASE <sup>1</sup>	449	0.055	117	0.2	4	0.428	0.135	1.354	79	25	251
Strath-bogie	All	STRP	7,240	0.003	2,100	69.8	27	0.092	0.058	0.147	31	19	49
	Wild	STRP	11,331	0.002	3,225	164.6	<b>5</b>	<b>0.012</b>	<b>0.005</b>	<b>0.031</b>	<b>4</b>	<b>2</b>	<b>10</b>
	Hybrid	STRP	5,396	0.005	1,586	39.8	10	0.042	0.020	0.087	14	7	29
	Domestic	SEFT	2,537	0.020	749	8.9	12	0.062	0.027	0.143	21	9	48
Strath-peffer	All	STRP	4,661	0.002	1,388	30.5	22	0.264 <sup>†</sup>	0.128	0.545	73	36	151
	Wild	STRP	6,228	0.002	1,828	52.9	<b>6</b>	<b>0.049</b>	<b>0.015</b>	<b>0.155</b>	<b>13</b>	<b>8</b>	<b>46</b>
	Hybrid	STRP	3,609	0.003	1,082	18.5	6	0.075 <sup>†</sup>	0.023	0.246	21	6	68
	Domestic	STRP	3,736	0.002	1,126	20.1	10	0.172 <sup>†</sup>	0.051	0.583	48	19	170

<sup>1</sup>Based on AIC. <sup>2</sup>TRN, SRSP and STTR models yielded identical results and equal support. <sup>†</sup>Needs minor update to improve habitat mask area.

## Results and Discussion

STRP was the most frequently supported model (Table 2), including wildcat models for two sites. This is an animal × site response model (the individual cats are responding positively or negatively to the camera at specific locations once they have discovered the bait). The SEFT model (Site Effectiveness model) was most supported on three occasions, including wildcat models for two sites. This is the site learned response model (site effectiveness changes once any individual is detected). The BASE model (probability of detection not based on any other parameter) was most supported two occasions (none were wildcat models) and the TRN model (transient response model; detection depends on prior detections) on one occasion (this being a wildcat model). The model for wildcats in the Angus Glens using conservative (low) pelage scores predicted very high numbers and cannot be considered reliable. All candidate models on this data provided similar predictions. Based on the difference in the number of wildcats (2 versus 8) from the conservative versus optimistic pelage scores, a more likely population estimate would be 3 individuals (95% CI range 2 – 6).

For three of the priority areas, probability of detection ( $g_0$ ) was lower (Table 2) than the 0.01-0.02 used in Newey's<sup>3</sup> simulations prior to this survey. The exception was the Angus Glens and Northern Strathspey where  $g_0$  was higher. As a result, mean  $g_0$  for wildcats across all areas was 0.02. Values of sigma (and consequently modelled 95% home range sizes) were larger than the 300-700 range used in Newey's simulations. For wildcats, mean sigma values were 1,873 and 95% HR estimates from these were 71km<sup>2</sup>. These are similar to those reported by Kilshaw<sup>1</sup> of 2,260 and 97km<sup>2</sup>. In practice, the higher sigma values suggest wider spacing of cameras is possible without reducing our ability to assess population density (our 0.85 – 1.1km spacing was closer than the intended 1.25km) while the lower  $g_0$  values suggest detecting population density changes will be difficult. However, changes in recruitment of wildcats and not population density will be our primary measure of success over the project. Overall, wildcats exist in the priority areas at a density of 2.42 (95% CIs 0.90 – 6.78) per 100km<sup>2</sup>. This is lower than density estimates obtained from radio-telemetry (except for Ro Scott's Ardnamurchan study) but similar to the 3-4 per 100km<sup>2</sup> reported from Kilshaw's<sup>1</sup> trail camera study. It is likely the two methods do not yield comparable density estimates.

With these caveats in mind and recalling that we used two different estimates of pelage score in Angus Glens, total population estimates of wildcat in the area analysed here is around 31-36 (lower 95% CI 14-18; upper 81-100, mean per PA 6-7). Total combined wildcats and hybrids number 101 (44 – 271, mean per PA of 20 individuals) and total of all cats is 186 (98 – 355, mean per PA of 37). While the estimated number of wildcats in each area is low, the total numbers of cats estimated is close to the target set out in the scoping survey<sup>3</sup> of 40 individuals per priority area, indicating as intended that these areas could generally support viable populations of wildcats, even if fewer are to be found currently in these areas. Only Morvern appears to support notably fewer cats than this.

After this surveyed period, we detected an additional 4 wildcats in Strathbogie. These may be newly recruited into the population or may have evaded prior detection. In either situation, the numbers here represent a conservative estimate since either we failed to detect them and overestimated  $g_0$ , and/or the population is open to immigration. The high sigma values indicate large scale movements, most notably for wildcats (except for the Angus Glens, each displaying the highest sigma values of all cat types). Movement into and out of at least some of the priority areas are therefore to be expected, with implications for the population viability: Population movements may hamper efforts to manage feral cats and hybrids (though movements are generally least for feral and

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<sup>3</sup> Newey, S., Potts, J. & Irvine, R.J. 2015. Simulation study to inform the design of wildcat camera trap monitoring protocols. *Scottish Natural Heritage Commissioned Report No. 899*.

hybrid cats suggesting that a smaller proportion of these will move in and out of the priority areas). On the other hand, movement of wildcats into the priority areas will increase the resilience of the wildcat 'population' within the priority areas where numbers are low.

## **Glossary of Terms and Table of previous Density Estimates**

Everything here is reproduced from Newey et al. (2015) and Kilshaw (2015).

“Key parameters for detecting population change relate to the precision of density estimates. Camera traps and image data are used to detect and identify individual wildcats and SECR analyses uses this information to estimate population density (and the variance in these estimates) based on the number of captures (individuals), recaptures (same individual at same location) and the number of spatial recaptures (same individual at different locations).” (Newey et al. 2015).

### **Glossary of terms**

**'R'** is an open source statistical computing platform.

**SECR** is a package in 'R' designed for Spatially Explicit Capture Recapture analysis.

**Capture:** a detection event on a camera-trap.

**Detection event:** the appearance of an individual (identifiable) cat within a 24 hour period.

**(g0):** the detection (or capture) probability. This is the probability of an individual being caught if a camera were at zero metres from than individuals home-range centre. The known range of values is between 0.01 and 0.02 (Newey et al. 2015).

**Sigma ( $\sigma$ ):** a biological parameter relating to animal movement and home range size. With a Halfnormal detection function sigma represents animal movement so that approximately 2.45 x sigma = 99% home range size. In their simulation study to inform the survey design for this project, Newey et al. (2015) used the published home-range sizes of 1.7 – 9.9.km<sup>2</sup>, which equate to approximate sigma values of 300m and 700m respectively. Since this study, data from radio-tracking studies have suggested that average wildcat home-ranges may be larger than these estimates (and subsequently, sigma values should be higher than this). Kilshaw (2015) reports mean sigma values (for Wildcats only) of 2268.4m, equating to a home range estimate of 96.8km<sup>2</sup>.

From Newey et al. (2015) “Two key biological parameters, g0 and sigma, were estimated from a small number of previous studies and the literature. Both of these are likely to be habitat and site dependent, will vary seasonally, annually and by individual and will likely impact on the efficacy of camera trap studies”.

Table 1: Summary of Scottish wildcat density and detection probability estimates from previous studies (reproduced with additions from Newey et al. 2015 and Kilshaw 2015).

Study	Density			Capture probability (g0)	Notes
	/ha	/1km <sup>2</sup>	/100km <sup>2</sup>		
Corbett (1979)	0.003	0.3	30		Radio-tracking East Scotland
Scott et al. 1993			1		Radio-tracking West Scotland
Kilshaw et al. (2014)	0.01	0.99		0.026	Includes hybrids
Kilshaw et al. (2015)			68		Includes hybrids, CNP
Littlewood et al. (2014)					
<i>Morvern</i>	<0.001	0.029	2	0.01	
<i>Angus</i>	0.001	0.149	15	0.02	

Kilshaw (2015) <i>Gartley (Strathbogie)</i> <i>Glen Isla (Angus)</i>			4 3	0.29 ( $\pm 0.41$ )	Wildcats only for two sites
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