

# IUCN / SSC Declining Amphibian Populations Task Force (DAPTF) *Ex situ* Conservation Advisory Group



## DAPTF

Declining Amphibian  
Populations Task  
Force

### MISSION STATEMENT

The *Ex situ* Conservation Advisory Group of the DAPTF will facilitate and support the appropriate and successful initiation and conduction of amphibian *ex situ* conservation by providing;

- A centralised searchable database/library of publications and websites of amphibian conservation programs, captive-breeding initiatives, husbandry guidelines and management protocols
- A searchable database of professional contacts worldwide with the aim of forming networks of expertise and the development of *ex situ* conservation capacity in range States.
- Multilingual guidelines, principles and working procedures for the management of *ex situ* populations of amphibians for conservation

AS DEFINED IN THE UNEP CONVENTION ON BIOLOGICAL DIVERSITY, *EX SITU* CONSERVATION IS THE CONSERVATION OF COMPONENTS OF BIOLOGICAL DIVERSITY OUTSIDE THEIR NATURAL HABITATS. THIS CAN INCLUDE INITIATIVES WITHIN THE SPECIES ECOLOGICAL/ GEOGRAPHICAL RANGE. IT ALSO INCLUDES INITIATIVES (IN OR OUTSIDE THE RANGE STATE), IN ZOOLOGICAL PARKS, ANIMAL COLLECTIONS, UNIVERSITIES, MUSEUMS, WILDLIFE RESEARCH FACILITIES ETC.

# DAPTF Guidelines and Working Procedures for the Management of *Ex situ* Populations of Amphibians for Conservation

## Introduction

The current scale of the extinction crisis facing the world's 5743 known amphibians is the largest to face an entire vertebrate Class since the extinction of the dinosaurs.

The uncomfortable reality of the current crisis is that, despite even the most heroic conservation efforts, many hundreds, if not thousands, of species of amphibian will be lost over the next 20-50 years. As conservationists, there is a need to ensure that limited resources are focused on the correct species and on the appropriate action, so that efforts to save these threatened species for future generations are charged with the greatest chance of success.

The IUCN's Technical Guidelines on the Management of *Ex situ* Populations for Conservation currently stipulate that all Critically Endangered and Extinct in the Wild taxa should be subject to *ex situ* management to ensure recovery of wild populations. Realistically however, because there are now so many amphibian species Endangered (761), Critically Endangered (427) and Extinct in the Wild (35), it is clearly going to be impossible to establish successful *ex situ* populations for them all. In addition to the species assessed as threatened, there are a further 1,290 species that remain Data Deficient, many of which may also be at risk of extinction.

The selection of the appropriate amphibian species for *ex situ* conservation must therefore be done with full appreciation of the limited resources and capacity of the available *ex situ* facilities/institutions around the world, and with appropriate consideration given to a wide variety of contributing factors e.g. the strength and effectiveness of the *in situ* conservation links; the cultural, economic or scientific importance of a species; the knowledge of a species captive husbandry; the likely success of any reintroduction initiative etc.

There is simply not enough time, space or expertise to establish *ex situ* initiatives for all the amphibians that now require it. These DAPTF guidelines are therefore designed to provide some guidance in the selection of species for *ex situ* conservation and their subsequent management for conservation purposes.

The guidelines have the following sections:

- Section A - Selection of Amphibian Species for *Ex situ* Conservation
- Section B - Origin of Specimens for *Ex situ* Conservation
- Section C - Practical Husbandry of *Ex situ* Populations
- Section D - Disease Risk Management of *Ex situ* Populations
- Section E - Reintroduction of *Ex situ* Stock

The guidelines seek to compliment and consolidate those guidelines set down in Article 9 of the Convention on Biological Diversity and the IUCN's Technical Guidelines on the Management of *Ex situ* Populations for Conservation.

## SECTION A

### SELECTION OF AMPHIBIAN SPECIES FOR *EX SITU* CONSERVATION

Given the finite resources and capacity of *ex situ* facilities around the world, it is vital that effort is focused on those species where an *ex situ* initiative is going to have the greatest overall conservation impact. The following questions should be asked before establishing any amphibian *ex situ* initiative;

1. **Mandate:** Is there an existing mandate recommending the *ex situ* conservation of this species?
2. **Conservation Role:** Does the proposed *ex situ* initiative have a clearly defined conservation role(s) in the conservation of the species and/or its habitat?
3. **Infrastructure:** Are the appropriate *ex situ* facilities, expertise and capacity in place to establish and manage the species with the greatest chance of success?
4. **In situ links:** Are there existing clearly defined *in situ* links to a conservation initiative for the species and/or habitat?
5. **Range State support:** Does the proposed *ex situ* initiative have the support of the range State?

Failure of the proposed initiative to satisfy all of the species selection criteria (1-5) above *does not necessarily* preclude the establishment of the *ex situ* program, but should raise fundamental questions about potential program deficiencies and should also promote the appropriate action to mitigate against these deficiencies.

These species selection criteria are examined in detail below;

#### **1. Mandate**

The recommendation for an *ex situ* population of a threatened amphibian species can come from a number of recognised sources such as;

- The Global Amphibian Assessment ([www.globalamphibians.org](http://www.globalamphibians.org)). A list of all species recommended for *ex situ* conservation action in the GAA - 240 in total - is given in Appendix X of this document.
- An IUCN/SSC Conservation Breeding Specialist Group (CBSG) Population and Habitat Viability Assessment (PHVA) workshop process ([www.cbsg.org/toolkit/phvas.scd](http://www.cbsg.org/toolkit/phvas.scd))
- An IUCN/SSC Conservation Breeding Specialist Group (CBSG) Conservation Assessment and Management Plan (CAMP) process (<http://www.cbsg.org/toolkit/camps.scd>)
- An IUCN/SSC Global Amphibian Specialist Group (GASG) recommendation
- An IUCN/SSC regional reptile and amphibian specialist group recommendation (Madagascar & Mascarene, Europe or China)
- A published Species Action Plan
- A local, regional or national government request.

#### **2. Conservation Role**

Simply keeping and breeding threatened<sup>+</sup> amphibian species in captivity does not in itself equate to *conservation*. As part of a genuine amphibian conservation initiative, the *ex situ* captive management should not only form part of the recommended

conservation action for the species but must also have a clearly defined role in the conservation of the species or its habitat.

The *Ex situ* Conservation Advisory Group of the DAPTF considers the following to be clearly definable conservation roles for the *ex situ* management of amphibian species.

- a) **Ark** – An amphibian species that is extinct in the wild (locally or globally) and which would become completely extinct without *ex situ* management.
- b) **Rescue** – An amphibian species that is in imminent danger of extinction (locally or globally) and requires *ex situ* management as part of the *recommended* conservation action.
- c) **Supplementation** – An amphibian species for which *ex situ* management benefits the wild population through breeding for supplementation as part of the *recommended* conservation action.
- d) **Farming** – An amphibian species threatened through wild collection (e.g. as a food resource), which is being bred in captivity – normally in-country, *ex situ* - to replace a demand for wild harvested specimens. *This category generally excludes the captive-breeding of pet and hobbyist species, except in exceptional circumstances where coordinated, managed breeding programs can demonstrably reduce wild collection of a threatened species.*
- e) **Conservation Research** – An amphibian species undergoing specific applied research that directly contributes to the conservation of that species, or a related species, in the wild (this would include clearly defined ‘model’ or ‘surrogate’ species)..
- f) **Conservation Education** – An amphibian species that is specifically selected for management – primarily in zoos and aquariums - to inspire and increase knowledge in visitors, in order to promote positive behavioural change. For example, when a species is used to raise financial or other support for field conservation projects (this would include clearly defined ‘flagship’ or ‘ambassador’ species).

Species selected for *in situ* conservation should fulfil at least one of the roles identified above to qualify as a genuine conservation initiative.

### 3. Infrastructure

Prior to initiating any *ex situ* conservation program, a full assessment needs to be made of the current and potential future requirements of a species in captivity, to determine that the necessary capacity exists to establish the program and to ensure its successful operation over the anticipated life of the program. Factors that need to be considered include;

- **Species knowledge** – appropriate understanding of ecology, behaviour, reproductive mode etc. and the species’ likely *ex situ* requirements. If this is not known sufficiently from the target species, then can it be inferred from similar species?

- **Accommodation** - appropriate quality and quantity available - not just for founder animals, but also for captive bred offspring of all life stages/sizes (consider heating, cooling, water supply, water quality, lighting, substrate, ventilation etc.)
- **Staff** - quality, experience, back-up.
- **Species management** – appropriate standard of record-keeping, experimental design, knowledge of small population management etc. (thus minimising the risk of any potential deleterious effects such as loss of genetic diversity, artificial selection, pathogen transfer and hybridisation).
- **Financial stability** - of the program/institution and its ability to support the *ex situ* component for the species over the anticipated life of the program.
- **Political stability** - of the institution/region/State etc. and a clear commitment to the *ex situ* program.
- **Food supply** – guarantee of quality and availability – for adult, immature and larval stages
- **Disease** – appropriate risk minimisation measures and the provision of appropriate quarantine – not only to protect species in question, but also to protect populations of other threatened amphibian species that may be held at the same institution.
- **Health monitoring** – appropriate provision for routine health monitoring of *ex situ* populations
- **Biosecurity** – appropriate minimisation of the risk of animal escapes and introduction as an invasive species.
- **Research pedigree** – appropriate skills and experience in *ex situ* research – particularly where ‘Conservation Research’ is one of the conservation roles of the population.
- **Education pedigree** – appropriate skills, experience and access to target audience – when ‘Conservation Education’ is one of the conservation roles of the population.

#### 4. *In situ* links

*Ex situ* conservation and management of a threatened amphibian species should only be considered as an alternative when the absolute imperative of *in situ* amphibian conservation cannot by itself ensure the survival of a species and its ecosystem.

An *ex situ* initiative should be viewed as just one of the tools that can help in the overall conservation of a species. It therefore follows that strong links between *ex situ* and *in situ* components are fundamental to the long-term success of species conservation. Full integration between *in situ* and *ex situ* conservation approaches should be sought wherever possible. This is normally best highlighted through the establishment of a formal Species Action Plan/ Species Recovery Plan that explicitly states the short, medium and long term goals of each component of the conservation initiative.

When *ex situ* management of an amphibian species is considered necessary and appropriate, the priority should be to establish the initiative within the range State of ecological origin. Emphasis should therefore be placed on developing appropriate capacity within the range State where this does not exist.

Data derived from *ex situ* management of amphibians should be made openly available to workers involved in the *in situ* conservation of the species (or similar species) and *vice versa*.

In exceptional cases where an *ex situ* conservation initiative has been established prior to/in the absence of a concurrent *in situ* initiative (e.g. where a political situation prohibits its, where a disease problem invalidates it etc.), emphasis should be placed on establishing the appropriate *in situ* links as soon as it becomes possible to do so.

The persistence of a species over the long-term can only be assured by its conservation *in situ*. Therefore, an *ex situ* component to a conservation program should only ever be viewed as a short/medium term initiative, and the conservation aim should always be to render its requirement superfluous!

### **5. Range State support**

Given the importance of integrating any *ex situ* initiative with the (ideally concurrent) *in situ* initiative, the support or participation of the range State (e.g. the Forestry, Agricultural, Fisheries or Environment Department) is absolutely crucial. Where an *ex situ* conservation initiative is not actually proposed by the range State itself, it is important that the program (either within or outside the State) at least has its support.

Regular and open communication between the non-governmental and governmental organisations is therefore vital to the long-term success of a species conservation initiative

## **SECTION B**

### **ORIGIN OF SPECIMENS FOR *EX SITU* CONSERVATION**

#### **1. From the Wild**

The collection of amphibian species from the wild for *ex situ* conservation purposes should not threaten the *in situ* population or its ecosystem except in exceptional circumstances where an amphibian species/population is at imminent risk of extinction and animals need to be collected on an emergency basis (e.g. an outbreak of chytrid fungus in an already very fragile population).

Whenever this emergency action is required it should be implemented only with the full consent and support of the range State and only after all alternative strategies have been fully investigated and rejected.

It must be ensured that all the required permits and licences (e.g. export, import, collection, health, CITES etc.) are in place prior to the collection of animals. **All acquisition and export/import of amphibians must be done in full compliance with all local, regional, national and international legislation.**

Appropriate acquisition of the founder stock is vital to the long-term viability of an *ex situ* population and due consideration needs to be given to the following factors when developing the methodology for wild collection:

- Number, sex ratio and age class of founder individuals to be caught.
- Obtaining as representative a sample of the population as possible (e.g. not tadpoles from a single clutch!).
- Method of capture
- Health and condition of captured animals
- Time and season of capture
- Holding time post-capture – prior to shipment to *ex situ* facilities
- Temporary holding facility design
- Shipment method and travel time to *ex situ* facilities (awareness of IATA Live Animal Regulations where appropriate)

## 2. From Existing *Ex situ* Populations

In some instances, an *ex situ* conservation initiative may be established from an existing population(s) of *ex situ* specimens (e.g. from a zoo, aquarium, university, research facility etc.). The following questions should be considered in these instances:

- Has the population(s) been carefully managed (e.g. as a recognised species studbook) to ensure that the risk of any potential deleterious effects such as loss of genetic diversity, artificial selection, pathogen transfer and hybridisation have been minimised?
- Are the animals of known provenance and were there sufficient founder animals to ensure the likelihood of a representative sample of the wild population?
- If the animals are of unknown provenance and/or genetic integrity, can this be clarified/established through testing or further investigation?
- Are further 'top-up' founder animals required from the wild to ensure the viability of the current *ex situ* population?
- Has the population shown any current/historic health problems that might compromise the future viability of the *ex situ* initiative?
- Where *in situ* links do not exist for the species, is there a clear opportunity to develop them as part of an integrated conservation initiative?

## Section C

### PRACTICAL HUSBANDRY OF *EX SITU* POPULATIONS

*This section is currently in preparation.*

Topics to be covered will include:

Housing  
 Handling & Restraint  
 Nutrition & Feeding  
 Reproduction  
 Identification  
 Transportation  
 Small population management

## Section D

### DISEASE RISK MANAGEMENT OF *EX SITU* POPULATIONS

*This section is currently in preparation.*

Workers are referred to the existing amphibian disease risk/health guidelines  
S.Thornton et al.

<http://www.jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm>

## SECTION E

### REINTRODUCTION OF *EX SITU* STOCK

*This section is currently in preparation.*

Workers are referred to the existing IUCN guidelines on reintroduction

#### *IUCN/SSC Guidelines for Re-Introductions*

Prepared by the SSC [Re-introduction Specialist Group](#) \*

Approved by the 41st Meeting of the IUCN Council, Gland Switzerland, May 1995

## INTRODUCTION

These policy guidelines have been drafted by the Re-introduction Specialist Group of the IUCN's Species Survival Commission (1), in response to the increasing occurrence of re-introduction projects worldwide, and consequently, to the growing need for specific policy guidelines to help ensure that the re-introductions achieve their intended conservation benefit, and do not cause adverse side-effects of greater impact. Although IUCN developed a Position Statement on the [Translocation of Living Organisms](#) in 1987, more detailed guidelines were felt to be essential in providing more comprehensive coverage of the various factors involved in re-introduction exercises.

These guidelines are intended to act as a guide for procedures useful to re-introduction programmes and do not represent an inflexible code of conduct. Many of the points are more relevant to re-introductions using captive-bred individuals than to translocations of wild species. Others are especially relevant to globally endangered species with limited numbers of founders. Each re-introduction proposal should be rigorously reviewed on its individual merits. It should be noted that re-introduction is always a very lengthy, complex and expensive process.

Re-introductions or translocations of species for short-term, sporting or commercial purposes - where there is no intention to establish a viable population - are a different issue and beyond the scope of these guidelines. These include fishing and hunting activities.

This document has been written to encompass the full range of plant and animal taxa and is therefore general. It will be regularly revised. Handbooks for re-introducing individual groups of animals and plants will be developed in future.

## CONTEXT

The increasing number of re-introductions and translocations led to the establishment of the IUCN/SSC Species Survival Commission's Re-introduction Specialist Group. A priority of the Group has been to update IUCN's 1987 Position Statement on the Translocation of Living Organisms, in consultation with IUCN's other commissions.

It is important that the Guidelines are implemented in the context of IUCN's broader policies pertaining to biodiversity conservation and sustainable management of natural resources. The philosophy for environmental conservation and management of IUCN and other conservation bodies is stated in key documents such as "Caring for the Earth" and "Global Biodiversity Strategy" which cover the broad themes of the need for approaches with community involvement and participation in sustainable natural resource conservation, an overall enhanced quality of human life and the need to conserve and, where necessary, restore ecosystems. With regards to the latter, the re-introduction of a species is one specific instance of restoration where, in general, only this species is missing. Full restoration of an array of plant and animal species has rarely been tried to date.

Restoration of single species of plants and animals is becoming more frequent around the world. Some succeed, many fail. As this form of ecological management is increasingly common, it is a priority for the Species Survival Commission's Re-introduction Specialist Group to develop guidelines so that re-introductions are both justifiable and likely to succeed, and that the conservation world can learn from each initiative, whether successful or not. It is hoped that these Guidelines, based on extensive review of case - histories and wide consultation across a range of disciplines will introduce more rigour into the concepts, design, feasibility and implementation of re-introductions despite the wide diversity of species and conditions involved.

Thus the priority has been to develop guidelines that are of direct, practical assistance to those planning, approving or carrying out re-introductions. The primary audience of these guidelines is, therefore, the practitioners (usually managers or scientists), rather than decision makers in governments. Guidelines directed towards the latter group would inevitably have to go into greater depth on legal and policy issues.

### 1. DEFINITION OF TERMS

**"Re-introduction"**: an attempt to establish a species(2) in an area which was once part of its historical range, but from which it has been extirpated or become extinct (3) ("Re-establishment" is a synonym, but implies that the re-introduction has been successful).

**"Translocation"**: deliberate and mediated movement of wild individuals or populations from one part of their range to another.

**"Reinforcement/Supplementation"**: addition of individuals to an existing population of conspecifics.

**"Conservation/Benign Introductions"**: an attempt to establish a species, for the purpose of conservation, outside its recorded distribution but within an appropriate habitat and eco-geographical area. This is a feasible conservation tool only when there is no remaining area left within a species' historic range.

## **2. AIMS AND OBJECTIVES OF RE-INTRODUCTION**

### **a. Aims:**

The principle aim of any re-introduction should be to establish a viable, free-ranging population in the wild, of a species, subspecies or race, which has become globally or locally extinct, or extirpated, in the wild. It should be re-introduced within the species' former natural habitat and range and should require minimal long-term management.

### **b. Objectives:**

The objectives of a re-introduction may include: to enhance the long-term survival of a species; to re-establish a keystone species (in the ecological or cultural sense) in an ecosystem; to maintain and/or restore natural biodiversity; to provide long-term economic benefits to the local and/or national economy; to promote conservation awareness; or a combination of these.

## **3. MULTIDISCIPLINARY APPROACH**

A re-introduction requires a multidisciplinary approach involving a team of persons drawn from a variety of backgrounds. As well as government personnel, they may include persons from governmental natural resource management agencies; non-governmental organisations; funding bodies; universities; veterinary institutions; zoos (and private animal breeders) and/or botanic gardens, with a full range of suitable expertise. Team leaders should be responsible for coordination between the various bodies and provision should be made for publicity and public education about the project.

## **4. PRE-PROJECT ACTIVITIES**

### **4a. BIOLOGICAL**

#### **(i) Feasibility study and background research**

- An assessment should be made of the taxonomic status of individuals to be re-introduced. They should preferably be of the same subspecies or race as those which were extirpated, unless adequate numbers are not available. An investigation of historical information about the loss and fate of individuals from the re-introduction area, as well as molecular genetic studies, should be undertaken in case of doubt as to individuals' taxonomic status. A study of genetic variation within and between populations of this and related taxa can also be helpful. Special care is needed when the population has long been extinct.
- Detailed studies should be made of the status and biology of wild populations (if they exist) to determine the species' critical needs. For animals, this would include descriptions of habitat preferences, intraspecific variation and adaptations to local ecological conditions, social behaviour, group composition, home range size, shelter and food requirements, foraging and feeding behaviour, predators and diseases. For migratory species, studies should include the potential migratory areas. For plants, it would include biotic and abiotic habitat requirements, dispersal mechanisms, reproductive biology, symbiotic relationships (e.g. with mycorrhizae, pollinators), insect pests and diseases. Overall, a firm knowledge of the natural history of the species in question is crucial to the entire re-introduction scheme.
- The species, if any, that has filled the void created by the loss of the species concerned, should be determined; an understanding of the effect the re-introduced species will have on the ecosystem is important for ascertaining the success of the re-introduced population.

- The build-up of the released population should be modelled under various sets of conditions, in order to specify the optimal number and composition of individuals to be released per year and the numbers of years necessary to promote establishment of a viable population.
- A Population and Habitat Viability Analysis will aid in identifying significant environmental and population variables and assessing their potential interactions, which would guide long-term population management.

**(ii) Previous Re-introductions**

- Thorough research into previous re-introductions of the same or similar species and wide-ranging contacts with persons having relevant expertise should be conducted prior to and while developing re-introduction protocol.

**(iii) Choice of release site and type**

- Site should be within the historic range of the species. For an initial reinforcement there should be few remnant wild individuals. For a re-introduction, there should be no remnant population to prevent disease spread, social disruption and introduction of alien genes. In some circumstances, a re-introduction or reinforcement may have to be made into an area which is fenced or otherwise delimited, but it should be within the species' former natural habitat and range.
- A conservation/ benign introduction should be undertaken only as a last resort when no opportunities for re-introduction into the original site or range exist and only when a significant contribution to the conservation of the species will result.
- The reintroduction area should have assured, long-term protection (whether formal or otherwise).

**(iv) Evaluation of re-introduction site**

- Availability of suitable habitat: re-introductions should only take place where the habitat and landscape requirements of the species are satisfied, and likely to be sustained for the foreseeable future. The possibility of natural habitat change since extirpation must be considered. Likewise, a change in the legal/ political or cultural environment since species extirpation needs to be ascertained and evaluated as a possible constraint. The area should have sufficient carrying capacity to sustain growth of the re-introduced population and support a viable (self-sustaining) population in the long run.
- Identification and elimination, or reduction to a sufficient level, of previous causes of decline: could include disease; over-hunting; over-collection; pollution; poisoning; competition with or predation by introduced species; habitat loss; adverse effects of earlier research or management programmes; competition with domestic livestock, which may be seasonal. Where the release site has undergone substantial degradation caused by human activity, a habitat restoration programme should be initiated before the re-introduction is carried out.

**(v) Availability of suitable release stock**

- It is desirable that source animals come from wild populations. If there is a choice of wild populations to supply founder stock for translocation, the source population should ideally be closely related genetically to the original native stock and show similar ecological characteristics (morphology, physiology, behaviour, habitat preference) to the original sub-population.

- Removal of individuals for re-introduction must not endanger the captive stock population or the wild source population. Stock must be guaranteed available on a regular and predictable basis, meeting specifications of the project protocol.
- Individuals should only be removed from a wild population after the effects of translocation on the donor population have been assessed, and after it is guaranteed that these effects will not be negative.
- If captive or artificially propagated stock is to be used, it must be from a population which has been soundly managed both demographically and genetically, according to the principles of contemporary conservation biology.
- Re-introductions should not be carried out merely because captive stocks exist, nor solely as a means of disposing of surplus stock.
- Prospective release stock, including stock that is a gift between governments, must be subjected to a thorough veterinary screening process before shipment from original source. Any animals found to be infected or which test positive for non-endemic or contagious pathogens with a potential impact on population levels, must be removed from the consignment, and the uninfected, negative remainder must be placed in strict quarantine for a suitable period before retest. If clear after retesting, the animals may be placed for shipment.
- Since infection with serious disease can be acquired during shipment, especially if this is intercontinental, great care must be taken to minimize this risk.
- Stock must meet all health regulations prescribed by the veterinary authorities of the recipient country and adequate provisions must be made for quarantine if necessary.

**(vi) Release of captive stock**

- Most species of mammal and birds rely heavily on individual experience and learning as juveniles for their survival; they should be given the opportunity to acquire the necessary information to enable survival in the wild, through training in their captive environment; a captive bred individual's probability of survival should approximate that of a wild counterpart.
- Care should be taken to ensure that potentially dangerous captive bred animals (such as large carnivores or primates) are not so confident in the presence of humans that they might be a danger to local inhabitants and/or their livestock.

**4b. SOCIO-ECONOMIC AND LEGAL REQUIREMENTS**

- Re-introductions are generally long-term projects that require the commitment of long-term financial and political support.
- Socio-economic studies should be made to assess impacts, costs and benefits of the re-introduction programme to local human populations.
- A thorough assessment of attitudes of local people to the proposed project is necessary to ensure long term protection of the re-introduced population, especially if the cause of species' decline was due to human factors (e.g. over-hunting, over-collection, loss or alteration of habitat). The programme should be fully understood, accepted and supported by local communities.
- Where the security of the re-introduced population is at risk from human activities, measures should be taken to minimise these in the re-introduction area. If these measures are inadequate, the re-introduction should be abandoned or alternative release areas sought.
- The policy of the country to re-introductions and to the species concerned should be assessed. This might include checking existing provincial, national and international legislation and regulations, and provision of new measures and required permits as necessary.
- Re-introduction must take place with the full permission and involvement of all relevant government agencies of the recipient or host country. This is particularly important in re-introductions in border areas, or involving more than one state or

when a re-introduced population can expand into other states, provinces or territories.

- If the species poses potential risk to life or property, these risks should be minimised and adequate provision made for compensation where necessary; where all other solutions fail, removal or destruction of the released individual should be considered. In the case of migratory/mobile species, provisions should be made for crossing of international/state boundaries.

## 5. PLANNING, PREPARATION AND RELEASE STAGES

- Approval of relevant government agencies and land owners, and coordination with national and international conservation organizations.
- Construction of a multidisciplinary team with access to expert technical advice for all phases of the programme.
- Identification of short- and long-term success indicators and prediction of programme duration, in context of agreed aims and objectives.
- Securing adequate funding for all programme phases.
- Design of pre- and post- release monitoring programme so that each re-introduction is a carefully designed experiment, with the capability to test methodology with scientifically collected data. Monitoring the health of individuals, as well as the survival, is important; intervention may be necessary if the situation proves unforeseeably favourable.
- Appropriate health and genetic screening of release stock, including stock that is a gift between governments. Health screening of closely related species in the re-introduction area.
- If release stock is wild-caught, care must be taken to ensure that: a) the stock is free from infectious or contagious pathogens and parasites before shipment and b) the stock will not be exposed to vectors of disease agents which may be present at the release site (and absent at the source site) and to which it may have no acquired immunity.
- If vaccination prior to release, against local endemic or epidemic diseases of wild stock or domestic livestock at the release site, is deemed appropriate, this must be carried out during the "Preparation Stage" so as to allow sufficient time for the development of the required immunity.
- Appropriate veterinary or horticultural measures as required to ensure health of released stock throughout the programme. This is to include adequate quarantine arrangements, especially where founder stock travels far or crosses international boundaries to the release site.
- Development of transport plans for delivery of stock to the country and site of re-introduction, with special emphasis on ways to minimize stress on the individuals during transport.
- Determination of release strategy (acclimatization of release stock to release area; behavioural training - including hunting and feeding; group composition, number, release patterns and techniques; timing).
- Establishment of policies on interventions (see below).
- Development of conservation education for long-term support; professional training of individuals involved in the long-term programme; public relations through the mass media and in local community; involvement where possible of local people in the programme.
- The welfare of animals for release is of paramount concern through all these stages.

## 6. POST-RELEASE ACTIVITIES

- Post release monitoring is required of all (or sample of) individuals. This most vital aspect may be by direct (e.g. tagging, telemetry) or indirect (e.g. spoor, informants) methods as suitable.

- Demographic, ecological and behavioural studies of released stock must be undertaken.
- Study of processes of long-term adaptation by individuals and the population.
- Collection and investigation of mortalities.
- Interventions (e.g. supplemental feeding; veterinary aid; horticultural aid) when necessary.
- Decisions for revision, rescheduling, or discontinuation of programme where necessary.
- Habitat protection or restoration to continue where necessary.
- Continuing public relations activities, including education and mass media coverage.
- Evaluation of cost-effectiveness and success of re- introduction techniques.
- Regular publications in scientific and popular literature.

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**Footnotes:**

1 Guidelines for determining procedures for disposal of species confiscated in trade are being developed separately by IUCN.

2 The taxonomic unit referred to throughout the document is species; it may be a lower taxonomic unit (e.g. subspecies or race) as long as it can be unambiguously defined.

3 A taxon is extinct when there is no reasonable doubt that the last individual has died