Wild animal translocations: animal welfare risk assessment guidance

Scottish Animal Welfare Commission

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Introduction

In recent years in many countries, activities have been initiated that are designed to restore ecosystems at a range of scales, both to address the increasing rate of biodiversity loss and to conserve particular threatened species, i.e., species restoration or recovery. With increasing understanding and acknowledgment of animal sentience comes an ethical imperative to ensure that these activities are carried out with as little welfare cost to the sentient individual as possible. While the list of sentient species is ever growing, for practical purposes, the scope of this document only covers vertebrate animals. As we learn more about the welfare needs of different vertebrate taxa, specific implications may emerge. Without proper consideration at all stages of the translocation process there is a risk that animal welfare will be compromised. This guidance provides a framework that practitioners may wish to adopt in order to include animal welfare as part of the overall translocation evaluation.

This document discusses "wild animal translocations", meaning operations where individual wild animals are either captured in the wild or bred in captivity prior to movement to a new location for one of a limited number of purposes.

Purposes of wild animal translocation

Conservation translocation is the intentional movement and release of a wild animal from one geographical location to another, where the primary purpose is a conservation benefit. This usually involves improving the conservation status of the focal species and/or restoring natural habitat or ecosystem functions or processes (adapted from Gaywood and Stanley-Price, 2022). The driver for many conservation translocations is the current climate/nature crisis where, in countries such as Scotland, biodiversity is declining at an alarming rate and where conservation translocations, when planned and executed well, prove to be highly effective interventions.

Definitions and guidance on how to conduct conservation translocations can be found in sources such as *Conservation Translocations*: *Looking to the Future* (ed. Gaywood et al., 2022); *Scottish Code for Conservation Translocations* and *Best practice guidelines* for *Conservation Translocations in Scotland* (referred to as SCCT/Best practice guidelines in this document) (National Species Reintroduction Forum, 2014); *IUCN/Species Survival Commission Guidelines for Reintroductions and Other Conservation Translocations* (IUCN/SSC, 2013); *Reintroductions and other conservation translocations: code and guidance for England* (DEFRA, 2021).

Situations where there is benefit to translocated individuals only are not considered as conservation translocations (IUCN/SSC, 2013) but this is under active consideration. Difficulties and possible solutions associated with conservation translocations were reviewed by Berger-Tal et al. (2020).

Conservation translocations can fall into two categories: **population restoration** and **conservation introduction**.

One purpose considered under population restoration is **reintroduction** – a conservation translocation for the specific purpose of restoring a threatened species to part of its indigenous range, to help restore the population (adapted from

Gaywood and Stanley-Price, 2022). There have been high profile wild animal reintroductions in Scotland, involving translocation of species such as the white-tailed eagle, golden eagle and Eurasian beaver.

A second, but possibly more common, population restoration purpose is **reinforcement** – whereby animals are introduced into an existing population to augment numbers.

Assisted colonisation (sometimes referred to as assisted migration) is a conservation introduction technique involving the removal of animals (or plants) from areas that have become (or are likely to become) unsuitable due to climate change impacts (or occasionally when there are population threats due to predators), and their translocation to new sites where conditions are more suitable (often those sites, given time, they might migrate to anyway). Some consider this to be a controversial practice akin to the introduction of new species. (For a recent review see Twardek et al. (2023))

The final conservation introduction is **ecological replacement**, whereby an animal is moved outside of its indigenous range to mimic the ecological function of a functionally similar species that has been lost, for example through extinction.

Rewilding programmes, while focussed on habitat restoration and management, often involve translocation of species such as free-ranging large herbivores; as reported by Newton (2023), of 72 projects that were part of Britain's Rewilding Network, 87% were using livestock as part of the management protocol.[1] These are usually livestock species acting as ecological replacements for predecessor species, such as bred-back aurochsen, domestic or wild horses and wild pigs, but reintroduction (see above) of wild species is also involved. A wider consideration of many of the ethical issues surrounding rewilding and reintroduction of wild animals is given by Thulin and Röcklinsberg (2020).

Management translocation is not for conservation but is an operation involving the removal of "problem" animals from a location where their presence is considered undesirable. This type of translocation is also considered. Some management translocations can become conservation translocations if the animal removed from a conflict situation is released at a new site where ecosystem restoration is proposed.

Welfare translocations can occur where an individual animal is brought into temporary captivity for rehabilitation purposes, then released either at the capture site or sometimes elsewhere. Indeed, this may be one of the most common of the translocation activities.

In welfare terms, the purpose of the translocation is less relevant than the impact of the process on the individual. The individual animal, whose physical and mental welfare is likely to be impacted by the process, should remain at the centre of the discussion.

[1] For a more comprehensive and up-to-date look at (re)wilding for conservation, see the continuing series of articles that commenced in British Wildlife in February 2021 (BW 32(4)).

1. Background

Codes of practice and other advice about wild animal translocations (see above) refer to adhering to high standards of animal welfare, good practice or having regard for animal welfare. However, few have clearly indicated how this should be evidenced or done, who should do this, or what should happen if welfare is currently or likely to be compromised (see Harington et al., 2013). Some wild animal translocations are reactive (particularly in the case of management translocations) and undertaken to protect individuals from present or impending threats to survival (sometimes referred to as mitigation translocations – such as when a building development threatens a particular species), while other movements of wild animals (as set out above) are for more general ecological or other reasons. In all cases, the welfare of the individual animal is potentially at risk due to its relocation. Additionally, there may be welfare risks to donor communities and to other animals and habitats at the relocation site. There is clearly an appetite for advice in this area to inform practitioners, both in addressing some of the underlying ethical issues involved and in developing practical, repeatable methods of animal welfare evaluation (Harrington et al., 2022; Gaywood et al., 2023).

2. Incorporating wild animal welfare risk assessment into the translocation process

This paper sets out a framework for an animal welfare risk assessment to accompany other existing guidance, with the aim to ensure that adequate attention is focussed on the potential animal welfare harms and benefits to individuals. It is already recognised that good animal welfare standards are likely to enhance the long-term success of conservation translocations, but there is a lack of guidance on how to identify and achieve these standards. It has been suggested that the purpose of the translocation should also impact on the weighting of the overall ethical assessment (Thulin and Röcklinsberg, 2020).

3. Levels of human responsibility

Depending on the stage and reach of any wild animal translocation programme, the level of human responsibility for animal welfare may be different, matched to different levels of intervention or control across time. For example, during the initial translocation phases (such as capture and captivity), humans directly involved in the project should assume full responsibility for the welfare of the individual animals involved. As the programme matures and the animals can live independently in their new habitat, this level decreases until a stable population / ecosystem state is reached where the level of human responsibility becomes minimal and the need for intervention also diminishes. This stage-by-stage approach should also be applied to host populations as much as to the translocated individuals. Thus, for example, the impacts of carnivores on the welfare of prey species should be reviewed throughout the different phases of the project. A suggested schema for this is given in Annex 1, with levels of responsibility decreasing from 3 to 0. Note that in many translocations the level of responsibility will never reach level 0, thus requiring continuing human intervention and responsibility albeit at a low level.

4. Who should oversee the risk assessment process?

Some of the existing frameworks for wild animal translocations require the completion of a licence application and meeting certain conditions (sometimes set out in a code), which are evaluated by the competent authority. However, animal welfare conditions are generally less detailed and may not be reviewed by experts in this field, possibly indicating a historic disjunction between conservation and animal welfare. It is commonplace now to submit disease risk assessments (DRA) for the reintroduction of a species to a new area/habitat as laid out, for example, in OIE/IUCN 2014 disease control guidelines (OIE/IUCN, 2014), and this is a good analogy for the proposed animal welfare risk assessment. DRAs and any welfare assessments may currently be undertaken in parallel, given the link between minimising stress partly to reduce disease impacts, but a contemporary welfare assessment encompasses far more than this alone. It is recognised that the assessment of the welfare of wildlife species is in its infancy, so the proposed risk assessment framework is likely to evolve as evidence linking observable indices with an individual's welfare state becomes available. It is also clear that there will be large differences between species in this regard and that individual species' evidence-based assessments may not often be available or cost-effective to create. In addition, even within a species, depending on the source population (wild-caught versus captive-bred for example), significant variations in an individual's response to its translocation management and release will occur based on its previous life experiences and personality traits. Therefore, in many cases, expert elicitation or careful assessment of individuals prior to release may be needed to produce the most accurate picture.

It is proposed that a specific animal welfare risk assessment should accompany any licence request and be reviewed by the competent authority or another independent body, as long as that authority or body includes animal welfare expertise. In Scotland, NatureScot, given sufficient resources, would be the appropriate body to oversee the process when assessing all aspects of conservation translocations, and need to make its decision against the backdrop of the over-arching climate and biodiversity crisis.

5. How should this be done?

The wild animal welfare risk assessment proposed here is based on a set of nine questions that should be answered by the practitioners undertaking the wild animal translocation. Some of these are already covered by existing licensing requirements. For example, in Question 1, much of this information will have been provided when considering the overall ecological feasibility of the proposal. Nonetheless, the issues impact on animal welfare too. Some existing guidance refers to "good" or "best" practice in this area, but since many wild animal translocations are novel, this is not always available. Wild animal welfare assessments should be made prior to any project commencing and repeated in the light of project progress, if conditions change, or to assess the current level of human responsibility. The process could be linked with a structured decision-making framework, as advocated by Harrington et al. (2022). It should be pointed out that in any restoration or rewilding process involving animals, a number of overarching ethical issues need to first be considered, such as the ten steps for "reintroduction

ethics" proposed by Thulin and Röcklinsberg (2020). Here we focus specifically on animal welfare.

6. The nine welfare risk assessment questions

While these questions tend to concentrate on the avoidance of harms, contemporary animal welfare evaluation also encompasses aspects of positive welfare, which also deserve attention. Indeed, from an ethical standpoint, the desired outcome of any wild animal translocation is that the welfare of individual wild animals involved shows a net benefit and any significant disbenefit is mitigated. If not, the assessment should clearly indicate who or what is the beneficiary of the wild animal translocation, with appropriate ethical justification. Positive individual animal-level effects are more likely where species conservation is undertaken to remove animals from degraded habitats or from where there is continuing habitat loss, when remaining *in situ* would compromise the survival or welfare of individuals.

i. Has the habitat been assessed (and adapted if necessary) prior to translocating animals?

It is assumed that practitioners undertaking wild animal translocations will assess suitability of the new habitat, food, shelter, food and range competition, predators, health risk, but welfare should be a factor here along with likely survival rates. Will animals need any pre-release enclosures, remote monitoring and feeding (a form of so-called 'soft release') at the site? The SCCT/Best practice guidelines and the IUCN guidelines advise on many aspects to ensure that the release site should basically meet all the needs of the species and its life stages, as well as being sufficiently far enough away from sub-optimal habitats to avoid the released population becoming entrapped in those areas as they disperse or grow. A recent report notes that animal personality and behavioural plasticity of animals selected for reintroduction may influence success (Wilson et al., 2022) and so should be taken into account. The wild animal welfare risk assessment should aim to quantify all relevant factors and decide what level of risk due to these environmental factors is acceptable, when set against the overall benefit of the project.

ii. What will be done to protect the welfare of resident species?

There will need to be a welfare-based assessment of any impacts on resident species, including residents of the same species and other species.

Welfare impacts on resident conspecifics could include competition for space, shelter, food and other resources. Conspecifics could also be exposed to novel diseases or introduced animals could exacerbate/trigger higher prevalence and spread of existing diseases. Translocated animals could disrupt existing social groups and territories/home ranges or cause injuries to, and death or infanticide of juveniles. Will the translocation of new individuals lead to the overall animal population exceeding the ecological carrying capacity of the site/habitat? If so, how will the population be controlled/stabilised? Can the population disperse to new areas?

Welfare impacts on other resident species may be similar to those on resident conspecifics, if these species are closely related ecologically and/or phylogenetically. Welfare impacts on other resident species could include over-

predation, disruption of land use or modification of habitats, thereby denying access to food and other resources, and leading to hunger, social stresses and poor health. Other resident species could also experience injuries caused by predation attempts and/or interspecific aggression/fighting, causing fear and pain, and exposure to disease.

Addressing this question will need case-specific information to allow proposers to consider whether any likely unacceptable welfare harm to resident animals may occur and, if so, whether this can be mitigated by reasonable means. For example, predation is a normal behavioural and ecological interaction in an ecosystem, but where this causes unforeseen harmful welfare, e.g., resulting in injuries by being driven into fences or other structures during pursuit, then mitigation would be required. If not (or if only partially), then the overall merits of the planned translocation will need to take account of this inter-species ethical dilemma: conservation is an inherently ethical field (Ferraro et al., 2021).

iii. What will be done to protect the welfare of animals at the point of capture, during transport, during any holding phase until release?

All transported vertebrate animals, whether wild or domestic, are subject to pre-existing welfare legislation (in Scotland currently the Welfare of Animals (Transport) (Scotland) Regulations 2006) and all wild vertebrate animals held in captivity are subject to the Animal Health and Welfare (Scotland) Act 2006. As such, considerable legal protection already exists for wild translocated vertebrate animals during the process of being held and transported. However, this protection is not tailored precisely to the needs of wild animals and the 2006 Act provides potential dispensations for certain conduct and circumstances that may occur during translocations. These include conduct that is licensed or otherwise authorised, undertaken for the purpose of benefiting the animal or considered, in the circumstances, to be that of a reasonably competent and humane person. If these exemptions are seen to apply, suffering that occurs may not be considered “unnecessary” and thus not an offence. The 2006 Act also requires responsible persons to take reasonable steps to ensure that the needs of animals are met to the extent required by good practice. However, here too the Act potentially exempts failure to meet an animal’s needs when the activity or the keeping is for a lawful purpose. Thus, while it may be particularly difficult to provide for the needs of wild animals being quarantined or transported, the general animal welfare legislation may not always address failures in that regard.

It should be noted that the needs of non-domesticated animals, whether they have been born in captivity and maintained in a manner to ensure they are not habituated to the presence of people, or born in the wild, are often not well known and so there will be much uncertainty about meeting their requirements compared to those of domestic animals. This is true even if the period of captivity/transport is brief, although often keeping this time as short as possible can significantly minimise any adverse welfare effects. Current guidelines emphasise the importance of post-release success by minimising stress during capture, handling, transport and pre-release management (National Species Reintroduction Forum, 2014; IUCN/SSC, 2013).

Therefore, it is important that persons responsible for animals being translocated take care to undertake relevant welfare assessments, as described in paragraphs 5 and 6 below, rather than relying solely on compliance with the law.

iv. What will be done if welfare is compromised post release?

Releasing into the wild an animal that is not fit to fend for itself would almost certainly constitute a breach of the Animal Health and Welfare (Scotland) Act 2006, which specifically prohibits the abandonment of an animal in circumstances likely to cause it suffering. Therefore, extreme caution should be taken to ensure any animal that is intended for release has been assessed by suitably competent persons as to its fitness to be released (this may include training to hunt or forage effectively in the new environment) and its likely ability to cope with the environment selected for its release. Knowingly releasing an animal into an environment that has an inadequate food source or significant hazards may also be in breach of the Act. SCCT/Best practice guidelines and IUCN guidelines reinforce these ideas with advice that only a suitable area of release should be selected and the life stage of the species, time of year, etc., should be carefully considered and justified to ensure released animals have the best chances of survival and good welfare. The importance of the species' social structure and individuals' interdependence must be considered; in many cases social groups, rather than individuals will need to be translocated. Guidance tends to favour "soft" release in animals planned for translocations, whereby the animal(s) are first (briefly) habituated to their new environment with the provision of food and shelter, to provide the best chance of monitoring welfare and ensuring subsequent successful release. In the case of animals rehabilitated after short-term captivity, success is better if the captive period is as short as possible. The translocations code and guidance for England (DEFRA, 2021) does refer to behavioural monitoring to give early warning of animal welfare problems after release. Plans need to include welfare-friendly exit strategies that may include attempts to re-capture individual animals showing signs of poor welfare, in order that they can be clinically assessed to determine, where possible, the reason for their failure to cope. Protocols should be in place to relieve the suffering of any captured individual unable to return to the wild. Experience from translocations of certain iconic species suggests that steps may need to be taken to, as far as possible, protect animals from human persecution. The degree of monitoring will be dictated by individual circumstances but is likely to be most intensive in the immediate post-release phase.

v. How will welfare be assessed / monitored?

One of the main purposes of this risk assessment is to provide guidance on welfare evaluation and monitoring. There are no widely accepted methods available specifically for this purpose. Some examples exist (e.g., Harvey et al., 2020; 2023). These require the collection of information about a range of measurable indicators, such as physical state and behaviour. These can be used to infer the mental state of the animal(s) concerned through, for example, using the Five Domains Model (e.g., Mellor & Beausoleil, 2015), whereby assessment in four physical/functional domains is used to infer the affective experiences of the animal(s) (i.e., mental state) and come to a representation of their overall welfare status (see the Five Domains Model below). The anticipated welfare impact of the proposed translocation needs to be assessed as part of the licensing process before any animal movements occur and be repeated at suitable intervals to both

confirm the predicted welfare status and monitor change over time. It is helpful to identify at the start of the process of a translocation programme what success actually looks like and where the demarcation lines should be drawn that would trigger a halt to the process and a re-evaluation of the methodology.

vi. Who will do this in practice?

The above process requires considerable effort to both collect relevant information prior to the translocation process and at appropriate intervals after release. This may also need to include information about other species at the release site, if they may be impacted. The initial data collection and evaluations may be undertaken by the project team, who may already have an ethical review panel; determining animal welfare status would ideally involve an external person/body trained in welfare assessments and be peer reviewed. In the Scottish context, NatureScot would be the appropriate government body to advise on this and encourage the practitioner to incorporate this consideration into project design. NatureScot would ultimately look at the licence application to see whether welfare had been adequately addressed and keep this under review through progress reports to oversee this.

vii. What is the scope for welfare considerations to impact on the delivery or termination of the programme?

Licensing authorities will need to consider more explicitly the need for a specific animal welfare assessment to be part of an application process and have agreed procedures in advance for deciding, for example, that a licence may not be granted on animal welfare grounds. Welfare considerations also need to include an exit strategy, if the welfare state of the released animals (or other indirect impacts) declines beyond an agreed point (and accepting there can be much individual variation when coming to this conclusion). It is recognised that in some cases, practical removal of released animals may be impossible (animals may be trap shy) or itself cause excessive harm, especially if they are species with more cryptic behaviour. If an animal is captured but cannot be returned to either its original or its new location, euthanasia may be preferable in welfare terms to long-term captivity, and the ethical implications of these decisions should be considered in advance.

viii. What is the best way to share the assessment to allow greater transparency and encourage those involved with other wild animal translocation programmes?

By sharing information about how animal welfare has been evaluated as an explicit part of determining the acceptability or otherwise of a wild animal translocation, a best-practice approach across a range of translocation activities can be fostered. Ideally this process should be peer reviewed to ensure a robust, evidence-based approach. Historically, and for understandable reasons, practitioners may have been wary about publishing important information on welfare issues when there have been concerns. SAWC will work to develop a way that useful but sensitive information can be shared to inform future activities.

ix. Can the welfare risk assessment be used as part of any public engagement activity?

Being positive and proactive about the welfare assessment will enhance the public attitude towards the proposed wild animal translocation and address

societal ethical expectations. Landowners are also key to any translocation process and ensuring they have evidence-based information regarding the welfare of the animals involved can only help guide continuing and future projects.

7. The Five Domains Model

Information about biological function and behaviour of the species concerned is collected to inform the four physical / functional domains. Ideally there will be scientific evidence linking information in these domains to inferred mental experiences in the fifth domain (Mellor et al., 2020). In relation to many translocations, this information may only be partly available or more likely completely unavailable. In this case, evidence from related wildlife species or, less robustly, other similar animals more generally, may be substituted until this evidence gap is rectified. In the absence of any relevant evidence, the advice of species experts could be sought, recognising that this is only a partial solution. As we move away from species-specific data, the decline in the level of confidence in any outcome must be recorded. It is acknowledged that the Five Domains model is a conceptual way to explore possible welfare compromises and enhancements of particular situations rather than being itself an assessment tool (Hampton et al., 2023). However, it does provide a recognised structural framework for bringing evidence together.

In the early 2000s, a panel of officials, scientists and animal welfare experts carried out a project for the Australian Government to devise a model for assessing the relative humaneness of pest animal control methods. The resultant paper (Sharp and Saunders, 2011) remains a model for applying the Five Domains to the welfare of wild animals subject to human control and has been replicated in some settings (e.g., Dolman et al., 2020). However, it would not be realistic to propose that every wild animal translocation be made subject to such a lengthy, detailed and resource-intensive process. Instead, a simplified worked example is provided in the next section as an initial guide.

The information used to populate the domains should include all phases of the translocation process and distinguish between short-term and long-term risks. If relevant, the assessment may need to include evidence of the welfare compromises to an animal in its existing location (which, for example, the translocation may be designed to address).

There would need to be separate welfare assessments for species potentially impacted at the host site (e.g., in the case of proposals to introduce predators).

In the following, some generic potential compromises are shown. Many of the enhancements are particularly relevant if a conservation translocation is involved. (Some adapted from Harvey et al., 2023) In each Domain, species-specific examples would need to be generated. Using this approach to document issues relevant to each domain introduces the necessary degree of transparency which will maximise stakeholder buy-in.

Physical / Functional Domains

Domain 1 - Nutrition / hydration

Examples of Compromises	Examples of Enhancements
Restricted food or water intake Low food quality	Improved food quality / access to sufficient food/water of a suitable quality (e.g., relative abundance of typical species-specific prey or forage)

Domain 2 - Physical environment

Examples of Compromises	Examples of Enhancements
Inappropriate / restricted habitat in new location (e.g., lack of shelter and safety)	Avoidance of habitat loss / disruption in previous location Presence of desirable environmental features (e.g., opportunities to explore) Physical environment that allows the species to maintain normal thermal responses through use of species-typical behavioural and physiological strategies

Domain 3 – Health

Examples of Compromises	Examples of Enhancements
Acute or chronic injury Exposure to novel diseases and parasites Exposure to predators including human hunters Weakness due to loss of appropriate nutrition/lack of prey	Move away from predators Possibility to have good physical fitness Absence/reduction of disease, parasites or injury

Domain 4 - Behavioural interactions

Examples of Compromises	Examples of Enhancements
Social isolation / loss of social/family networks Disruption of complex hierarchies Loss of positive interactions with conspecifics New predators Anthropogenic disturbance Competing for resources in a novel environment	Ability to explore a new environment and participate in new social bonding Possible removal from previous predators/social threats Physical and social environment allows the animal to engage in species-typical exploratory/navigation/foraging/hunting/ reproductive and other social interactions Animals protected from damaging interactions with people (or species in the environment which would not be native to the normal habitat for the species) Reduced competition with conspecifics and other species

Affective Experience Domain

Domain 5 - Mental state

Examples of Compromises	Examples of Enhancements
Presence of negative emotional states: thirst, hunger, pain, anxiety, fear Weakness Exhaustion Thermal discomfort Social isolation Frustration from inability to perform social behaviours including finding a suitable mate Loneliness from loss of conspecifics Lack of security/control	Opportunities to experience mostly positive emotional states Rewarding engagement from environmental exploration and foraging Gastrointestinal comfort/satiety Vitality of fitness New affiliative opportunities Social interactions Sense of control/security

8. Example: applying the Five Domains Model to a translocated beaver in Scotland

This example refers to direct impacts on an individual being translocated for either conservation or management purposes. Beavers have been translocated in Scotland both as part of a planned reintroduction programme and on a reactive basis to remove them from areas where their activity was considered damaging to agricultural land or riparian structure.

In practice, site-specific and other information would also be incorporated. Indirect welfare issues could also be assessed, such as: risks to the individual(s) in not translocating them; indirect welfare impacts on the donor community (e.g., removing socially important individuals); impacts on animals at the receiving site, such as impacts resulting from habitat modification.

It may also be valuable to consider animals of subsequent generations: translocated parental animals may have previously experienced territorial aggression (possibly injury and potential death) yet if translocated to a new "vacant" catchment this risk may not be so great for them and their offspring until population densities increase.

Physical / Functional Domains

Domain 1 - Nutrition / hydration

Examples of Compromises	Examples of Enhancements
Novelty/availability/reliability of food at new site	Improved food quality / access to sufficient food of a suitable quality

Domain 2 - Physical environment

Examples of Compromises	Examples of Enhancements
Inappropriate / restricted habitat in new location (e.g., site may have no existing protective structures) Lack of options for future dispersal Short-term impacts of cage trapping, holding, transport, release into pens	Presence of desirable environmental features (e.g., rich riparian habitat diversity) Physical environment that allows the maintenance of normal thermal responses through use of typical behavioural and physiological strategies Enclosures at release site to encourage site fidelity and allow post-release monitoring

Domain 3 – Health

Examples of Compromises	Examples of Enhancements
Acute or chronic injury because of translocation (including mortality) or tagging Exposure to novel diseases and parasites, depending on other species (including beavers) present Exposure to predators including human hunters; exposure to other human-related risks such as road traffic Exposure to dogs Weakness due to loss of appropriate nutrition/lack of food	Possibility to have good physical fitness Absence/reduction of disease, parasites or injury (e.g. from fighting as beavers are highly territorial) Reduction in territorial conflicts and fight injuries when introduced to "vacant" territories – at least until population densities increase

Domain 4 - Behavioural interactions

Examples of Compromises	Examples of Enhancements
Social isolation / loss of social/family networks Disruption of complex hierarchies Loss of previous positive interactions with conspecifics New predators Anthropogenic disturbance Competing for resources in a novel environment May depend on whether individual animals or family groups moved together	Able to explore a new environment and participate in new social bonding Possible removal from previous predators and environmental and anthropogenic risks Physical and social environment allows beavers to engage in species-typical foraging/hunting/reproductive and other social interactions Translocated beavers may be protected from damaging interactions with people or man-made environmental features Reduction in territorial conflicts and fight injuries when introduced to "vacant" territories – at least until population densities increase

Affective Experience Domain

Domain 5 - Mental state

Examples of Compromises	Examples of Enhancements
There may be initial/continuing negative emotional states: Thirst, hunger, anxiety, fear Weakness/exhaustion Thermal discomfort Social isolation Frustration from inability to perform social behaviours including finding a suitable mate Loneliness from loss of conspecifics Lack of security/control Fear of humans during the proximate capture and translocation elements	Opportunities will develop to experience positive emotional states Rewarding engagement from environmental exploration and foraging Gastrointestinal comfort/satiety Vitality of fitness New affiliative opportunities, if groups are translocated Social interactions Sense of control/security in the new environment Feeling of safety

Evidence in each of these categories would need to be documented, and the harms weighed against the benefits in each, to develop a matrix of likely impacts in terms of their severity and duration. (See Sharp & Saunders, 2011 for more details). The harms and benefits in each domain may operate over different periods, so the basis for overall judgement would need to be given. In general, a very poor assessment in one domain cannot be offset by better assessments in others. However, a benefit of making this assessment may point to mitigating measures that can be implemented to reduce welfare harm. It is usual for the assessment in domain 5 to reflect the poorest assessment from the other four domains. A more nuanced assessment would include a comment on the degree of certainty attached to each domain's assessment. This combined information could be presented to the licensing authority.

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ANNEX - LEVELS OF HUMAN RESPONSIBILITY

Welfare responsibility level	Intervention / control level	Translocation/ reintroduction phase	Welfare responsibilities to the animal	Associated interventions
3	Full	Preparation	Capture, captive breeding, transport, veterinary, release protocols, welfare risk assessment. Provenance and associated genetic 'health' of donor population and associated individuals.	High-level habitat restoration/ management/ development of corridors; elimination/ reduction of competitors/ non-native species; vaccination of conspecifics or reservoir species.
2	High	Establishing population	Post-release monitoring, soft-release support, continuing vaccinations, capture of unfit/ injured individuals. Welfare risk review.	Medium- to long-term habitat restoration and management to achieve a desired outcome.
1	Low	Expanding and stabilising population	Management of population, e.g., translocations, culling; population censuses. Source of animals for further translocations? Welfare risk review.	Routine habitat maintenance (annual or less); mitigations for human effects, e.g., road building, other change of land use
0	Minimal	Stable population	Full ecosystem function restored. Periodic censuses to monitor population. Little or no intervention except *ad hoc* euthanasia of injured/ diseased individuals, release of rehabilitated animals. Source of animals for further translocations? Welfare risk review.	Minimal

Appendix I – Membership of the Scottish Animal Welfare Commission

The Scottish Animal Welfare Commission Members are:

- Professor Cathy Dwyer from Scotland's Rural College and the University of Edinburgh (Chair)
- Dr Harvey Carruthers, veterinary surgeon
- Mike Radford, lawyer specialising in Animal Welfare
- Paula Boyden, Veterinary Director at Dogs Trust
- Professor Marie Haskell, Professor in Animal Welfare Science at Scotland's Rural College
- Dr James Yeates, Chief Executive Officer of the World Federation for Animals
- Libby Anderson, Animal Welfare Policy Advisor
- Mike Flynn, Retired Chief Superintendent at the Scottish SPCA
- Dr Pete Goddard, veterinary surgeon
- Dr Andrew Kitchener, Principal Curator of Vertebrates at National Museums Scotland
- Dr Ellie Wigham, Lecturer in Veterinary Public Health, University of Glasgow

Scottish Animal Welfare Commission: member biographies.

Appendix II – Acknowledgments

SAWC would like to thank Dr Martin Gaywood of NatureScot and Dr Maria Diez-Leon of the Royal Veterinary College for their help when preparing this document.

Appendix III – Contact Details

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