Strategic Planning for Species Conservation: A Handbook

The Species Conservation Planning Task Force
Species Survival Commission, IUCN

Version 1.0

Species Survival Commission

Strategic Planning for Species Conservation: A Handbook

Version 1.0

Marine iguanas (*Amblyrhynchus cristatus*) in the Galapagos Islands, Ecuador

Strategic Planning for Species Conservation: A Handbook

The Species Conservation Planning Task Force

Species Survival Commission, IUCN

Version 1.0

IUCN/Species Survival Commission

September 2008

Production of this document was made possible by the generous support of the Wildlife Conservation Society in providing editorial and production services.

WILDLIFE CONSERVATION SOCIETY

Support for the work of the IUCN/SSC Species Conservation Planning Task Force was provided by grants from the Forestry Bureau of the Taiwan Council of Agriculture; the Chicago Board of Trade Endangered Species Fund, administered by the Chicago Zoological Society; and the IUCN Species Survival Commission. Working meetings of the Task Force were generously hosted by the Wildlife Conservation Society, Budapest Zoo, and the WildCRU of the University of Oxford.

Chicago Zoological Society

Published by: IUCN, Gland, Switzerland.

Citation: IUCN/SSC. 2008. *Strategic Planning for Species Conservation: A Handbook*. *Version 1.0.* Gland, Switzerland: IUCN Species Survival Commission. 104pp.

ISBN: 978-2-8317-1125-6

Cover design and layout by: Karin Svadlenak-Gomez.
Cover photo: Waved Albatross (*Diomedea irrorata*) in the Galapagos Islands, Ecuador © Robert Lacy.

Available online at: http://intranet.iucn.org/webfiles/doc/SSC/SCSHandbook.pdf

SSC
Species Survival Commission

Contents

Preface

The global community recognises the importance of conserving nature. The natural systems of the planet make human life possible, by providing energy, food, water, and other material resources; but nature also makes life worth living by providing beauty, inspiration, and context for human life, as demonstrated in the cultural traditions of human societies from around the world and by everyone every day who admires a bird or takes a walk in the woods (Wilson 1984). The intrinsic and extrinsic values of nature have been recognised in international declarations, treaties, and conventions including the Convention on Biological Diversity (CBD), the Convention on Migratory Species of Wild Animals (CMS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Wetlands (popularly known as the Ramsar Convention), the World Heritage Convention (WHC), the Forest Principles, and the Kyoto Protocol, as well as the formation of IUCN, the International Union for Conservation of Nature, where nations and non-governmental entities have banded together to ensure that nature is conserved and managed wisely.

Species are the players on the ecological stage, as evolved and established over millennia. Species and their interrelationships – including their relationship to people – are the fabric of nature. Many of the closest relationships people have formed with nature are based on species: the species we eat, the species we fear, the species we love. As humanity has learned more about the biological diversity of the planet, people have increasingly come to appreciate the multiple roles of species, and the profound diversity and wonderful strangeness of life on Earth. Many people also feel that the degradation of natural ecosystems that has accompanied the stunning success of the human species, which today is more populous and – on average – richer than ever before, has impoverished modern humanity.

The sheer diversity of species on Earth is extraordinary. More than 1.7 million species have been identified and estimates of the total number of species on the planet, including those not yet known to science, have ranged from 8 million to 100 million (Tudge 2000). The estimates of how much of this extraordinary diversity of life is being lost each year are disheartening. More than 16,000 species of animals and plants are known to be threatened with extinction – one in four mammals, one in eight birds, one in three amphibians, and a considerable proportion of assessed plant groups, according to the 2007 IUCN Red List Assessment (http://www.iucnredlist.org). These figures appear even more startling if one considers that the number of assessed species is only a fraction of the total number of species estimated to exist on Earth. Similarly, many ecosystems – particularly wetlands, forests, grasslands, and coral reefs – are being degraded and destroyed, even though natural ecosystems provide humans with a wide range of valuable services.

In an effort to save species and overall biodiversity, a number of approaches to conservation have been suggested. Some approaches focus on species' habitats, ecosystems, or other area-based classifications such as hotspots, ecoregions, Important Bird Areas, Important Plant Areas, and so on. Such approaches seek to save nature in a place or region by ensuring that the ecosystem processes and structures which support nature are maintained. Although these approaches are critical to conservation of nature, they are insufficient on their own. Just as species need well functioning ecosystems in which to live, ecosystems depend on their species. An exclusively area-based approach can result in species being lost from the areas of concern. Conservationists have long appreciated that many species, and species groups, need particular attention, requiring species-focused conservation strategies. Furthermore, because many people have deep attachments to particular species, these can be used to catalyze conservation efforts. In other words, endangered species can serve as iconic ambassadors for the conservation of nature.

The Species Survival Commission (SSC), created in 1949, is the largest of IUCN's six volunteer commissions. With some 8,000 scientists, government officials, and conservation leaders worldwide, the SSC membership is an unmatched source of information about species conservation. SSC members provide technical and scientific advice to governments, international conventions, and conservation organizations throughout the world. SSC also provides the best available information critical to the development of tools for species conservation such as the IUCN Red List of Threatened Species™. SSC works primarily through its 120 Specialist Groups, which focus on a wide range of plants and animals, or on issues such as the effects of invasive species and the sustainable use of wildlife. In addition, the IUCN Species Programme implements global species conservation initiatives with and in support of SSC. This Species Programme's support role includes coordinating the Red List, conducting communications work, and facilitating inputs to conventions (see http://www.iucn.org/species).

In this document, we provide guidance to IUCN/SSC Specialist Groups on when and how to prepare and promote what we call Species Conservation Strategies (SCSs). This guidance includes advice on how to conduct a thorough Status Review; how to develop, through broad consultation with stakeholders, a Vision and Goals for the conservation of a species or species group; how to set Objectives to help achieve the Vision and Goals; and how to address those Objectives through geographically and thematically specific Actions.

Without meaning to appear prescriptive, we recommend that those preparing SCSs consider all the components and processes described herein and then make use of those that are appropriate for their species of concern. This Handbook describes recommended methods for creating successful SCSs, brief case studies or examples of aspects of SCSs, and references to sources of additional help and guidance. We expect that this Handbook will be an evolving document, with further explanations and links to reference materials added over time; hence the guidance provided here will be updated as more is learned about the best ways to achieve effective species conservation.

Finally, the value of even the most comprehensive and well-conceived SCS can only be judged by whether it achieves its Goals. The crucial challenge, therefore, is to translate the efforts made in compiling the SCS into effective action and, in particular, to ensure that the recommended Actions are implemented and their results monitored throughout the SCS's life time. It is clear that SCSs and Action Plans alone do not save species: strategies and Action Plans provide the context for well-coordinated and effective action, and the processes used to develop them should consider, at every step, the most effective ways to facilitate and motivate implementation.

We hope that this Handbook will inspire IUCN/SSC Specialist Groups and other conservation practitioners and partners in the private and public sectors to use the methods we recommend for developing SCSs, and through that mechanism to achieve our shared vision of a world where people and the rest of nature thrive together for generations to come.

Acknowledgements

The guidelines presented in this document were developed through the work of SSC's Species Conservation Planning Task Force (the members are listed below). The Task Force would like to express our thanks to the SSC Chair Holly Dublin and to the SSC Steering Committee for envisioning and then creating the Task Force, and for their support and guidance throughout. Other members of the Commission and of the IUCN Species Programme also provided insights and feedback both to the work of the committee generally and on this document.

Funding for the work of the Task Force was provided by SSC and by grants from the Forestry Bureau of the Taiwan Council of Agriculture and the Chicago Board of Trade Endangered Species Fund. Working meetings of the Task Force were generously hosted by the Wildlife Conservation Society, Budapest Zoo, and WildCRU of the University of Oxford. The organizations of the Task Force members provided not only the substantial expertise and time of those members, but also often funded the costs of their travel to Task Force meetings.

Funding for professional editing and production of this document was provided by the Wildlife Conservation Society. Without the skilled and very dedicated copy editing by Karin Svadlenak-Gomez, this document would not have been produced. The Task Force is grateful for her assistance.

Finally, the ideas and guidelines in this document arose from the experience and insights of the many people who have worked to develop effective Species Conservation Strategies and Action Plans, both within IUCN/SSC Specialist Groups and within many governmental agencies and non-governmental conservation organizations. We thank all who have worked diligently and with passion to conserve species diversity in the past and especially those who will use these guidelines to help achieve more successful conservation of species for the future.

SSC Species Conservation Planning Task Force: Editorial Team

- Simon Hedges, Wildlife Conservation Society; Co-chair, IUCN/SSC Asian Elephant Specialist Group; Large Bovini Coordinator, IUCN/SSC Asian Wild Cattle Specialist Group
- Robert Lacy, Chicago Zoological Society; Chair, IUCN/SSC Conservation Breeding Specialist Group
- David Mallon, Dept of Biological Sciences, Manchester Metropolitan University; Co-chair, IUCN/SSC Antelope Specialist Group
- Philip McGowan, Director, World Pheasant Association; Co-ordinator, WPA-IUCN SSC Galliformes Specialist Groups
- Philip Miller, Senior Program Officer, IUCN/SSC Conservation Breeding Specialist Group
- Eric Sanderson, Wildlife Conservation Society
- Claudio Sillero-Zubiri, Wildlife Conservation Research Unit (WildCRU), University of Oxford; Chair, IUCN/SSC Canid Specialist Group
- Karin Svadlenak-Gomez, Wildlife Conservation Society (Copy Editor)
- Rosie Woodroffe, Zoological Society of London; Coordinator, African Wild Dog Working Group, IUCN/SSC Canid Specialist Group

Other members of the SSC Species Conservation Planning Task Force

- Julian Blanc, CITES MIKE (Monitoring the Illegal Killing of Elephants) Programme
- Urs Breitenmoser, University of Bern; Co-chair, IUCN/SSC Cat Specialist Group; Large Carnivore Initiative for Europe Working Group
- Dena Cator, IUCN Species Programme
- Philippe Chardonnet, International Foundation for the Conservation of Wildlife; Co-chair, IUCN/SSC Antelope Specialist Group
- Holly Dublin, Chair, IUCN Species Survival Commission; Chair, IUCN/SSC African Elephant Specialist Group
- Richard Emslie, Scientific Officer, IUCN/SSC African Rhino Specialist Group
- David Garshelis, Minnesota Department of Natural Resources; Co-chair, IUCN/SSC Bear Specialist Group
- John Haslett, Department of Organismal Biology, University of Salzburg
- Margaret Kinnaird, Mpala Research Centre and Conservancy and the Wildlife Conservation Society
- Susan Lieberman, World Wide Fund For Nature (WWF)
- Michael Maunder, Fairchild Tropical Botanic Garden; IUCN/SSC Plant Conservation Sub-Committee
- Patricia Medici, Chair, IUCN/SSC Tapir Specialist Group
- Russel Mittermeier, Conservation International; Chair, IUCN/SSC Primate Specialist Group
- Deborah Procter, IUCN/SSC Invertebrate Conservation Sub-Committee
- John Robinson, Wildlife Conservation Society
- Pritpal Soorae, Environment Agency, Abu Dhabi; Program Officer and Reptiles and Amphibians Section Chair, IUCN/SSC Re-introduction Specialist Group

Glossary of terms and abbreviations

Actions	The activities which need to be implemented to achieve the Strategy's Objectives and, ultimately, its Goals and Vision.
Actors	Those individuals responsible for Actions.
Area of Occupancy	The Red List term "Area of occupancy" is defined as the area within its "extent of occurrence" which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g., irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data. (For an illustration, see http://www.iucnredlist.org/info/categories_criteria2001#definitions accessed 25 July 2008.)
Causal Flow Diagram	A graphical technique for describing and analysing real or hypothesized cause-and-effect relationships.
CBD	Convention on Biological Diversity.
CBSG	Conservation Breeding Specialist Group of the IUCN Species Survival Commission.
CEESP	Commission on Environmental, Economic and Social Policy of the IUCN.
CEM	Commission on Ecosystem Management of the IUCN.
Constraint	Factors which contribute to or compound the threats. For example, lack of political will and resources might contribute to a lack of law enforcement, leading in turn to over-exploitation.
Direct threat	See "Threat" below.
Extent of Occurrence	Red List term used to define the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g., large areas of obviously unsuitable habitat; but see "area of occupancy"). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).
Goal	A rephrasing of the Vision in operational terms to capture in greater detail what needs to be done, and where (to save the species).

	Goals thus have the same long-term time frame and wide spatial scale as the vision. Goals use the same criteria for what it means to save a species that were agreed when developing the Vision (e.g., striving to achieve ecologically functioning populations).
Goal Target	Goal Targets provide a medium-term (typically 5–10 years) subset of the Goals. Thus they represent those Goals that can realistically be achieved over the lifetime of the SCS (and/or those steps towards achieving the Goals that can realistically be achieved over the lifetime of the SCS). Like all targets, Goal targets should be SMART.
GIS	Geographic Information System.
Indicator (of success)	A single measure of achievement; or a description of the conditions that would show that a particular Action had been implemented successfully. Good indicators are measurable, precise, consistent, and sensitive.
IUCN	International Union for Conservation of Nature.
NGO	Non-governmental organization.
Objective	Broad summaries of the approaches to be taken in attempting to achieve a strategy's Vision and Goals. Each objective usually relates to a logically related set of threats and constraints; for example, if lack of capacity were to be identified as a constraint on effective conservation of a species, then one obvious Objective would be to develop capacity.
Objective Target	Detailed, time-bound, summaries of what needs to be achieved to attain a strategy's Vision and Goals. Objective Targets help to group Actions into logically related clusters.
Problem Tree	A visualization technique, useful for informing the development of Objectives, which links proximate threats with their ultimate causes and constraints. Proximate threats to species are represented at the bottom of the diagram, with ultimate causes at the top.
PVA	Population Viability Analysis.
PHVA	Population and Habitat Viability Assessment; an interactive, participatory workshop process that generates extinction risk assessments based upon in-depth analysis of information on the life history, population dynamics, ecology, and history of a population.
Red List	The IUCN Red List of Threatened Species^{TM} is an annually updated inventory of the extinction risk and global conservation status of plant and animal species.
Red List Categories	The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide

an explicit, objective framework for the classification of the broadest range of species according to their extinction risk.

Extinct (EX) Species for which extensive surveys show there is no reasonable doubt that the last individual has died.

Extinct in the Wild (EW) Species that survive only in cultivation, in captivity or as a naturalized population (or populations) well outside the past range.

Critically Endangered (CR) Species that are facing an extremely high risk of extinction in the wild when the best available evidence indicates that they meet any of the criteria for the category Critically Endangered.

Endangered (EN) Species that are facing a very high risk of extinction in the wild when the best available evidence indicates that they meet any of the criteria for the category Endangered.

Vulnerable (VU) Species that are facing a high risk of extinction in the wild when the best available evidence indicates that they meet any of the criteria for the category Vulnerable.

Near threatened (NT) Species that do not qualify for Critically Endangered, Endangered or Vulnerable now, but are close to qualifying for or are likely to qualify for a threatened category in the near future.

Least concern (LC) Species that do not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant species are included in this category.

Data deficient (DD) Species for which there is inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution and/or population status. A species in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat.

Not evaluated (NE) A species is considered “Not Evaluated” when it has not yet been evaluated against the criteria. NE species are not shown on the IUCN Red List.

Threatened Species Threatened Species are any of those classified as CR, EN, or VU. See http://www.iucnredlist.org (accessed 24 July 2008).

RWPS — Range-wide Priority Setting.

SMART — The acronym “SMART” refers to targets and indicates that they should be Specific, Measurable, Achievable, Realistic, and Time-bound.

Species Action Plans	Publications written by IUCN/SSC Specialist Groups and other organizations and groups (e.g., WWF, the European Union, and others) that assess the conservation status of species and their habitats and outline conservation priorities.
SSC	Species Survival Commission (see http://cms.iucn.org/about/work/programmes/species/index.cfm accessed 24 July 2008).
Stakeholder	In the present context, an individual that demonstrates some combination of concern (about the outcome of an SCS process), expertise (i.e., has information or resources required to participate in an SCS process), and/or power (i.e., is able to either block or facilitate recommendations which result from the SCS process). Taken together, a potentially valuable stakeholder can either significantly affect the formulation of recommendations at the workshop, and/or be significantly affected by them.
Target	A measure applied to Goals or Objectives, as appropriate. Targets should always be SMART (see above). The term target is sometimes also used, in non-SCS contexts, to indicate the entity of conservation concern (e.g., target species, ecosystems, or ecological process). See also "Goal Target" and "Objective Target'. In our usage, Targets are to measurable steps that describe what needs to be accomplished to meet a Goal or Objective.
Threat	A factor which causes either a substantial decline in the numbers of individuals of that species, or a substantial contraction of the species' geographic range. Threats can be divided into proximate and ultimate threats. **Proximate threats** are immediate causes of population decline, usually acting on birth or death rates (e.g., habitat loss, over-harvest). **Ultimate threats** are root causes of proximate threats, and are almost always anthropogenic (e.g., habitat loss (a proximate threat) might be driven by human population growth (an ultimate threat)).
Vision	An inspirational and relatively short statement that describes the desired future state for the species (i.e., it describes in broad terms the desired range and abundance for the species, its continuing ecological role, and it relationship with humans). The Vision is an essential part of the new SCS process in that those writing a SCS should discuss explicitly what it means to save a species and use the answer to this question to develop the associated Goals. The Vision should, therefore, be derived from a range-wide analysis of a species' status and a detailed presentation of the long-term range-wide conservation needs of the species (informed by the threat analysis).
WPCA	IUCN World Commission on Protected Areas (see http://cms.iucn.org/about/union/commissions/wcpa/index.cfm accessed 24 July 2008).

Photo G.1 A female lion (*Panthera leo*) yawning in Linyanti, Botswana
IUCN Photo Library © IUCN / Sue Mainka

1. The evolution of SSC's planning for species conservation

This chapter provides a very brief history of how SSC's planning for species conservation has evolved from the publication of the first SSC Action Plan in 1986. We list some of the challenges encountered that prevented many of these Plans from being effectively implemented. We provide reasons why we and others feel that new, more inclusive strategic planning processes, based on the principles of both sound science and wider stakeholder participation, are needed to save species.

1.1 Introduction

Since the first SSC Species Action Plan was published in 1986, more than 60 Plans have been published in a series that is now well recognised[1]. In April 1991 a joint meeting on Action Plans and their implementation was held by the Fauna and Flora Preservation Society (now Fauna & Flora International, FFI) and SSC. By then, only five years after the first Plan appeared, 16 Plans had already been published, and many more were in draft stages. A message from the then SSC Chairman, George Rabb stated that "The subject of Action Plans and their implementation is at the core of the Species Survival Commission's work" (Morris 1991). At the time of the meeting, SSC had just received a donation of US$1 million for the preparation of Action Plans and the promotion of their implementation.

To date, the majority of IUCN/SSC Action Plans have covered mammals, especially the larger charismatic species, such as primates and wild cats, but there are also Action Plans for orchids, conifers, dragonflies, several groups of birds (e.g., cranes, parrots, and pheasants), fishes, and other groups. According to SSC, this series "…assesses the conservation status of species and their habitats, and specifies conservation priorities. The series is one of the world's most authoritative sources of species conservation information available to natural resources managers, conservationists, and government officials around the world" (IUCN/SSC 2002).

All Action Plans were compiled, edited, or authored by Specialist Groups with the single exception of the Parrot Action Plan, for which there was no Specialist Group in existence at the time. The effort expended by the Groups in synthesising information and assessing conservation needs was considerable, and even though the majority of compilation work was carried out voluntarily the cost of editing and printing the Plans was also significant.

1.2 The need for better Action Plans

At a relatively early stage, SSC recognised that simply publishing information on species was not sufficient to ensure conservation results, and therefore recommended that Action Plans should include "prioritized recommendations specifically designed for key players" (IUCN/SSC 2002).

---

1 For online access to published IUCN/SSC Species Action Plans see http://www.iucn.org/about/work/programmes/species/resources/publications/index.cfm (accessed 16 September 2008).

The other purposes of the Plans were listed as follows:

- To serve the interests of the Specialist Group members;
- To provide a baseline record against which to measure change;
- To expand on the IUCN Red List of Threatened Species;
- To provide scientifically-based recommendations for those who can promote and support species conservation;
- To provide a common framework and focus for a wide range of players;
- To provide a convenient and accessible conservation resource;
- To establish priorities in species conservation; and
- To aid fundraising.

There are now many other sources of information on some of these species and the places where they live, and there is much greater demand for species-related information. Furthermore, it has become increasingly clear that implementing realistic and sustainable conservation programmes is very complex.

The way SSC prepares SCSs and Action Plans has to evolve to reflect this changing world. In particular, there is a need to draw on new approaches and techniques from a variety of fields and to identify clearly and then engage with a much wider community of stakeholders (see Chapters 2 and 4).

Action Plans have proven very successful as collations of large quantities of useful information on the distribution, status, and habitats of species or groups of species, and in identifying (typically biological) priorities and gaps in knowledge. Most of these Plans, however, have had only a limited effect. Whilst the standard of biological information contained in the Plans attracted widespread admiration, their relevance to practical conservation programmes was often not clear. This lack of impact had three overlapping causes (IUCN/SSC 2002):

- *It was not clear who the target audience was.* The need for the plans was perceived differently by different Specialist Groups because of varying perceptions of who the target audiences should be (namely those who can and will act on the recommendations). This materially affected the content of the plans.

- *Action Plans were mostly compiled by Specialist Groups with limited resources.* The voluntary nature of these groups meant that they usually had little money and time to devote to compiling the Plans. Consequently, there was usually a trade-off between compiling Plans quickly and using an inclusive process to develop plans that would have wide support.

- *There were no clear guidelines on what the Plans should contain.* There was little consistency between Plans in the way that recommendations were formulated. This appeared to be partly due to a lack of guidance on how to determine what action is needed (i.e., how to formulate recommendations) and partly because of a desire not to inhibit the Specialist Groups' thinking by being too prescriptive.

- *There was rarely a clear link to action.* These Plans usually remained at the level of a Status Review, covering a taxonomic group with many species. Key species were typically identified on the basis of their Red List status or other criteria, although some plans or related documents did contain priority projects or areas for research. However, there was rarely a clear and coherent link from the Status Review and threat analysis, through Goals and Objectives, down to the Actions to be taken.

Through this Handbook we intend to address these issues and also to accommodate other developments in species conservation planning. We describe a process for planning SCSs that improves on that employed in preparing the earlier Action Plans. We provide a conceptual framework that is based on clear linkages between its component parts, yet is designed to retain sufficient flexibility to allow application to a wide range of species and circumstances. Strategies may be formulated for single species or groups of species, at regional, national, or local scales, but the concept of SCS that we outline here has a taxonomic focus that is narrow enough to allow development of the specific Actions needed to ensure conservation of the species. This contrasts with, but builds upon, the broader assessment of all species within a group that was undertaken in many of the earlier Action Plans. It also means that a number of SCSs might be developed to cover many (but often not all) of the species that were included within former IUCN/SSC Action Plans.

However good these guidelines may be, we emphasise that the resulting SCSs will only be successful if they are implemented. As with Action Plans, SCSs must be based on sound conservation science, but they should also be prepared through inclusive, participatory processes that lead to broad ownership. This will improve prospects for implementation and, ultimately, sustained and successful conservation efforts. Both SCSs and Action Plans are only tools and are of no use without effective implementation.

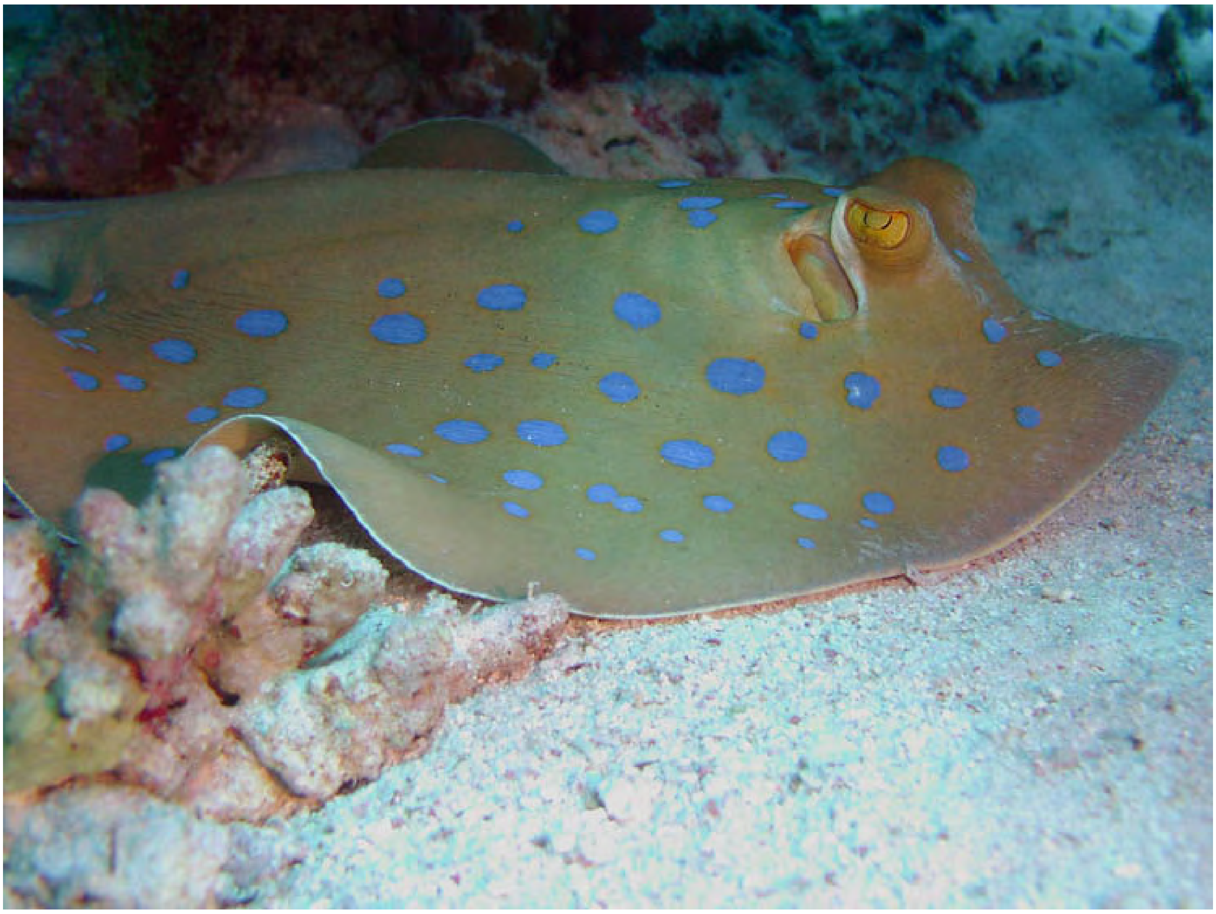

Photo 1.1 Bluespotted stingray (*Taeniura lymma*) in the Red Sea, Egypt
IUCN Photo Library © Christian Laufenberg

2. A framework for strategic planning for species conservation

This chapter defines what we mean by a SCS, provides an overview of its components (Status Review, Vision, Goals, Objectives, Actions, and associated Targets), and briefly outlines the steps involved in developing a SCS. It contrasts the SCS process with earlier species Action Plan preparation processes and emphasises the importance of broad-based participatory processes, such as stakeholder workshops, in all phases of SCS preparation, as a basis for successful implementation.

2.1 What is a Species Conservation Strategy?

A SCS, as described in this document, is a blueprint for saving a species or group of species, across all or part of the species' range. A SCS should contain a Status Review, a Vision and Goals for saving the species, Objectives that need to be met to achieve the Goals, and Actions that will accomplish those Objectives. The components of a SCS are as follows:

- A range-wide Status Review (incorporating a threat analysis). This Status Review defines the historical and current distribution of the species, states population sizes (or at least gives some measure of relative abundance), evaluates population trends, and identifies losses and threats. The Status Review should, where available, be informed by the appropriate Red List Assessment(s) and supporting documentation from the Red List Unit of the IUCN Species Programme and the Species Information Service (SIS). The completed Status Review should also in turn feed back into the Red List process.

- A range-wide (or in some cases a regional) Vision, which is an inspirational description of the participants' desired future state for the species, and a set of associated Goals (Chapter 6). These Goals are a rephrasing of the Vision in operational terms to capture in greater detail what needs to be achieved, and where, to save the species. Both the Vision and the Goals have the same geographical and temporal scale. The Goals have a set of associated Goal Targets[2], which are a medium-term (typically 5–10 years) subset of the Goals. Goal Targets represent those Goals (and/or the necessary steps towards those Goals) that can realistically be achieved over the lifetime of the SCS. Like all targets, Goal Targets should be SMART[3].

- A set of Objectives needed to achieve the Goal Targets over the stated time-span. Objectives address the main threats to the species identified in the Status Review process and the other constraints on achieving the Vision and Goals. In fact, Objectives can be thought of as the inverse of key threats and

2 Note: In a few conservation planning processes, the term "Target" is used to refer to the entity being conserved. We here follow the conventional usage of the concept of targets, which is also that widely used by IUCN.

3 The acronym "SMART' indicates that Targets should be Specific, Measurable, Achievable, Realistic, and Time-bound.

constraints. Each Objective should also have a SMART Objective Target. Objectives are typically developed using some form of problem analysis (e.g., “problem tree” methods; see Chapter 7). Each Objective is usually associated with one or more SMART Objective Targets.

- Actions to address each Objective Target. Actions are the activities which need to be performed in order to achieve the Objectives, Goals, and, ultimately, the Vision. Recommendations for Actions should ideally provide details of what needs to be done, where, when, and by whom (see Chapter 8). Actions are typically short-term (usually 1–5 years).

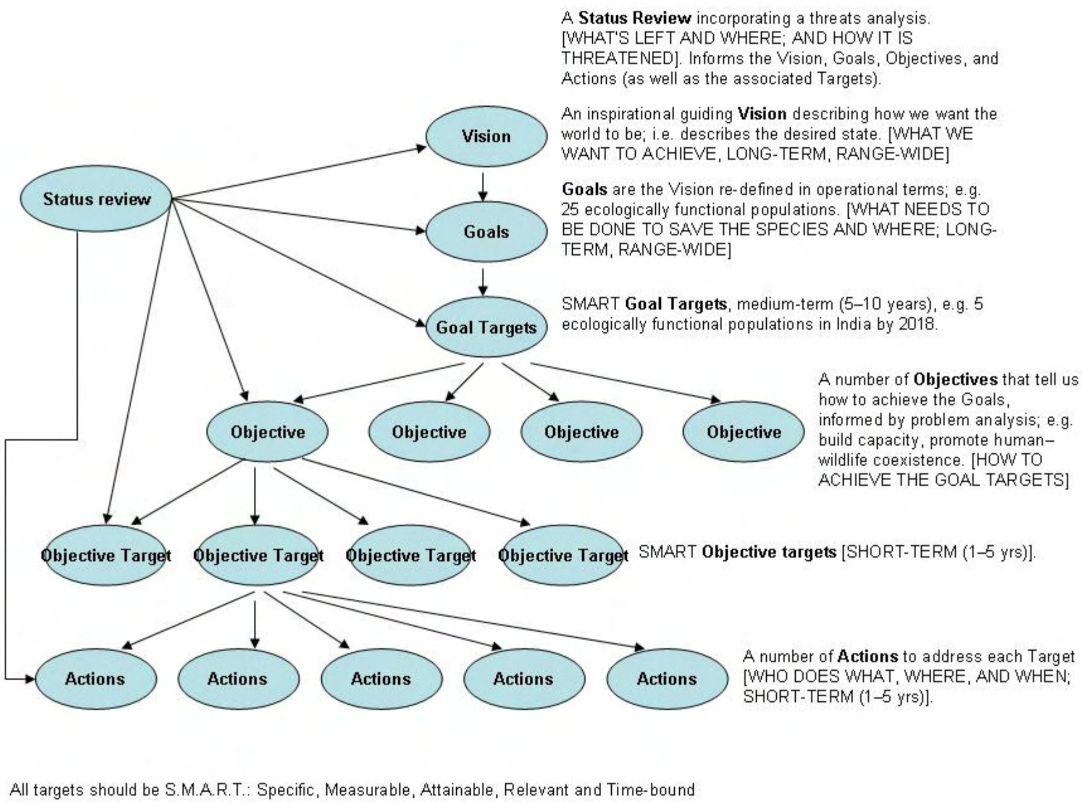

Figure 2.1 Relationships between components of the SCS

The relationships of these components to one another are illustrated in Figure 2.1 and exemplified in Table 2.1 (at the end of this chapter). Table 2.1 is an extract from the Conservation Strategy for Wild Cattle and Buffaloes in Southeast Asia, which was developed using the process described in these guidelines. (The complete strategy is provided at the following website: http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf, as are some other recent conservation strategies.)

2.2 How the SCS process differs from earlier approaches

Our recommended approach differs from the earlier IUCN/SSC Action Planning process in its **requirement to explicitly define what it would mean to save a species**, development of a plan that is judged sufficient to achieve that end, and an **emphasis on multi-stakeholder participation** with (as applicable) species specialists, range State government staff responsible for implementation of conservation measures, members of local communities, regional politicians (if relevant), and so on, explicitly included in all steps.

Earlier processes tended to favour either international species specialists or range State government staff, few involved stakeholders other than the species specialists and government agency staff, and few attempted to get the balance right. By contrast, the new SCS approach explicitly emphasises the importance of a fully participatory process, whether at the range-wide (or regional) strategic planning level or at the national or local action planning level, with the explicit aim of developing national or local Action Plans as appropriate, based on SCSs agreed by all major stakeholders.

If SCSs and national or local action plans can be agreed by all key stakeholders, this would avoid the all-too-common situation where a series of competing action plans and strategies are produced by different organizations, duplicating efforts and wasting resources.

2.3 An outline of the SCS process

The Status Review will typically begin before any workshops are held, but should be discussed and revised at a range-wide or regional strategic planning workshop. To ensure adequate participation of all relevant stakeholder groups, the Vision, Goals and Goal Targets, Objectives and Objective Targets, and Actions should also be developed in a workshop setting, ideally in the same strategic planning workshop that prepares and/or revises the Status Review.

In the case of a single species with a relatively narrow distribution, the SCS process can typically be completed in a single workshop, with part of the Status Review (e.g., data compilation) and perhaps other additional elements such as a population viability analysis (PVA) taking place before the participatory workshop; examples of agendas of such workshops are provided at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_rgl_wkshp_agenda_AWCB.pdf (for Asian wild cattle and buffaloes) and http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_rgl_wkshp_agenda_cheetwd.pdf (for cheetahs and African wild dogs).

When the SCS process is applied to a larger group of species that inhabit multiple countries, a range-wide strategic planning workshop should ideally be followed by a series of national action planning workshops, which will provide more detail about the required Actions and typically should also identify those individuals who will be responsible for Actions (see Chapter 9 for details). These national Action Plans may not be IUCN-led plans but it is probable that IUCN species specialists will be involved in the workshops and in reviewing the national plans (as has been the case, for example, in the development of rhino strategies in South Africa, Namibia, Tanzania, Zambia, Zimbabwe, Swaziland, Botswana, and Kenya). A focus on national Action Plans is generally appropriate because Actions usually take place in national settings and require the approval and cooperation of national governments.

One useful example of the application of the SCS process to a group of species occupying a broad geographic area is provided by the range-wide Status Review for Asian Wild Cattle and Buffaloes and the Strategic Planning Workshop for Wild Cattle and Buffaloes in Southeast Asia, which was followed by a National Action Planning Workshop for Wild Cattle and Buffaloes in Vietnam. The agendas for these workshops are provided at http://

intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_cheetwd_BOT.pdf (national workshop on cheetahs and wild dogs in Botswana) and http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_AWCB_VIE.pdf (national workshop on Asian wild cattle and buffaloes in Vietnam). A slightly different model, but one also based on the Vision–Goals–Objectives–Actions approach, has been used successfully with several species in other fully participatory stakeholder workshops (see for example the strategies for Arabian leopard (*Panthera pardus nimr*) (Edmonds 2007), Caucasus leopard (*Panthera pardus ciscaucasica*) (Breitenmoser *et al.* 2007), Arabian oryx (*Oryx leucoryx*) (Mallon, Kiwan and Qarqaz in press), Przewalski's gazelle (*Procapra przewalskii*) (Mallon pers. comm.), Saiga Antelope (*Saiga tatarica*) (CMS 2006), black rhino (*Diceros bicornis*) and white rhino (*Ceratotherium simum*) (Anon 1998, 2000a, 2000b, 2001a, 2001b, 2005, Emslie 2007, Kampamba and Chansa 2003, Okita-Ouma *et al.* 2007).

Other useful (partial) models are provided by the recent Cheetah and African Wild Dog Regional Strategies for Eastern and Southern Africa (available in draft form at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_Strategy_cheetwd.pdf) and their associated national Action Plans (e.g., from Kenya; see http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_ntlAP_cheetwd_KEN.pdf). In these examples, the Strategic Plans were developed at regional workshops attended by higher-level representatives of range State wildlife authorities, other species specialists, and representatives of major relevant non-governmental organizations (NGOs). These regional workshops were followed by a series of national action planning workshops (see Chapter 9) attended by many more range State participants, including lower-level staff from government authorities (e.g., park staff), as well as national and international NGO staff and other species specialists.

2.4 Monitoring and revision of SCSs

Rarely, if ever, will the available data, and the participants' ability to predict and control the future, be adequetate to guarantee that a strategy, when first developed, will achieve the desired future for the species. For this reason, adaptive management (Walters 1986; Parma *et al*. 1998) has to be integral to the SCS philosophy. A SCS therefore needs to include a monitoring framework, including a process for the monitoring of Targets at the Goals and Objectives level, and timelines at the Actions level (see section 8.4).

More generally, the SCS process needs to include a mechanism for continuing review and refinement. This mechanism should include ongoing compilation and review of data on species status and distribution. Thus even if a SCS is formally published, it will often need to be an electronic "living document" subject to continual refinement (but with adequate version control so that it can be properly referenced and progress can be traced).

Table 2.1. Strategic Plan Logical Framework Example

STRATEGIC PLAN LOGICAL FRAMEWORK FOR THE CONSERVATION OF WILD CATTLE AND BUFFALOES IN SOUTHEAST ASIA

Vision						
We envision viable, ecologically functioning populations of wild cattle and buffalo that are appreciated by humankind. These populations will represent						
Goals						
Anoa	**Banteng**	**Gaur**	**Kouprey**	**Saola**	**Tamaraw**	**Water buffalo**
Ensure 10 viable, ecologically functioning anoa populations, with 2 populations in each biogeographic region (Buton, South-East, East, North and Central) and their habitat. All anoa populations should co-exist with people supported by regional planning.	26 ecologically functional, large populations, with 17 populations in dry forest mosaic habitat types and 9 in evergreen forest habitat types; giving 4 populations in the Bornean subspecies/ ESU, 6 in the Javan subspecies/ESU, and 16 in the mainland subspecies/ESU. Achieving this will require reintroductions to former range in Thailand and Indonesia. All populations should be co-exist with people and their domestic animals, and be valued by people in range States and internationally.	30 ecologically functional, large Gaur populations, with 21 populations in mixed forest habitat types and 9 in evergreen forest habitat types; giving 4 populations in the *Bos gaurus hubbacki* subspecies/ESU and 26 in the *Bos gaurus readei* subspecies/ESU. Achieving this will require reintroductions to former range in Malaysia, Thailand, and Vietnam. All populations should be co-exist with people and their domestic animals, and be valued by people in range States and internationally.	Kouprey exist in the wild in multiple viable populations.	Saola is recognised in and beyond Lao and Vietnam as a flagship species of the Annamites, motivating effective conservation of the ecoregion. Saola will not be lost from any site in which they now occur and will recover to at least 800 free-ranging adults, with at least 3 sub-populations of over 200 adults each in landscapes larger than 1,000km^2	Secure three ecologically functioning [including two viable] populations of tamaraw co-existing with indigenous people and other stakeholders in the Island of Mindoro, Philippines	10 viable, ecologically functional populations of wild and wild type buffalo (as well as feral populations of exceptional interest) in Southeast Asia. Achieving this will require identification of populations of wild, wild type, and feral buffalo in all Southeast Asian countries, especially in Malaysia and Indonesia. All populations should coexist with people and their livestock and, be appreciated.

Goal targets						
Anoa	**Banteng**	**Gaur**	**Kouprey**	**Saola**	**Tamaraw**	**Water buffalo**
• By 2010, define population structure of the anoas, including taxonomic status. • By 2012, determine species' status, threats to anoas, and habitat condition in all areas of confirmed and possible range, including identification of isolated populations. • By 2014, determine species' status in areas of unknown range in South Sulawesi. • By 2016, achieve significant decline in poaching of the anoas and in habitat loss through awareness programs and law enforcement around 10 populations. • By 2018, 5 populations to be stable or increasing, one in each of the biogeographic regions.	• Maintain the secure Banteng populations in Ujung Kulon NP in Java (Indonesia) and Huai Khai Khaeng WS and the Eastern Forest Complex in Thailand. • Increase Banteng numbers in: • Nam Nao NP, Kaeng Krachan NP, and Dong Phra Yayen–Khao Yai Forest Complex (Thailand) by 2013; • Baluran NP (Java, Indonesia) by 2011, and Alas Purwo and Meru Betiri NPs (Java, Indonesia) by 2013; • Alaungdaw Kathapa NP, Bago Yoma Reserved Forest, and the proposed Mahamyaing WS (Myanmar) by 2013; • all Cambodian PAs by 2018; • stabilize the populations in the Ea So area and Yok Don NP (Vietnam) by 2013 and increase them by 2018. • Determine the species' range and status in Cambodia, China, Kalimantan (Indonesia), 6 PAs in Lao PDR, and Myanmar by 2013, and in Malaysia by 2018. • Reintroduce Banteng to Leuweung Sancang NR and Cikepuh GR in Java (Indonesia; both evergreen habitat types) by 2018 and Om Koi WS (dry forest mosaic) and Chumporn Forest Complex (evergreen forest) in Thailand by 2018.	• Maintain or increase as appropriate the priority populations in the Western Forest Complex and the Dong Phra Yayen–Khao Yai Forest Complex (Thailand), Taman Negara NP and the Belum and Temenggor Forest Reserves (Malaysia), and the Hukaung Valley / Hukaung Tiger Reserve (Myanmar). • Increase Gaur numbers in: • 2 Cambodian populations by 2013 and 2 Cambodian populations by 2018 • Khlong Saeng WS, Kaeng Krachan NP, Eastern Forest Complex, and Phu Khieo WS / Nam Nao NP (Thailand) by 2013; • Tanintharyi NP, Rakhine Yoma Elephant Range, Alaungdaw Kathapa NP, and the Pegu Yoma area (Myanmar) by 2018; • the Nam Et / Phou Louey NPA, Nakai Nam Theun NPA, and the Bolikahmxay populations by 2013, and all other populations in the Lao PDR by 2018; • Yok Don NP, the Ea So area, Cat Tien NP, and Chu Mom Ray NR (Vietnam) by 2018; • the Yunnan population in China by 2018; • the Endau–Kota Tinggi / Endau Rompin complex in Malaysia by 2013. • Determine the species' distribution in Cambodia, China, Lao PDR, Malaysia, and Myanmar by 2011. • Determine the species' distribution and status (population size/trend) in 10 populations by 2013 and the remainder by 2018. • Reintroduce Gaur to Vinh Chu and Dak Minh (*B. g. readei*, Vietnam) and Om Koi (*B. g. readei*, Thailand). • Augment (through translocations) the existing populations in Khao Luang NP (*B. g. hubbacki*, Thailand) and Krau GR (*B. g. hubbacki*, Malaysia) by 2018.	• 1A) Find any remaining Kouprey. • 1B) Create a genetic sample bank from trophies and other specimens held in private collections and museums. • 2) Secure any Kouprey found in the wild by creating a semi-captive protected ranch within the range State of origin. • 3) Evaluate the possibility of cloning Kouprey if none found are found in the wild / or if otherwise necessary (i.e. if too few wild animals are found to facilitate the establishment of viable populations).	• Communities, provinces and national governments of Saola range understand that the Saola is found only in their areas, is threatened with extinction and requires their support to survive, and this understanding is shared by the international community. • All areas currently with Saola still have Saola in 2018. • In 2018 the best estimate is that at least 350 adult Saola range free. • Saola conservation is officially recognised as a land use function of the 3 landscapes of 'the Northern Annamites', 'Kham-Sav-Tri-Binh' and 'Hue-Quang Nam'.	• Secure all three existing populations (Mount Iglit-Baco National Park, Aruyan and Calavite) of the Tamaraw by 2015 and ensure proper management by 2018. • Establish species' status in two (2) areas of possible range (Mapad & FBH- Mount Iglit-Baco National Park corridor) by 2013. • Develop and implement area-specific management plans, including habitat restoration plan for three confirmed ranges (Mount Iglit-Baco National Park, Aruyan & Calavite) by 2015 and for two possible ranges [depending on survey results] by 2018.	• Secure the three existing known populations of wild/wild type buffalo in Southeast Asia (those in Cambodia, Thailand, and Myanmar) by 2013. • Determine the status of wild, wild type, and feral buffalo in all remaining areas in all range States in Southeast Asia by 2018. • Secure any newly-identified populations of wild or wild type buffalo (and exceptionally interesting feral populations) in Southeast Asia within 5 years of discovery.

Objective	Objective target	Action
Maintain and, where appropriate, expand the area of wild cattle and buffalo habitat, and increase the proportion of that habitat that is well managed, to ensure the viability and ecological functionality of wild cattle and buffalo populations. For additional Objectives, Objective targets, and Actions please see the full example online at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf.	Well managed protected areas with priority populations of wild cattle and buffaloes maintain or where appropriate improve their management standards by 2013	Assess management of protected areas *Species:* Anoas, Banteng, Gaur, Tamaraw, Water Buffalo *Sites for Anoas:* Bogani Nani Wartabone, Panua-Nantu, Pati-Pati, Bakiriang, Morowali, Lore Lindu/Pegunungan Takolekaju, Matano, Pergunungan Verbek, Buton Utara, Lambusanga *Sites for Banteng, Gaur, Tamaraw, and Water Buffalo are also identified* (see full example online at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf).
		Review monitoring programmes and results in protected areas every 3 years *Species:* Anoas, Banteng, Gaur, Saola, Tamaraw, Water Buffalo *Sites for Anoas:* Bogani Nani Wartabone, Panua- Nantu, Pati-Pati, Bakiriang *Sites for Banteng, Gaur, Saola, Tamaraw, and Water Buffalo are also identified* (see full example online at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf).
		Improve protected area management and monitoring programmes where they are deemed in need of improvement *Likely sites:* Where appropriate based on reviews described above
	Appropriate management practices developed for other priority protected areas with wild cattle and buffaloes by 2013	Assess management of protected areas *Species:* Anoa, Banteng, Gaur, Saola, Tamaraw, Water buffalo *Sites for Anoa:* Pantai timur – pantai barat, Tanjung Peropa, Latimojong *Sites for Banteng, Gaur, Saola, Tamaraw, and Water Buffalo are also identified* (see full example online at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf *)*.
		Improve management and monitoring programmes of protected areas *Species:* Anoa, Banteng, Gaur, Saola, Tamaraw, Water buffalo *Sites for Anoa:* Pantai timur – pantai barat, Tanjung Peropa, Latimojong *Sites for Banteng, Gaur, Saola, Tamaraw, and Water Buffalo are also identified* (see full example online at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf).
		Review management results in protected areas every 3 years after strengthening management and monitoring *Species:* Anoa, Banteng, Gaur, Saola, Tamaraw, Water buffalo *Sites for Anoa:* Pantai timur – pantai barat, Tanjung Peropa, Latimojong *Sites for Banteng, Gaur, Saola, Tamaraw, and Water Buffalo are also identified* (see full example online at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf).

3. When should a Species Conservation Strategy be developed?

This chapter considers when new SCSs should be prepared. It discusses when single-species strategies are appropriate, and when multi-species strategies would be preferable. We argue that the SCS process may be applied to any level within the taxonomic hierarchy of species and species groups, and at any spatial scale. We also briefly address the need for resources and provide an example of one IUCN/SSC Specialist Group's fund raising strategy.

3.1 Getting started

Species-focused strategies are appropriate when the relevant IUCN/SSC Specialist Group or other authority for a species or a group of species deems coordinated conservation attention necessary. The need for coordination may arise because the geographic range of the species or species group straddles political boundaries or multiple ecological zones and so requires different political entities and groups of scientists, conservationists, managers, and policy-makers to act in concert, or it may arise because the level of threat is endangering the viability of key populations, their ecological functions, and/or their habitat.

Before embarking on the preparation of a new SCS, it is important to be aware that the process requires substantial effort, and that time, funds and personnel have to be available to develop the SCS. In addition, dedicated staff and resources will often be needed to implement the resulting SCSs.

One of the first steps required for strategic planning, therefore, will usually be to raise funds to support the process. Fundraising can, however, coincide with the equally necessary step of identifying and gaining the support of key stakeholders (see Chapter 4), as both governments and NGOs are more likely to support a process both financially and with their participation if they expect that it will meet their needs. Box 3.1 provides an example of the fund-raising strategy used by one of the Specialist Groups, the Tapir Specialist Group, to support their planning workshops. A well-developed and broadly endorsed SCS can be a great help in raising the funds and obtaining the agency and institutional commitments needed to implement the recommended Actions.

Apart from resources, developing an effective SCS ideally requires a great deal of data (e.g., on distribution, trends, and threats), and consequently a serious lack of information might be a reason to postpone development of a full conservation strategy. However, a lack of data should never be a reason to suspend all activity for a species. If vital data are lacking, it might be appropriate to develop a plan to research, survey, assess, and monitor the species, with the aim of collecting sufficient data to undertake the development of a more complete conservation strategy at a later date. In almost all cases, however, some important data will be missing, and part of each SCS will need to address further data collection needs. Often, the SCS process itself will lead to the recognition that more data are required to fully understand the threats to the species, or the best ways to mitigate those threats. Understanding such issues is key to ensuring that the recommended Actions will be adequate to save the species.

Box 3.1 How can funds be raised to support species conservation strategic planning?

The IUCN/SSC Tapir Specialist Group's (TSG) Population and Habitat Viability Assessment (PHVA) Workshops for all four species of tapirs had the financial support from 170 organizations worldwide.

3 Zoological associations (AZA, EAZA, WAZA)
29 American zoos
16 European zoos
23 Latin American zoos
4 Networks of the IUCN/SSC CBSG (including the regional networks in Brazil, Europe, and Mexico)
2 Local communities in range countries
16 International conservation organizations
16 NGOs in range countries
38 Governmental agencies (international and range countries)
21 Universities (international and range countries)
2 Airlines (American Airlines and Continental Airlines)

Support was provided in the form of donations (grants) to the workshops, coverage of organizing and travel costs, sponsorship for key participants, infra-structure and logistics for the meetings, and professional fees.

Photo 3.1 Lowland tapir (*Tapirus terrestris*) in the Pantanal region of Brazil, wearing a radio collar © Joares May Jr.

71 of these 170 organizations (42%) were zoological institutions in North America, Europe, and Latin America, because over the past years the TSG has established a long-term partnership with the Tapir Taxon Advisory Groups (TAGs) of the American and European Associations of Zoos and Aquariums (AZA and EAZA). The Tapir TAGs connect the TSG with tapir-holding zoos worldwide, which is fundamental in providing opportunities to link *in-situ* and *ex-situ* initiatives for tapir conservation, stimulating the exchange of data and information. The Tapir TAGs also provide the TSG with vital support for the design and implementation of fundraising campaigns for specific activities of the group, including PHVA workshops and Tapir symposia (e.g., Costa Rica in 2001, Panama in 2004, Argentina in 2006, and Mexico in 2008). To raise funds for these workshops and symposia, the TSG and the Tapir TAGs mainly approach zoos that currently have tapirs with support request letters (signed by the TSG's chair and both Tapir TAG chairs), about a year before a specific event.

Additionally, the chair of the TSG presents the TSG's work to zoo community members at the AZA and EAZA Annual Conferences, which includes explanations about how their funding has been used, and reasons why they should continue their support.

Finally, the TSG and Tapir TAGs provide all zoological institutions supporting the TSG with complete reports on PHVA workshops or Tapir symposia. These reports are sent with a letter of thanks, acknowledging the importance of their contributions. All institutions supporting the TSG are listed and acknowledged on articles published in *Tapir Conservation* (the newsletter of the TSG) and on the TSG Website (http://www.tapirs.org/).

The completion of a Red List assessment or updated species assessment (Baillie *et al*. 2004; http://www.iucnredlist.org) may be an opportune time to initiate the development of a SCS for those species that are listed as threatened. Red List assessments describe the broad status of the species, identify primary threats, and assess these data against defined categories of threat (IUCN 2001). Red List assessments are just estimations of extinction risk; they do not set out to be SCSs or action plans. They therefore do not contain the level of detail on status and threats to individual populations needed to plan conservation action, nor do they specify the actions needed to improve the species' status. Red List assessments can provide initial baseline data that would be expanded in the process of developing a SCS, and they can also justify the need for attention to the species or group of species. If a Red List assessment does not already exist for a given species, or is considered out-of-date, or if the species has been categorised as "Data Deficient", then the detailed Status Review conducted within a SCS process will allow for a Red List (re) assessment.

Other broad assessments of species in need of conservation action (such as many of the prior IUCN/SSC Action Plans and related conservation assessments that reviewed all the species within the remit of IUCN/SSC Specialist Groups) can also provide the impetus for a more detailed and genuinely action-oriented SCS. Similarly, the SSC Biodiversity Assessments (e.g., the Global Amphibian Assessment, IUCN, CI, and NatureServe 2006) may provide the first "port of call" regarding which species should be prioritized for SCSs.

A Specialist Group should not automatically be expected to take the lead in developing full SCSs for every species within their responsibility. A Group would decide to lead the development of a SCS for a species only if it has a functioning and representative membership that agrees to work together on the task with a broad array of other stakeholders, including both governmental and non-governmental entities.

We recognise that other conservation groups and management authorities will also be developing species conservation strategies, and we encourage such groups to use the approach and tools described in this document in their own strategic planning efforts. We also encourage them to make use of the expertise available within the IUCN/SSC Specialist Groups and to engage with the appropriate Specialist Group(s) to develop comprehensive SCSs that provide coordinated plans for working in collaboration towards species conservation.

3.2 Taxonomic scope: single, few, or many species?

In the past, IUCN/SSC Specialist Groups often developed an Action Plan that aimed to provide the best current information and conservation recommendations for the entire taxonomic group under their mandate (see Chapter 1). These compendia were and remain valuable, but they often were primarily surveys of species' status. In contrast, the approach that we describe in this Handbook includes a detailed Status Review, a Vision of what it would mean to save each species, specific Goals, Objectives to be achieved, and detailed Actions that should be adequate to achieve the defined measures of success for each species. This more complete concept of a conservation strategy for a species requires a more focused effort, especially as it involves many stakeholders with interests in the conservation of the species (see Chapter 4). Thus, a Specialist Group would not normally develop a single SCS for all those species within its mandate, unless that covered relatively few species. Instead, they would more commonly develop a SCS for one or a few species each time that the need and opportunity arose.

Although the concept of a SCS is typically focused on one or a few species, much of the fundamental SCS framework can be applied to the spectrum of taxonomic groupings, from single or few species to more speciose groups. SCSs can also be applied across the spatial range, from taxa having wide geographic distributions across many countries, to those with extremely restricted geographic ranges. SCSs may be prepared for single species or closely related groups of species, or for larger numbers of different species that share a common habitat type or geographic area, or for sets of species which face similar threats or are involved in interacting ecological relationships (e.g., predators and prey).

It will often be useful to include several species within one SCS if it is expected that the threats and Objectives will be similar, even when the specific Goals and Actions may be somewhat different. In some instances, a SCS may cover a multitude of species and still appropriately have species-focused Goals, Objectives, and Actions, if groups of species require similar conservation responses (see Table 2.1). For example, conserving some invertebrate groups may require planning for thousands of poorly known species; developing individual species-by-species strategies would be impossible for such groups. However, under such circumstances it might be valuable to conduct Status Reviews that consider geographic range, habitat requirements, threats, and changes in abundance and distribution (and possibly species richness) for a group of similar species within an area. Additionally, stakeholders might agree to a common Vision and Goals for the set of species, Objectives might define what needed to be accomplished to ensure protection of the suite of species, and Actions could be determined that would result in meeting those Objectives. An example of a strategic planning approach that applies many of the concepts of a SCS to a group containing a very large number of species can be found in the European Strategy for the Conservation of Invertebrates (Haslett 2007); more detail is provided in Box 3.2.

Regardless of the species for which planning is being conducted, we suggest that all the components of a SCS, as outlined in this document, should be considered for inclusion. However, the details of conservation planning and the emphasis, nature, and level of detail for the various components of the SCS may be quite different from SCS to SCS. For example, a single-species plan might be able to provide documentation of estimated numbers of individuals, extent of occurrence, detailed threats to each population, and in-depth risk assessment using a tool such as PVA, and might recommend Actions focused on each population considered within the Vision to be an essential component of the species. In contrast, a SCS for a large number of species will necessarily take a higher level view of each of these components. Such a multi-species strategy might tally species richness, trends in abundance of multiple-species guilds, and changes in the extent and quality of habitats utilized by the group, and might have relatively more emphasis on setting a broad Vision and Goals, and determining Objectives, with Actions more broadly defined than those in a single-species strategy.

Factors or species characteristics that would indicate that a single species could be the appropriate focus for a SCS include:

- The species has a high risk of extinction (as indicated by Red List status).
- Data are available on the species' distribution, status, and threats.
- The species has a major ecological role, such as being a keystone species.
- Conservation of the species will require protection and management of large areas of habitat, thereby serving as an umbrella for protecting biodiversity.
- The species faces unique threats.

- The species is very important to humans, economically or culturally.
- There is an opportunity to develop a SCS for the species, afforded by strong interest by those with data, resources, or responsibility to implement conservation actions.

Box 3.2. Components of a conservation plan for a speciose group

Vision: A world in which invertebrate animals are valued and conserved, in parallel with all other groups of organisms, now and in the future.

Photo 3.2 A stag beetle (*Lucanus cervus*) in Gablitz, Austria
© Hans Svadlenak

Goal: To halt the loss of invertebrate animal diversity in Europe.

Objectives

Objective 1: Raise awareness and alter human attitudes and behaviour towards the importance of conserving invertebrate animals.

Objective 2: Promote integrated management of landscape mosaics at the relevant scales to be sustainable for invertebrates;

Objective 3: Strengthen European to national/ local invertebrate conservation policy and action

Objective 4: Identify and prioritise key actions to be implemented at different political and geographical levels.

Objective 5: Promote accessibility and efficient flow and exchange of information on invertebrates within and between the scientific and public domains;

Objective 6: Promote inclusion of a fully representative variety of invertebrate species in conservation and environmental management decisions, including integration of invertebrate conservation into existing and future conservation strategies involving other organisms

Objective 7: Build scientific and technical capacity for the conservation of invertebrates and identify areas of urgent further research.

The Strategy includes a chapter outlining **issues and threats** to invertebrate conservation (inventory, mapping; preventing habitat destruction, invasive species, etc.), followed by a list of key **Actions** for responding to each issue.

Source: *European Strategy for the Conservation of Invertebrates* (Haslett 2007)

In contrast, factors that could lead to a multi-species conservation strategy include:

- Limited data are available on the distribution of and threats to each species.
- Multiple species share largely overlapping ranges and habitats.
- A guild of species with similar ecological roles is of concern.

- There are common threats to a group of species.
- There are limited resources for or interest in multiple plans for individual species in a group.

Multi-species strategies would most commonly be prepared for a group of related species (e.g., the Asian Wild Cattle and Buffaloes Conservation Strategy described in Chapter 2), but it might also be beneficial to design such strategies for a group of species that have common ecological roles e.g., pollinators), share habitat (e.g., reef fish), are linked by strong ecological relationships (e.g., a predator and its prey), or face similar threats in similar areas and at similar spatial scales (e.g., cheetahs (*Acinonyx jubatus*) and African wild dogs (*Lycaon pictus*); IUCN/SSC in press). It may also be appropriate to develop a higher level SCS for a group of species, with more detailed species-specific SCSs for a few representative, threatened, or focal species from the group.

As more species are included, the SCS may take on more of the characteristics of an area-based conservation plan (e.g., Bottrill and Pressey in press), as the Objectives and Actions will often be focused more on protection of the areas of habitat on which the suite of species depends than on measures to protect each species individually. If the group of species is vulnerable to a common threat (e.g., over-exploitation), however, then a threat-based SCS might be needed to address the cause of the threat (e.g., by reducing demand) beyond just protecting areas of habitat. Usually there will not be a rigid demarcation between species-centred conservation plans, area-based plans, and threat-based plans, with plans focused at any of these dimensions often requiring attention to the others as well. For example, a conservation strategy for an important conservation area will often need to include specific Actions to protect a few keystone species within it, while a SCS will need to ensure that the ecological communities and systems on which the species depends continue to maintain their structure and function. Finally, we note that a species-focused conservation strategy may not be appropriate at all for some very speciose groups, if there are insufficient data to define threats to any of the species, or if the different species have ecologies, threats, and conservation needs that are too dissimilar to be addressed within a common strategy.

4. Who should be involved in developing a Species Conservation Strategy?

This chapter elaborates on why broad-based stakeholder engagement and participation in all planning stages of a SCS are essential to achieving effective conservation. The chapter emphasises the importance of identifying the right participants in the SCS process, and outlines the role of IUCN/SSC Specialist Groups in the development of SCSs.

4.1 Introduction: the need for a participatory multi-stakeholder approach

To ensure that SCSs have the best chance of being implemented, the SCS process emphasises **multi-stakeholder participation**. Range State government staff and conservation NGO staff, other conservation specialists (such as law enforcement specialists), species specialists (some of whom may of course work for government agencies and NGOs), representatives of local communities or local authorities (when appropriate), the private sector (for example, logging or mining company representatives, or tourism operators), and other key stakeholders should be explicitly included in all steps. That is to say, representatives from all these stakeholder groups should participate in the Status Review part of the process as well as in defining the Vision, Goals, Objectives, and Actions.

Photo 4.1 Masked Booby (*Sula dactylatra*) in the Galapagos Islands © Robert Lacy

Too many Action Plans over the years have been shelved because they were written by international species specialists with little or no input from other stakeholders, particularly range State government stakeholders whose authority is critical for implementation. Challenging as it may sometimes be, broader participation is necessary if SCSs and Action Plans are to be more than biologists' "wish lists".

Range State government participation is necessary for the Status Review stage of the SCS process as well as all the subsequent stages. Clearly, in many cases, the relevant species specialists will have the best data on distribution and abundance, but often range State government staff will also have valuable data on the species. In addition to providing valuable data, participants representing range State authorities can ensure that the results of the Status Review are accepted by their organizations: in some instances the results of Status Reviews were rejected by range State governments, because the workshops were conducted predominantly or solely by species specialists. The government representatives, not having been involved in the Status Review, may have felt alienated, or did not understand or agree with the basis of the biologists' conclusions about status. Moreover, in some cases they rightly pointed out omissions and/or errors in the data.

Another important point is that involving range State stakeholders in the Status Review part of the process can help to highlight the need for better data-gathering using standard methods, in those cases where their own data are out of date or based on suboptimal methods.

Finally, the Status Review part of the process contains the vitally important threat analysis, and range State agency participants (and other local stakeholders) often have good data on threats that are not necessarily available to other species specialists. There will often not be species specialists working in (or even familiar with) all range States, and so range State government participants may be the only source of data for some countries or parts of some countries (see Chapter 6 for a discussion of maintaining and coding data reliability when data come from multiple participants). Furthermore, when the threat analysis is expanded to a broader problem analysis, identifying both threats and constraints (direct and indirect threats) (prior to drafting the Objectives), range State participants (especially range State authorities at various levels) usually have the best first hand knowledge about what prevents them from achieving Goals (see section 7.2 for more detail).

Clearly, the relevant specialists for the species concerned have to be involved in developing the Vision, Goals, Objectives, and Actions. In addition to being stakeholders in their own right, such species specialists are often best placed to formulate the "species' eye view" that the overall SCS should promote in order to best conserve the species. However, it bears repeating that it is also vitally important for range State stakeholders to be involved in this process because of their understanding of the context in which the conservation activities will be conducted, and because they (and not IUCN/SSC) are mandated to implement Actions, so their participation is a prerequisite to achieve the sense of ownership and responsibility for the SCS that leads to an enabling political environment and to implementation of the SCS's recommendations.

4.2 Identifying stakeholders and participants for the SCS process

The identification of appropriate *stakeholders* as potential participants in a SCS workshop is a crucial early design step.

At a strategic level, if the right people with the right kinds of information and the proper motivation for participating are present at the workshop, significant progress can be made on crafting truly effective strategies and plans. Ensuring a good balance of different stakeholders is also crucial: a SCS workshop should not be dominated by any one group (e.g., academics or NGO staff). Participants should include people with the authority to make conservation decisions from the range States, as well as range State resource managers (e.g., national park directors), not least because such senior officials can also motivate their staff to put the SCS into practice and put in place monitoring measures to see how well the plan is being implemented.

IUCN/SSC Specialist Groups are often well placed to identify suitable participants because of their broad membership, which typically encompasses people from multiple range States, including resource managers, all or most of the big international NGOs, and a range of specialists on relevant subjects (from taxonomy and ecology to practical wildlife management and law enforcement).

At the range-wide or regional level, SCSs are best developed at workshops attended by higher-level range State government representatives, species specialists, other conservation specialists, and representatives of major NGOs (there may of course be overlap in these categories). These regional workshops should then be followed by a series of national or local action planning workshops (see Chapter 9), which will be attended by many more range State participants, including additional government staff (e.g., lower-level staff such as park wardens), as well as national and international NGO staff and other species specialists.

Box 4.1 ***Who are stakeholders?***

A stakeholder, in the present context, is defined as an individual or institution that demonstrates some combination of *concern* (about the outcome of a SCS process), *expertise* (i.e., has information or resources required to conduct the SCS process), and/or *power* (i.e., is able to either block or facilitate recommendations which result from the SCS process). Taken together, a potentially valuable stakeholder can either significantly affect the formulation of recommendations at the workshop, and/or be significantly affected by them. This concept is represented by a simple matrix (Figure 4.1), whereby individuals can be assessed for their relative value as SCS workshop participants. This approach is particularly valuable when a large number of potential invitees must be reduced to a more manageable size for optimal workshop conduct.

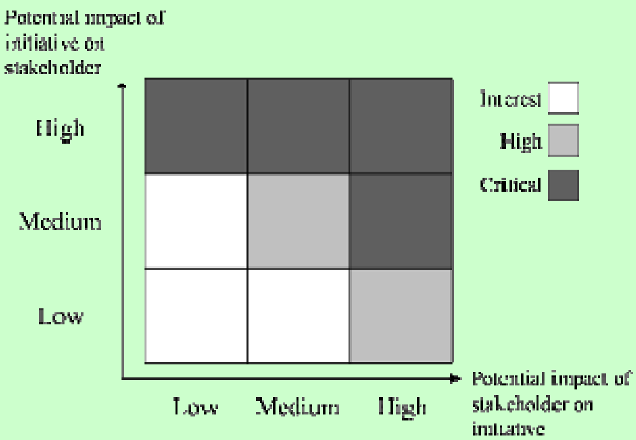

Figure 4.1 Simple matrix-style approach for categorizing stakeholders during early stages of SCS workshop design (adapted with permission from Frances Westley, University of Waterloo)

4.3 The role of IUCN/SSC Specialist Groups

IUCN/SSC Specialist Groups can and, in most cases, should play a number of roles in the SCS process. For example, a Specialist Group will, as a result of its Red Listing activities, have a clear idea of priority species for which to prepare SCSs. The Specialist Group may also organize the collation of data for the Status Review, and convene the strategic planning workshop in which the Status Review will be reviewed and/or revised and the rest of the SCS developed. Specialist Group Chairs and other members should be involved in identifying the most appropriate participants and ensuring good representation from range State governments and other key stakeholder groups.

Another role that particularly lends itself to Specialist Groups is maintaining an up-to-date database on the species' status and distribution following the Status Review. The IUCN's neutral inter-governmental status has in the past given governments confidence about submitting data to SSC-maintained databases, which they would probably not have done had the database been maintained by an NGO. A good example of this role is the African Elephant Database, which is maintained by the African Elephant Specialist Group on behalf of the African elephant (*Loxodonta africana*) range States. Another example is the African Rhino Specialist Group, which has routinely (every two years) updated continental population statistics since 1991.

The Specialist Groups are also well positioned to coordinate and monitor the overall progress of implementing the range-wide or regional SCSs, as well as some national or local Action Plans. Nonetheless, it may often be necessary to invite additional stakeholders from outside the Specialist Groups to help play with this promoting and monitoring role, especially if these additional stakeholders were involved in developing the Vision and the wider SCS. This could be achieved through the creation of conservation strategy and action planning working groups within each Specialist Group.

Box 4.2 illustrates how a Specialist Group created an Implementation Taskforce to promote implementation of their Action Plan. Alternatively, other groups that include IUCN species specialists as members could be formed to do this; an example of this approach could be the SADC Rhino Management Group for managing and updating the South African black rhino conservation strategy.

Box 4.2: ***The Tapir Action Plan Implementation Taskforce***

The Tapir Specialist Group has established an Action Plan Implementation Taskforce and charged it with the responsibility of:

- **Publicising** the new Tapir Action Plan throughout all tapir range countries in Central and South America, and Southeast Asia, reaching all possible stakeholders and key conservation players;
- **Promoting the active use** of the new Tapir Action Plan as the main source of information for all organizations directly or indirectly involved with tapir conservation in the range countries and internationally;
- **Leading a constant process of review, updating and adaptation** of the Tapir Action Plan, incorporating any evolving and emerging tapir conservation needs identified through this process. *Note:* The new Tapir Action Plan is a "*living document*" – not printed – only available online on the TSG website (in all appropriate languages);
- **Maintaining the network** of professionals and organizations formed during the process of organizing and holding the PHVA Workshops;
- **Providing technical assistance** for any professionals/organizations aiming at **raising funds** to implement actions of the Tapir Action Plan; assisting with proposal development and review, translations, identification of potential donors, proposal endorsement, and lobbying;
- **Providing institutional support** for any initiatives aimed at **implementing actions** of the Tapir Action Plan: endorsement, discussions and negotiations with interested parties and potential partners, establishment of partnerships, and political lobbying;
- **Keeping in close contact with the persons who committed** to put in practice all the actions listed as priorities and make sure they work on their actions accordingly with proposed deadlines;
- **Reporting** back to the TSG membership on a regular basis.

5. Status Review

This chapter describes the process of preparing a Status Review for a species or group of species. The purpose of the Status Review is to compile data on all the factors relevant to the species' current conservation status, including sections on species description, function and values, historical account, current distribution and demography, habitat and resource assessment, threat analysis, and ongoing conservation and management actions. The Status Review process should be broad-based and participatory. How it is conducted will depend on the data available on the species and the resources available to the planning group.

5.1 Introduction

The Status Review provides a summary of all the factors relevant to the species' conservation status. It summarises information and analyses about the current and historical biological status of the species, and the species' socio-economic and cultural importance. Status Reviews should ideally assess the species' status at a range-wide level, whether that range be a continent or only a single watershed. They should also be spatially explicit to the extent possible, supported by appropriate geographic information system (GIS) analyses and other metadata, where available, but also including other relevant datasets on demography, threats, and current conservation efforts. Status Reviews should be conducted using protocols which allow the available data to be collated in a standardized way. They should include summaries of recent surveys, distributional patterns, populations, population sizes and trends, threats, the species' socio-economic and cultural importance, legal status, and existing actions, as described below.

In other contexts, Status Reviews might be called status reports or species profiles. They have been an important part of Action Plans in the past, although they have tended to be less comprehensive in scope, less meticulous in documenting metadata, and less critical of the quality of the data and their interpretations than outlined here.

As we have already emphasised, the Status Review should rely on a critical and inclusive analysis of scientific data and traditional knowledge, and should be inclusive of all the major stakeholders who will also have been invited to participate in the larger conservation planning process. To be of use to these stakeholders, the information collected in the Status Review needs to be reliable, which means that it should be well-documented, attributed according to quality and source, and, where possible, subjected to peer-review, according to guidelines described below. To the extent possible, the information collected during this review should be placed in the public domain. Workshops provide opportunities for synthesizing data, discussing the implications of the data, and data sharing. We stress here that a misleading Status Review may yield inappropriate Goals and Objectives, and poor criteria by which to gauge the success of a conservation strategy.

The Status Review mechanism we describe draws on protocols that are well-established in the scientific literature and in conservation planning practice, including past IUCN Status Surveys and Conservation Action Plans and procedures from the Range-wide Priority-Setting (RWPS) process (Sanderson *et al.* 2002), species recovery planning (Crouse *et al.* 2002) and the PHVA process (Westley and Miller 2003). It differs from past IUCN guidelines in placing emphases on demographic and spatial data at various relevant scales (e.g., range-wide, ecosystems, populations), and on the factors affecting population dynamics, including threats from human activity.

The Status Review will allow stakeholders to formulate well-grounded Objectives (see Chapter 7) and Actions (see Chapter 8), based on a transparent reading of current information on species status. As the Status Review is often conducted in tandem with the Vision and Goal setting process (see Chapter 6), the review can help formulate realistic Goals and add detail to the Vision. Over time, subsequent updated Status Reviews will provide a mechanism to evaluate progress toward achieving the Vision and Goals.

5.2 How to conduct a Status Review

As we have already mentioned, a Status Review requires broad collaboration. No one person or agency has a monopoly on knowledge of the status of a species. Participation should be as broad as possible and, at a minimum, representative of all the major ecological settings and nations where the species can be found. It should include input from scientists, managers and local stakeholders to the extent practicable. For example, range State agency participation is important, to ensure that the Review results are well-informed and broadly accepted in the nations where the species is found. Scientists, policy makers, managers, and local people all may have information concerning the status of the species.

Ideally the Review should be based on “hard data”, including rigorously conducted surveys, estimates of population size, population trends, rates of population growth or decline, reproductive rates, and rates and causes of mortality; quantitative evaluation of extent, quality, and rates of change in habitat; and assessment of rates and effects of human exploitation, among others. Often, however, these data are incomplete or entirely lacking, demanding inference of species’ status, for example from second-hand reports of sightings or “expert” opinion. Collation of data from the so-called “grey literature” can be a useful side-product of the Status Review process, as often many of the data are difficult to find or access.

In addition, the Red Listing process may provide valuable information at the species scale. Although Red List data may be useful, the Status Review process differs from Red List assessment in that its focus is on the detailed information necessary to the conservation planning process, whereas the aim of the Red Listing process is to assign categories of threat status for the species as a whole.

To make different kinds of data work together, the Status Review process depends on mechanisms for data assimilation, identification, and characterization, as described below. Data assimilation methods combine data from diverse sources into a common system. Data identification means that each individual datum is identified by its source, its date and its location. Data characterization means that metadata describe the certainty with which data are known using standardized categories, and how the data were generated.

It is equally important for the Status Review to be transparent and systematic. Species should be assessed according to standardized guidelines and using methods that are clearly documented. Data contributors, analysts, and reviewers should all be identified. Synthetic databases produced as part of the Status Review, including tabulated population estimates, graphs of population trend, maps and GIS layers, should be made broadly available in the public domain. Data should include adequate metadata describing sources, methods, and data-quality. Data providers should ideally agree at the start of the process to the release of the generalized and summary data (not necessarily the raw data, of which

Box 5.1 ***Introduction to Geographic Information Systems (GIS)***

GIS are a set of computer hardware and software tools for analysing spatial data. GIS data layers contain both a mapped representation of the information (commonly as points, lines, polygons or grids) and the associated attribute information, as in any kind of computer database. For example, a GIS data layer of species locations may show points where those locations were made on a map as well as information about who made each observation, and how and when it was made. GIS are particularly helpful when collating large amounts of spatial data or when analysing data in relationship to each other (e.g., how do threats relate to species distribution?) Examples of species conservation planning conducted with GIS include Sanderson *et al*. 2002; Thorbjarnson *et al*. 2006; Dinerstein *et al*. 2007.

Numerous GIS platforms are available. The Environmental Systems Research Institute Conservation Program provides GIS software at reduced costs for conservation organizations.

some people may be protective) into the public domain. Such releases should be sensitive to the research requirements of the people who contributed the data, and the potential for misuse, but not to the extent of delaying the release unduly or restricting the access to the data unnecessarily.

We recommend that the Status Review consist of seven sections, as outlined below. The mechanisms to assemble this information will probably include a combination of workshops, literature synthesis, correspondence, document preparation, and peer review. Examples of elements of the proposed system can be found in IUCN Status Survey and Conservation Action Plans (e.g., Sillero-Zubiri *et al.* 2004; Oldfield and IUCN/SSC Cactus and Succulent Specialist Group 1997; Meine, Archibald, and IUCN Crane Specialist Group 1996; Moore and IUCN/SSC Odonata Specialist Group 1997; and in associated databases, like the African Elephant Database (Blanc *et al.* 2007)). Many of the elements we outline below are incorporated in the RWPS process (Sanderson *et al.* 2002), and in the PHVA (Westley and Miller 2003) process; both are described in Chapter 10.

5.3 What does the Status Review contain?

We recommend that the Status Review contain the following sections.

5.3.1 Species description

This section includes the relevant systematic and phylogenetic information related to the species or other taxonomic unit for which the SCS is being conducted. Species should be identified by scientific names and common names (in major languages from the range countries). This section should also include a photograph or drawing of the species (or representative examples, in the case of multi-species groups). Previous conservation assessment information, including Red List status and/or other national and international recognition (e.g., CITES listings), and prior conservation status and actions, including any existing Action Plans, should be described. Relevant morphological, behavioural, genetic, and ecological aspects of the species' biology should also be summarised in this section, with an emphasis on those attributes that make the species prone to various threats (e.g., long generation times, required habitat dependencies, low genetic diversity, etc.). Key citations from the scientific literature regarding the species' biology should be included.

Summaries of this information are becoming increasingly available through IUCN's Species Information System (SIS) and global assessments (e.g., Global Amphibian Assessment, IUCN, CI, and NatureServe 2006; Global Mammal Assessment, IUCN/SSC 2008) and provide a useful starting point.

The Status Review should also include a description of the species' legal status across its/their geographic range, including in relevant national jurisdictions. Table 5.1 shows an example of a table describing both threat status and legal status of African wild dogs.

Table 5.1 Example of a table showing threat status of African wild dogs and degree of protection (Woodroffe, Ginsberg, and Macdonald 1998).

Country	Status of wild dogs	Date	Degree of protection	Date
Algeria	rare?	1989	?	–
Angola	rare?	1987	total?	1957
Benin	extinct?	1987	?	–
Botswana	present	1996	partial	1979
Burkina Faso	extinct?	1987	partial	1989
Cameroun	present	1992	partial?	?
Central African Republic	present	1987	total	1984
Congo	extinct	1992	total	1984
Côte d'Ivoire	rare?	1987	noxious	1965
Eritrea	extinct?	1992	?	–
Ethiopia	present	1995	total	1972
Gabon	extinct	1987	?	–
Ghana	extinct?	1987	partial	1971
Guinea	rare	1996	total	1990
Kenya	present	1996	partial	1976
Malawi	rare	1991	partial	?
Mali	extinct?	1989	?	–
Moçambique	rare	1996	total	1978
Namibia	present	1996	total	?
Niger	extinct?	1987	total?	?
Nigeria	extinct?	1991	total	1985
Rwanda	extinct	1987	total	1974
Sénégal	present	1996	partial	1986
Sierra Leone	rare?	1996	?	–
Somalia	rare?	1994	total	1969
South Africa	present	1996	specially protected	?
Sudan	rare	1995	total?	?
Swaziland	extinct?	1992	?	–
Tanzania	present	1996	total	1974
Tchad	rare	1987	?	–
Togo	rare?	1987	partial	1968
Uganda	rare?	1996	?	–
Zaïre	extinct?	1987	partial	1982
Zambia	present	1994	total	1970
Zimbabwe	present	1992	partial	1990

5.3.2 The species' functions and values

This section considers the current cultural, socio-economic, religious, legal, ecological, and other significance the species may have to people. The section should highlight ecosystem services connected to the species and any use- and non-use values the species may have (discussed in more detail in Chapter 10), both within and outside the species' geographic range. In addition, the species' ecosystem functions should be discussed, including predator-prey dynamics, competition, mutualisms, and the species' role in creating or changing ecosystems (e.g., beavers creating dams, elephants' destruction of trees, etc.). An example of the North American bison's (*Bison bison*) ecological functions is provided in Table 5.2.

Table 5.2 Ecological Functions of North American bison (Sanderson *et al*. 2008)

Ecological Function	Representative Reference(s)
Creation of landscape heterogeneity through grazing and wallowing	Polley 1984; Coppedge *et al.* 1999
Nutrient redistribution	Frank and Evans 1997
Competition with other ungulates (e.g., elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), caribou (*Rangifer tarandus*), moose (*Alces alces*))	Fischer and Gates 2005
Prey for wolves (*Canis lupus*), grizzly bear (*Ursus arctos*), and humans	Haines 1995; Smith *et al.* 2000
Habitat creation for grassland birds, prairie dogs (*Cynomys*), and other commensals (e.g., black-footed ferret (*Mustela nigripes*))	Johnsgard 2005
Provision of carcasses for scavengers and as a localized nutrient source	Green, Mattson, and Peeke 1997; Towne 2000
Opened access to vegetation through snow cover	Hawley and Reynolds1987
Modification of and use of fire regimes	Fuhlendorf and Engle 2001
Disturbance of woody vegetation by rubbing	Coppedge and Shaw 1997
Provision of bison wool for small mammals and nesting birds	Coppedge and Shaw 1997

5.3.3 Historical account

This section should provide a summary of the species' history, including its historical distribution, and explain briefly how the species came to be of conservation concern and what major threats there have been. A well-documented historical distribution of the species would include maps (and corresponding GIS layers) which could, in most cases, provide an outer bound of the conservation planning area.

The historical distribution or extent of occurrence map can provide the basis for evaluating a species' present and potential range; it need not, however, necessarily be the same as the target area for species conservation that will be defined in a SCS. For example, in an era of climate change species distributions are likely to shift over the next decades, and this will have to be considered when preparing a SCS. The word "historical" also requires definition. We suggest that the historical period should reflect a time when modern human societies were not the major constraint on the species' geographical range and the species had not, as far as this is known, experienced major range loss because of human activity. For example, for jaguars (*Panthera onca*), a planning team selected approximately the year 1900 (Sanderson *et al.* 1999); for tigers (*Panthera tigris*) another planning team selected the year 1850 because of significant hunting in the latter half of the 19th century (Dinerstein *et al.* 2007). For bison, another group selected the year 1500, recognising the major range collapse of bison from the eastern North American forests in the 18th century and the major collapse on the central North American grasslands in the 20th century (Sanderson *et al.* 2008).

Historical distributions are notoriously difficult to establish and can probably never be defined with certainty. When mapping historical distributions, the planning team should consider historical records (taking into account the records' provenance and assessed reliability), known habitat affinities, and changes in the human landscape (e.g., human population density, land-use, etc.) over time. Source material and any assumptions should be carefully documented. The map itself should be prepared as a GIS layer and documented with appropriate metadata. An example of a historical distribution map for tigers is shown in Figure 5.1. This map shows that tigers now occupy 7% of their historic range.

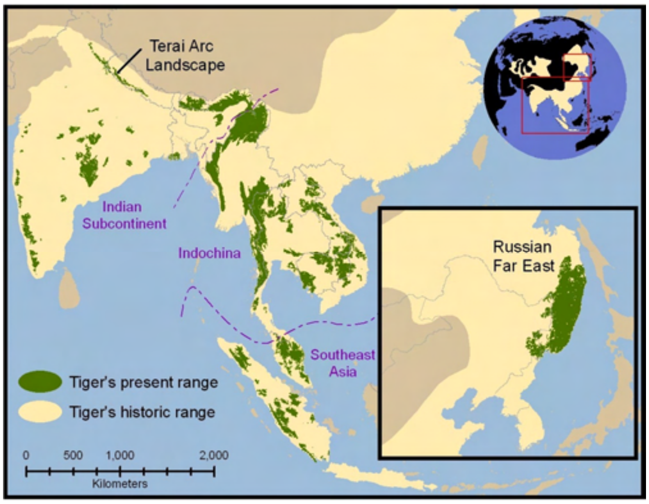

Figure 5.1 Historic and present range map for tigers
Source: Save the Tiger Fund. Online at http://www.savethetigerfund.org/Content/NavigationMenu2/Initiatives/TCL/default.htm (accessed 25 July 2008).

For some species, historical information related to population size is also available. Ideally some measure of certainty and quality should be attached to these data. For example, hunting harvests, sighting records, or rough counts from the past might provide a relative gauge of a change in abundance compared to present data.

A simple comparison between present and historical distributions can be deceiving without further context. For many species, the present range is only a fraction of the historic range, but judging species status based solely on the occupied proportion of historic range can be misleading; other factors should be taken into account. The value of the comparison is the realization of how much the geographical circumstances of the species have changed through time.

The historical account is an overview of how the species got to the state that it is in today. Many species are still suffering from low populations due to past threats, even if those threats have now subsided. For example, small, remnant populations that were heavily exploited in the past may continue to shrink, even with greatly diminished levels of exploitation. Likewise, habitat losses from the past may be unrecoverable given current trends in human population size and economic development. The present status of a species is very much a function of, and should be viewed in terms of, historical threats.

On the one hand there are species that persist in some areas that were historically marginal range, because they have been displaced from the best portions of their range, and hence they have very little demographic resilience. On the other hand there are species that were reduced to small, remnant populations, but are now recovering. For the latter type of species, a snapshot of present status would suggest a poor status, but in contrast to their historical near-elimination, they are presently doing relatively well (e.g., brown bears (*Ursus arctos*) in some European countries). In general the aim is to provide historical context to understand the current distribution.

5.3.4 Current distribution and demography

This section summarises the current status of the species, including both spatial and demographic data. The distribution information should include synthesised map layers documenting (a) locations of recent surveys for the species, and their results with appropriate data characterization (see below); and (b) the current distribution, categorized by level of confidence according to standardized categories (e.g., definite, probable, doubtful, extirpated, reintroduced, unknown, etc.). Each of these data should be attributed by their source, date, and method of collection, with standardized metadata. At a later stage in the SCS process, once the Vision and Goals have been developed, it may also be useful to add information on important population units, where conservation Actions (including restoration where relevant) might be conducted.

5.3.4.1 Recent survey locations

Recent survey locations (including sometimes opportunistic observation data as well as data from standardized surveys), often referred to informally as “point” data, are critical to the interpretation and lasting value of the Status Review, as they represent the primary data about the species. Such data should be collected and assimilated to a consistent spatial and temporal scale using a grid or system of circular plots (e.g., combining all observations within a given radius and over a one-year period) or other standardized spatial framework that will not change over time. Observations should also be summarised temporally, limited to a time frame relevant to conservation planning for the species (e.g., 5–10 years, depending on the rate of species loss). For the better surveyed species, such as African elephants, there will be population size estimates with confidence intervals that apply to areas (e.g., national parks). In such cases, describing a survey could additionally be done by having a polygon associated with a survey area (Blanc *et al.* 2007).

All areas surveyed should be coded by the name of the observer(s), the period, and the methods used to find the species, and the results of the survey. Where appropriate, a measure of search effort should be provided. Example data forms can be downloaded from http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch5_jaguar_forms.pdf, http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_AWCB_forms.pdf, and http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_cheetwd_forms.pdf.
The set of forms at the last weblink also contains some useful instructions to participants on GIS mapping.

Where additional information is obtained at the same scale, for example about abundance, population trend, reproductive status, and/or mortality, this information should be linked to the point data or polygon data, as described in the following section. Note that it is

Box 5.2 Assessing point location data in a Status Review of the African wild dog

The African wild dog is a species which lives at very low population densities and ranges widely. These characteristics make it difficult to survey, and most point locations were sightings made opportunistically by a large number of trained and untrained observers. Participants contributing sighting data were therefore asked:

- whether photographs were available to confirm the sighting; and
- what type of person made the observation (categories were: self, experienced observer (e.g., biologist or guide), untrained observer (e.g., herder), inexperienced observer (e.g., first-time tourist)).

It is difficult to translate opportunistic sightings of wild dogs into estimates of the species' range, because dispersing animals may travel hundreds of kilometres and so can be sighted in areas lacking resident populations. Dispersal groups are usually small and consist of adults animals of a single sex. To try to distinguish dispersal groups from resident packs, participants contributing sighting data were therefore asked:

- how many dogs were seen;
- whether pups were sighted and, if so, their size relative to the adults;
- whether the observer was confident they had seen the whole group;
- whether an adult male was seen;
- whether an adult female was seen.

Source: IUCN/SSC in press.

important to include data from surveys where the species was sought, but not observed, as well as from surveys which successfully observed the species. Surveys that do not locate the species (sometimes also called negative data) are important to retain; they may provide indications of absence or the need for additional search effort. An example of a map of recent survey locations for jaguars is shown in Figure 5.2. Box 5.2 provides an example of assessing point location data for African wild dogs.

Point data and polygon data also need to be characterized according to their reliability using a standardized system of data codes. These codes reflect the inherent differences in reliability of different observation methods (not differences in observers) and should be agreed to as part of the Status Review. See examples in Blanc et al. (2007), McGowan, Gillman, and Dodd (1998), McGowan and Gilman (1997), IUCN/SSC (in press), and IUCN/SSC (in review).

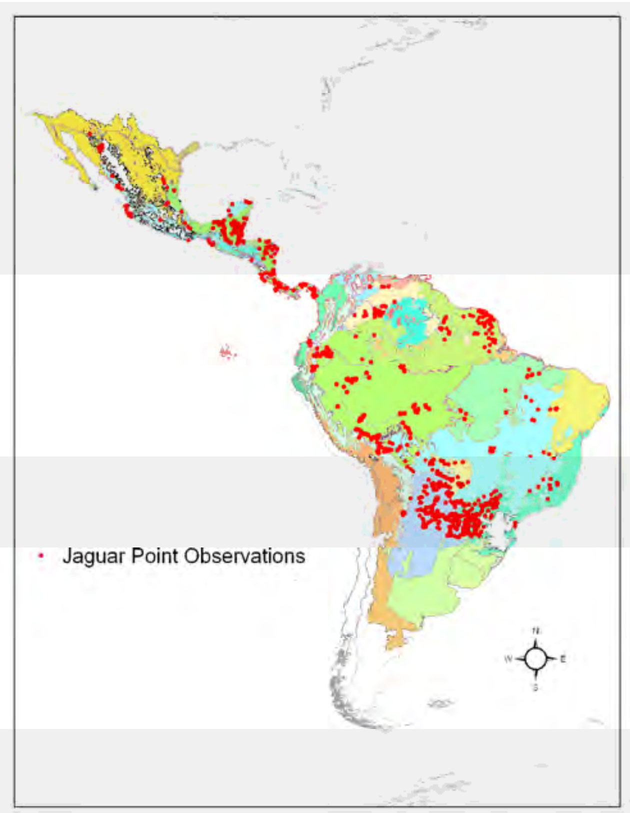

Figure 5.2 Map of recent survey locations for jaguars
Source: Sanderson *et al.* 2002.

5.3.4.2 Current Distribution (including Extent of occurrence and Area of occupancy)

Although recent survey locations (5.3.4.1) provide the most precise information about species distribution, they usually represent only samples from a larger geographic distribution. For planning purposes, it is useful to have distribution maps which convey the current distribution of the species in a manner which is comparable with the historical distribution.

These current distribution maps can be developed in a few different ways. The Red List Criteria for Critically Endangered, Endangered, and Vulnerable Species refer, among other parameters, to “extent of occurrence” and “area of occupancy”. Extent of occurrence is defined as the “*area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a species, excluding cases of vagrancy… This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g., large areas of obviously unsuitable habitat). … Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).”* The Red List term “area of occupancy” is defined as “*the area within its 'extent of occurrence' … which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data.”* The Red List guidelines recommend that to avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, estimates should be standardized by applying a scale-correction factor. How exactly standardization should be done depends on the scale-area relationships of the different taxa of concern (IUCN 2001).

Several statistical methods exist for extrapolating from point data across larger geographic regions. These methods vary in the number and types of observations required, in the types of ancillary environmental and human geographic data needed, and in their assumptions about the statistical properties of the species’ distribution. Commonly used “species distribution models” are MAXENT (maximum-entropy approach for species habitat modelling; Phillips, Anderson, and Schapire 2006), regression models (Scott, Heglund, and Morrison 2002), GARP (Genetic Algorithm for Rule-set Production; Stockwell and Peters 1999), and bio-climatic envelope models (Pearson and Dawson 2003). Appropriate training and software are required to use these techniques successfully. Moreover, ground-truthing is required to check model predictions.

In addition to such predictive models of species distribution, various “expert-based” methods have also been employed, which take into account not only the occurrence data but less precise information about habitat status, human pressure, and other less quantifiable factors. Although less computationally intensive and more conducive to application in a workshop setting, expert-based methods are subjective, susceptible to peer pressure, and can mask differences in interpretation between different experts. These disadvantages mean that expert-based methods may be less replicable than empirical methods. Although statistical methods are more replicable, given that they are appropriately documented, such methods are not entirely without bias, as choices are still required about which method to use, the underlying assumptions of the method, and the quality and type of other data used in the analysis. Statistical models can also be less transparent, requiring specialist knowledge to interpret correctly; and they are less conducive to building a community of stakeholders with a shared purpose.

Figure 5.3 Map of the current distribution of jaguars
Source: Sanderson *et al.* 2002.

Additionally, the two methods will vary in their reliability according to the threats which have shaped the species' current distribution. For example, if a species is closely tied to a particular habitat type, and is threatened primarily because that habitat type is being destroyed, the modelling approach might be well suited to predicting the species' current distribution. In contrast, if the species' distribution has been reduced by some factor which is less readily mapped, such as episodic (but unpredictable) disease epidemics, or hunting by particular groups of people (not well captured by maps of human density), then predictive models might provide very inaccurate projections.

However current distribution maps are developed, they too should be attributed regarding sources, time period, method by which they were created and certainty. An example of the data form associated with a current range distribution assessment for jaguars can be downloaded at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch5_jaguar_forms.pdf, and for cheetah and African wild dogs, available at http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_cheetwd_forms.pdf. . A suggested set of certainty measures associated with current distribution areas is provided in Blanc *et al.* (2007). An additional example is provided by the system used for the Asian Wild Cattle and Buffaloes Status Review, available at http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_AWCB_forms.pdf. Figure 5.3. shows an example of a map of the current distribution of the jaguar.

5.3.4.3 Identifying Populations

Species are rarely uniformly distributed across their ranges; clumps, patches, or other definable areas can be used to distinguish populations[4]. Individual populations are often the focus of conservation effort and are the basic units of the SCS. Populations may be defined through genetic testing (Moritz 1994; Avise 2000), but are more frequently, though less exactly, defined through geographic analysis and field experience. Some populations are simply defined by convenient boundaries, such as a reserve or other administrative unit, rather than by some biological criteria. If populations represent different subspecies or other genetic units below the species level, that fact should be noted for each population.

[4] The Red List Criteria use the term "population" differently, specifically referring to the total number of (mature) individuals of the taxon. On the other hand, the Criteria define subpopulations as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less) (see IUCN 2001).

We recommend that, wherever possible, the Status Review should define both populations and the areas associated with them. Once the populations are mapped, data should be systematically collated on the status and demography of each population, the threats facing them (see subsection 6), and the conservation measures occurring within each unit (see subsection 7). The species' ecosystem relationships for particular populations should also be defined in this section (e.g., predator-prey relationships, seed dispersal, pollination, landscape modification, etc.). An example of the kinds of data that might be assembled for each population is shown in Form C "Revised Important Areas for Jaguar Conservation (Jaguar Conservation Units or JCUs)", one of the three jaguar survey forms that can be downloaded from the web at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch5_jaguar_forms.pdf. Other data form examples are provided at http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_AWCB_forms.pdf (for Asian wild cattle and buffaloes), and http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_cheetwd_forms.pdf (for cheetahs and African wild dogs). From these data, it is often useful for the SCS to summarise the information in a tabular format.

5.3.4.4 Demographic analysis

For some species, reliable demographic data exist, which are likely to be important in characterizing the species' status. Demographic data include population estimates, population indices, mortality data, reproductive data, sex- and age-structure data, etc. Such data are often more indicative of rates and direction of population change than are changes in spatial distribution (e.g., sea otters (*Enhydra lutris*) in the Aleutian Islands have declined by more than 90% in less than two decades, among the most drastic declines of a species in recent times, but they still exist throughout the island chain). However, the accuracy and precision of demographic data vary enormously, and so does the data interpretation. In rare cases, a precise time series of count data are available from which population changes can readily be discerned. More frequently, a few estimates are available from selected locations, which vary in reliability, and may or may not be representative of a larger portion of the range. Indices of abundance, vital rates, and population composition data are more common than actual population estimates for many species, and all are subject to varying interpretations, and so should be presented with a full explanation.

Population and density estimates may be derived for portions of the geographic range. The Status Review should examine and make note of the precision of relevant estimates, and should consider which estimates are acceptably reliable to provide useful insights about population status and trends. Reliable estimates of population size are essential for assessing viability and sustainability of human offtake.

Whereas spatial data may be readily understood and interpreted by stakeholders in a workshop setting, demographic data typically must be analysed first by people with the necessary mathematical and biological expertise. Results of such analyses can then be presented to a wider group of stakeholders. The planning document should strike a balance between high-powered mathematical analyses that few will understand and a very superficial analysis that forces knowledgeable readers to simply trust the results.

Whereas for spatial data the sought-after end product is a series of fully-documented GIS layers, the end product of demographic analyses might be graphs, tables, and statistics indicating population trend, and, where possible, population viability. For maximum utility, such data could also be incorporated as GIS layers (e.g., population densities, growth rates, reproductive rates, etc.). An advantage of using GIS is that if all the datasets are represented as georeferenced layers, they can be analysed to show interrelationships, such as areas of range loss, representation of populations across ecological settings, measures of search effort, and distribution across the current range, which are relevant to the Vision and Goals. Of course if a GIS is unavailable, some of these analyses can be made in other ways. Ultimately, all the status information should be matched against habitat requirements and threats, so that the primary threats to populations can be identified.

Photo 5.1 A jaguar (*Panthera onca*) close up in Quito Zoo, Ecuador IUCN Photo Library © Imène Meliane

5.3.5 Habitat and resource assessment

This section discusses habitat requirements of the species (including food, water, and shelter). Typically this section will also include specific key resources needed by the species (e.g., prey for predators) and describe a map of the major ecological settings, where the species occurs, including a review of land type and land-use. For migratory or other highly-mobile species, this section should also include an assessment of ecological linkages between disjunct population areas.

For many or most species, habitat needs are unknown, or at best only superficially known. Many threatened species now exist in the most marginal parts of their former range, because humans have usurped the best areas; in effect, they are living in what could be termed the best of the worst areas. Assessing the potential capacity of additional areas to support the species, based on an assessment of what appears to be preferred habitat within the presently occupied range, should proceed cautiously. A range-wide perspective that includes all parts of the historical and potential range should be considered when defining species needs.

Importantly, this section should include an evaluation of gains and losses in the extent of habitat types used by the species. These may or may not provide an accurate reflection of population trends, or a projection of future trends, but for some species this may be the best indication available of the direction and magnitude of population change (e.g., extensive forest loss indicative of major declines in sun bear (*Helarctos malayanus*) populations).

For widespread species, the historical range needs to be analysed to define the major ecological settings where the species occurs and formerly occurred. Ecological functions vary, often as a function of habitat and sympatry with other species (e.g., predators, prey, competitors, parasites, and mutualists). Such variation is usually continuous across the range, complicated, and poorly understood, so geographic surrogates (e.g., vegetation or biome maps) are frequently used to define ecological settings geographically. Sometimes a combination of vegetation and region may be used (e.g., for tigers, the moist tropical evergreen forests of the Indian Subcontinent are distinguished from the dry tropical deciduous forests of Southeast Asia). As with other geographic maps developed in the Status Review, the ecological setting map should be produced through a GIS analysis, as a printed map, and be distributed in the public domain as a GIS layer with appropriate metadata.

5.3.6 Threat analysis

This section attempts to diagnose the processes threatening the species. The aim is to accurately and comprehensively identify the primary threats to species persistence. If the wrong threats are identified, proposed Actions may fail to halt or reverse population declines. Identification of threats therefore needs to be a thorough process, subject to peer-review wherever possible, involving critical analysis of the best available data. The threat analysis process also needs to be participatory, recognising where appropriate how threats vary spatially and temporally across the species' geographic range. To the extent possible, data on the evidence that particular factors act as threats should be collated for each population.

A threat is any factor that causes either a substantial decline in the numbers of individuals or a substantial contraction of the geographic range. Some common threats to species include direct exploitation, habitat destruction and modification, competition for resources with people or human-associated species (e.g., domestic animals), interactions with exotic species, disease organisms, and climate change. Threats may already be in operation (e.g., continued conversion of Bornean orang-utan (*Pongo pygmaeus*) habitat from natural forest to oil palm plantations), or they may be anticipated (e.g., possible destruction of southern sea otter habitat by an oil spill).

It is important to distinguish threats from the natural processes that limit population size and distribution. For example, in large intact ecosystems cheetah numbers and distribution are strongly influenced by lion (*Panthera leo*) predation (Durant 1998). However, this is a natural process which maintains low cheetah density but does not cause population decline. Lion predation should not, therefore, be considered a threat to cheetah populations under such circumstances. Likewise, brown bear populations in high-altitude habitats of southern Asia are not threatened by low natural food abundance, even though this causes extremely low reproductive rates and hence low population growth. The threat to these populations is human-caused mortality in an environment that provides a minimal sustainable offtake (Nawaz, Swenson, and Zakaria 2008). Conversely, brown bears in the Gobi desert appear to be suffering from increased desertification, which is indeed a real environmental threat.

For many species, it will also be helpful to distinguish proximate and ultimate threats to wild populations. Proximate (direct) threats are immediate causes of population decline, usually acting on birth or death rates. Proximate threats are often anthropogenic (e.g., conversion of habitat to cultivation or hunting for bushmeat), but may occasionally involve interactions between native species that formerly coexisted (e.g., unusually high rates of parasitism or predation).

Ultimate (indirect) threats are the root causes (also sometimes referred to as underlying drivers) of proximate (direct) threats, and are almost always anthropogenic. For example, conversion of, say, forest to cultivation (a proximate threat) may be driven by human population growth, poverty, or people's inability to realize economic benefits by sustainable use of uncultivated areas (all ultimate threats). Similarly, unusually high rates of predation by an indigenous predator (a proximate threat) may occur where prey movements are constrained by fencing (Van Dyk and Slotow 2003), where habitat has been modified or fragmented by people (Hedges and Tyson 2002), or where the introduction of exotic prey species has allowed predators to reach unusually high population densities (Novaro and Walker 2005; Roemer, Donlan, and Courchamp 2002). In these examples, the impact of natural predators has been elevated by human activities: hence, while the predator may represent the proximate threat, the ultimate threats are anthropogenic.

This distinction of proximate and ultimate threats is important. First, the distinction may help to guide Actions (see Chapter 8). Sometimes it may be appropriate to address proximate threats directly (e.g., reducing illegal offtake through anti-poaching patrols), but proximate threats may also be alleviated by addressing their ultimate causes (e.g., increasing local people's food security to reduce reliance on bushmeat). Second, factors that act as proximate threats may in some cases be components of functioning ecosystems worth conserving in their own right. Examples would be the predation and parasitism processes mentioned above. In these cases it will usually be more appropriate, for long-term biodiversity conservation, to tackle the ultimate threat (e.g., by reversing habitat fragmentation or dismantling fences) than the proximate threat (e.g., through intensive control of an indigenous predator). We admit, however, that sometimes the line between proximate and ultimate threats is blurred.

Photo 5.2 A Sherpa man with a Blood pheasant (*Ithaginis cruentus*) in Arun Valley, Nepal
IUCN Photo Library © Jeffrey McNeely

It may be useful to be aware that the Red List Unit of the IUCN Species Programme has recently revised the Red List classification scheme of direct threats into a set of 11 major threats, most of which are anthropogenic, but some of which are not (IUCN/CMP 2006). Details on each of these categories can be accessed online at http://conservationmeasures.org/CMP/IUCN/browse.cfm?TaxID=DirectThreats (accessed 26 July 2008). It would not, however, be useful to constrain the definition of threats to those categorized by the Red List. The purpose of conducting a threat analysis as part of a Status Review is to guide conservation action by identifying which threats need to be mitigated, and this is likely to require a much more detailed characterization of threatening processes than can be achieved within the Red List definitions.

In conducting threat analyses, it is important to avoid extrapolating too much from data on a single population, since threats often vary from place to place. For example, accidental capture in snares caused a major decline in the African wild dog population of Lower Zambezi National Park, Zambia, and was considered an important threat to several other populations, but was seldom or never observed in another set of wild dog study populations (Woodroffe *et al.* 2007a).

5.3.6.1 Diagnosing ongoing threats

Identifying threats correctly is critical to ensuring that the correct measures are taken to reverse species declines. Caughley and Gunn (1996) provide a detailed review of approaches to the diagnosis of factors that cause population declines. They suggest that, after confirmation that a species is in decline, diagnosis of the causes should follow four steps:

(a) study the species' natural history to provide insights into likely causes of decline;

(b) list all conceivable agents of decline;

(c) compare the level of each possible agent of decline with that in areas, or at times, where the species is/was not in decline; for example determine whether harvest levels have increased over time, or whether local population extinctions have occurred in areas where habitat destruction has occurred. Use these comparisons to identify one or more likely agents of decline;

(d) test the hypothesis that the agent(s) of decline have been correctly identified by experiment: in most cases the experimental "treatment" can be a management intervention designed to combat the threat, and so confirmation of the cause of decline can be combined with active efforts to conserve the species.

Although Caughley and Gunn's (1996) method may appear labour-intensive, this level of scientific rigor is entirely appropriate for such a critical component of SCS planning. Moreover, their approach need not be arduous if (as is often the case) there is clear evidence for decline being associated with some straightforward factor such as overharvest or habitat destruction (e.g., see Box 5.3). If the causes of a species' decline are less straightforward – for example if they involve interactions between more than one factor – then the extra effort made to identify the causes will be worthwhile, since management interventions directed only at the most obvious factor may fail to halt or reverse declines.

Often threats may be so confounded that the identification of the key factor in population decline is very difficult. For example, in highly fragmented environments, a species may be more subject to predation by other natural predators, may be more prone to be hunted by humans (because humans have easier access to small patches of their habitat), may be more apt to raid crops and hence be killed by humans, and may be more likely to suffer effects of malnutrition due to reduced food availability or compressed animal density. Each of these threats might be dealt with in a somewhat different way (e.g., predator reduction, poaching patrols, crop field deterrents, and artificial feeding, respectively), especially if what appears to be the ultimate threat (habitat fragmentation) is not readily rectified. Rigorous studies to disentangle these confounded effects are unlikely to exist for most species. In the absence of hard data, a listing and discussion of all the possibly important threats may spur future studies and provide more avenues for potentially effective conservation than a best guess about a single dominant threat. Population responses to conservation efforts will in the end give the best indication of what the threats were. For example, if improving anti-poaching measures is associated with an increase in population size, then over-hunting can be assumed to have been a key threat.

The first two steps of Caughley and Gunn's (1996) "recipe" – studying the species' natural history and identifying possible causes of decline – are likely to have been conducted prior to the development of a SCS, at least for some species in each taxon. Key aspects of the species' natural history will have been summarised earlier in the Status Review. The "threats" section should thus list evidence for and against particular factors representing threats to species persistence, based on the correlational methods outlined in Caughley and Gunn's (1996) step (c), or, where available, on experimental evidence from their step (d). Box 5.3 provides some examples of threat analyses based on these sorts of evidence; note that the analysis process is not always arduous. The examples are chosen to show how threat analyses can sometimes be conducted for groups of species as well as for single species.

When a list of multiple threats is generated during the threat analysis process, it may be helpful to categorise these into most serious, less serious and so on, so as to ensure that resources and efforts are focused on those Objectives and Actions that will have the greatest effect in saving the species.

Box 5.3 Examples of threat analyses for various species

Example 1: Causes of Asian elephant (**Elephas maximus*****) decline in Sumatra***

Problem: Field surveys revealed that, of 12 sites in Sumatra's Lampung Province which formerly supported elephant populations, only three contained elephants in 2002.
Threat analysis: Field surveys and analyses of remote sensing data showed that, at the nine sites which no longer supported elephants, native habitat had been converted to agriculture, whereas the three occupied areas still contained relatively intact forest. No experimental test was needed to confirm habitat loss as the ultimate cause of elephant decline. At some of the sites, the last elephants had been live-captured by wildlife authorities to alleviate human–elephant conflict; hence conflict was a proximate threat, ultimately caused by loss of habitat which placed elephants in closer contact with people and their crops (Hedges *et al.* 2005).

Example 2: Causes of black rhino (**Diceros bicornis*****) decline in the Luangwa Valley, Zambia***

Problem: Black rhinos in the Luangwa Valley declined to extinction between 1979 and 1985.
Threat analysis: Comparisons of rhino sighting rates in different sectors of the park revealed that rates of rhino decline were highest where anti-poaching patrols were least intensive. The hypothesis that poaching was causing the decline was supported by retrieval of rhino carcasses with their horns removed. Quasi-experimental evidence to confirm the importance of poaching as the key cause of rhino decline came from a comparison of population trends in different rhino populations, which showed that rhino populations were growing in areas receiving substantial investment in anti-poaching (Leader-Williams and Albon 1988).

Example 3: Causes of decline of resident wildebeest (**Connochaetes taurinus*****) in the Masai Mara ecosystem, Kenya***

Photo 5.3 Wildebeest (*Connochaetes taurinus*) migration in the Masai Mara © Karin Svadlenak-Gomez

Problem: Resident wildebeest declined by 81% between 1977 and 1997.
Threat analysis: Ottichilo *et al.* (2001) used spatial and temporal analyses to compare changes in wildebeest density with rainfall, the conversion of habitat to cultivation, and the density of livestock. Their results showed that loss of wildebeest was associated with conversion of wet season grazing and calving areas from savannah to cultivation. No experimental test of this hypothesis could be conducted since restoration of habitat was not possible.

Example 4: Causes of decline of island foxes (**Urocyon littoralis*****) on Santa Cruz Island, California***

Problem: This island-endemic subspecies declined by 90% between 1993 and 1999.
Threat analysis: Potential causes of decline were predation by exotic golden eagles (*Aquila chrysaetos;* Roemer *et al.* 2001), and infection by an exotic pathogen (heartworm; Crooks, Scott, and Van Vuren 2001). Sightings of golden eagles increased markedly around the time that the fox decline began, and 19 of 21 carcasses of radio-collared foxes appeared to have been consumed by eagles; in contrast, eagle sightings remained extremely infrequent on other islands where foxes did not decline (Roemer *et al.* 2001). Evidence of apparent heartworm exposure was found among foxes on Santa Cruz Island, but was also found on another island where foxes did not decline (it was

later found that the test for heartworm was in fact detecting exposure to another parasite (Clifford *et al.* 2006)). Strong evidence for the importance of eagle predation as the major cause of decline comes from the observation that fox survival increased, and population recovery commenced, after eagle numbers were substantially reduced by live capture and removal (Swarts 2006).

Example 5: Causes of local extinction of large mammalian carnivores inside protected areas

Problem: All over the world, large mammalian carnivores have disappeared from national parks and reserves, despite nominal protection.
Threat analysis: Possible explanation for local extinctions were (a) effects of small population size in isolated areas, and (b) killing by people living on land adjoining the (unfenced) parks. Woodroffe and Ginsberg (1998) compared parks where large carnivores had persisted with those where they had been extirpated, and developed measures of the area required for each species to persist. They suggested that if extinction was associated with small population size (hypothesis (a)), then area requirements should be greatest for the species living at lowest population densities. In contrast, if extinction was caused by edge effects (hypothesis (b)), then area requirements should be greatest for species which range most widely and hence have greatest contact with people on neighbouring lands. Woodroffe and Ginsberg (1998) showed a close correlation between ranging behaviour and area requirement, with no such effect of population density: they also showed that people were the principle cause of mortality for most large carnivore species, even when studied primarily inside protected areas. Experimental testing of the relationship between carnivore declines and killing of carnivores has not been conducted formally, but there are several examples of large carnivore populations recovering when protected from killing by people (e.g., Boitani 1992; Linnell, Swenson and Andersen 2001; Woodroffe *et al.* 2007b).

5.3.6.2 Anticipating threats

Some factors may threaten species conservation in the future, even if they played no role in the species' original decline. For example, the decline of the southern sea otter was driven by overharvest during the 18th and 19th centuries, but by 2003 a possible oil spill was identified as the most serious perceived threat to the subspecies (USFWS 2003). Likewise, mountain gorilla (*Gorilla beringei*) populations have been substantially reduced by habitat destruction, which remains a major threat (Harcourt 1995); but arrival of a virulent infection such as measles or Ebola virus could also potentially cause population extinction (Walsh *et al.* 2003). Climate change is a particular threat that will affect many species, and predictions of the impact of climate change on habitat and resources as well as ecological relationships of the species which may be disrupted should therefore be analysed.

Many potential threats to species can be imagined, but only those threats with a realistic chance of causing population decline should be included in SCSs: it will only be worth expending conservation efforts on genuine threats. In the gorilla example above, for instance, it might be worth developing preventive measures and contingency plans to address the threat of measles infection, but similar plans to address the risk of a meteorite impact would not be appropriate (since the latter is substantially less probable).

Simulation models may be useful for evaluating the possible impacts of likely threats. For example, Carroll *et al.* (2004) used statistical models to project the effects on wolves (*Canis lupus*) and grizzly bears (*Ursus arctos*) of anticipated growth in human populations and development in North America's Yellowstone ecosystem. Models are likewise useful for predicting the likely effects of climate change on species' distribution and status (e.g., Carroll 2007; Thomas *et al.* 2004). Where such model results exist, they should be described in the Status Review.

5.3.7 *Conservation and management*

This section identifies current measures in place that contribute to the conservation of the species at the site and the range-wide level. The Actions currently underway that are listed in this section will help provide the context for additional Actions (see Chapter 8). An example of Actions currently under way for Slater's monal (*Lophophorus sclateri*) is presented in Box 5.4.

For each of the populations identified previously, current conservation measures should be documented, including the primary implementing agencies or groups. Typical conservation measures focused on proximate threats include legal protections (e.g., creation of protected areas and formulation of laws controlling exploitation and use), law enforcement (e.g., patrols), and habitat restoration efforts. Typical conservation measures focused on ultimate threats include education, policy reform, and poverty reduction.

Assessing the effectiveness of past Actions is vital for developing recommendations about which Actions should be implemented in the future. Various methods for evaluating effectiveness are described in Chapter 8.

Box 5.4 Measures that were known to have been taken for the poorly documented Sclater's monal (*Lophophorus sclateri*)

Illustration 5.1 Sclater's monal (*Lophophorus sclateri*)
© Suresh Kumar

Legislation Legally protected in China (a first class nationally protected species), India (Schedule 1; Wildlife Act 1972) and Myanmar (List of protected species 1994). It is listed on CITES Appendix I.

Protected areas Known from Dibang Valley Wildlife Sanctuary, Arunachal Pradesh (India). In China it is found in Medog National Nature Reserve and Chayu Nature Reserve (Tibet), Gaoligong Shan National Nature Reserve and Nu Jiang Nature Reserve (Yunnan).

Research General surveys in mountainous regions of India have revealed its presence and even located a new form of the species in Arunachal Pradesh.

Captive breeding In early 1997 three pairs were sent from Yunnan to the Endangered Species Breeding Centre in Beijing for a captive breeding programme. The success of this venture is not known.

Source: Abridged from BirdLife International 2001, where full details can be found.

6. Vision and Goals

This chapter defines the Vision as an inspirational and relatively short statement, describing the desired future state for the species. The chapter describes how to develop a Vision, based on a range-wide analysis of a species' status and a detailed consideration of the species' long-term conservation needs. The chapter also introduces the concept of Goals, which represent the Vision redefined in operational terms, and provides guidelines on how to use the Vision to develop Goals. Finally, the chapter describes Goal Targets, which are a subset of the Goals which can realistically be achieved over the lifetime of the SCS (usually 5–10 years).

6.1 What is a Vision?

An over-arching Vision outlines, in an inspirational and relatively short statement, the desired future state for the species. Hence, the Vision describes, in broad terms, the desired range and abundance for the species, its ecological role, and it relationship with humans. The Vision is an essential part of the new SCS process, which requires those writing a SCS to discuss explicitly what it means to save a species, and to use the answer to this question to develop Goals. The Vision, therefore, should be derived from an analysis of a species' status, and from a detailed consideration of the long-term conservation needs of the species (informed by the threat analysis). The Vision should be as ambitious and as inclusive as possible. Examples of Vision statements are provided in Box 6.1.

Box 6.1 Examples of Vision Statements

"Over the next century, the ecological recovery of the North American bison will occur when multiple large herds move freely across extensive landscapes within all major habitats of their historic range, interacting in ecologically significant ways with the fullest possible set of other native species, and inspiring, sustaining and connecting human cultures" (Sanderson *et al*. 2008).

"To secure viable and ecologically functional cheetah and African wild dog populations as valued components of development in eastern Africa" (IUCN/SSC in press).

"New England Wild Flower Society's Vision for 2025 holds that all native plants of the New England region exist in vigorous populations within healthy, balanced, natural ecosystems, with suitable protections that allow these ecosystems and the native plants within them to adapt and evolve over time, and that the citizens of the region are actively engaged in conservation of New England's native plants, while enjoying native plants in the wild and in their own gardens" (NEWFS 2007).

There is no "one size fits all" definition of what it means to save a species, because species vary in their biology, relationships to people, and current conservation status. However, there are some basic principles that should always be considered when creating a long-term Vision for successful species conservation.

These principles include:

- *Representation*
  Conservation of populations within all the major ecological settings across the species' natural range; and conservation of the species' genetic diversity across that range;

- *Replication*
  Replication of populations within ecological settings and within genetically-defined units (e.g., subspecies or evolutionary significant units (ESUs[5])), to avoid irreplaceable loss in the event that one or more populations are lost due to unforeseen and possibly unavoidable catastrophes;

- *Ecological functionality*
  Conservation of large enough populations, in areas large enough to support self-sustaining populations interacting with the full range of the species' natural predators, parasites, competitors, mutualists, and prey and/or food plants;

- *Human socio-economic and cultural needs and desires*
  Conservation and management of the species across its geographic range to satisfy human socio-economic and cultural needs and desires, in a manner consistent with the principles above.

In the context of defining a Vision it will be necessary, therefore, to decide (a) whether the most appropriate approach for the species is to focus on ecological, behavioural, and/or genetic variability within the species and how to maximize representation and replication across these categories; (b) what time scale the Vision addresses (it should be long-term unless a convincing justification for another time scale is presented); (c) what spatial scale the Vision addresses (it should be range-wide unless a convincing justification for another spatial scale (e.g., regional) is presented); and (d) what approaches to take to setting target population sizes, densities, and range area (e.g., viable populations, ecological functionality, restoring population sizes and/or distribution to some previous historical level pre-dating human expansion into the species' range (see Chapter 5), or permitting sustainable exploitation of the species).

A species' ecological interactions change across eco-geographic settings because ecosystem dynamics, vegetation types, and competitors, predators, prey, parasites, mutualists, and commensals vary from setting to setting. The Vision for a widely-distributed species should, therefore, include conservation of all (or as many as possible) of these settings and interactions. Similar concerns apply to socio-economic and cultural values, since these will also vary across a species' range.

[5] An evolutionarily significant unit, or ESU, is a population or group of populations that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species (Ryder 1986).

A method for developing a Vision statement is provided in Box 6.2.

Box 6.2 Formulating a Vision statement: an example from the Southeast Asian Wild Cattle and Buffalo Conservation Strategy Workshop, June 2008

- First, the workshop facilitator explained what an SCS-type Vision is (see Section 6.1) and presented several examples of Vision statements including the Bison Vision (see Box 6.1).
- Then, in an interactive plenary session, all the workshop participants were asked to suggest the concepts or values (e.g., ecological functionality and population viability) that they thought should be included in a Vision statement for Asian Wild Cattle and Buffalo Conservation in Southeast Asia.
- Once a list of concepts/values had been compiled and discussed in the plenary session, a drafting group was formed to prepare the first draft of the Vision statement.
- While the drafting group was meeting, the other participants continued to update the species distribution maps and Status Review.
- When the drafting group had a first draft of the Vision statement, that draft was presented to all the workshop participants in another plenary session in which possible changes and additions were discussed and noted.
- The drafting group then met again to work on a second draft of the Vision statement.
- This process was repeated until a final Vision statement was agreed in a plenary session. At the June 2008 workshop, three drafts were prepared before the participants agreed on a fourth and final Vision statement: "We envision viable, ecologically functioning populations of wild cattle and buffalo that are appreciated by humankind. These populations will represent the species' genetic diversity, in well-managed landscapes, replicated across their original ecological settings and in all range States".

6.2 What are Goals?

While the Vision statements of the type described above and in Box 6.1 are inspiring encapsulations of what needs to be achieved in order to save a species, a more detailed set of range-wide, high-level Goals are also needed. The SCS's Goals represent the Vision defined in operational terms. Thus Goals specify, for example, the desired number of ecologically functional populations to achieve replication per major habitat type, or whether restoration (reintroduction) is needed. Goals thus have the same long-term time frame and wide spatial scale as the Vision, and they are developed using the same criteria for what it means to save a species that were agreed when developing the Vision (e.g., striving to achieve ecologically functioning populations). For example, at the June 2008 Asian Wild Cattle and Buffaloes Conservation Strategy Workshop in Vietnam, at which the SCS process outlined here was used, the following Vision for Asian Wild Cattle and Buffalo conservation was developed:

> *"We envision viable, ecologically functioning populations of wild cattle and buffalo that are appreciated by humankind. These populations will represent the species' genetic diversity, in well-managed landscapes, replicated across their original ecological*

settings and in all range States" (IUCN/SSC in review).

This Vision was then used in conjunction with the previously completed range-wide Status Review to derive the following Goals for Banteng (*Bos javanicus*), one of the nine Asian wild cattle and buffalo species:

- *Twenty-six ecologically functional, large populations, with 17 populations in dry forest mosaic habitat types and 9 in evergreen forest habitat types; giving 4 populations in the Bornean subspecies/ ESU, 6 in the Javan subspecies/ESU, and 16 in the mainland subspecies/ESU (please note that the 26 populations are identified in the Strategy).*

- *Achieving this will require reintroductions to former range in Thailand and Indonesia.*

- *All populations should co-exist with people and their domestic animals, and be valued by people in range States and internationally* (IUCN/SSC in review).

Box 6.3 Formulating Goals from a Vision statement: an example from the Southeast Asian Wild Cattle and Buffalo Conservation Strategy Workshop, June 2008

- Once the Vision had been agreed, the Goals could be developed. Since the Goals represent the Vision defined in operational terms (see Section 6.2), a first step in developing the Goals is to compare the species' current status (as summarised in the Status Review) with the status it would have under a future scenario in which the Vision had been achieved. One way to do this is to break down the Vision into its component parts, and to then use some sort of "scorecard" (e.g., the scorecard developed in association with the bison Vision statement, which is available at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch6_bison_scorecard.pdf) to assess each remaining population's contribution to achieving the Vision. For example, as discussed above, the participants developing the conservation strategy for wild cattle and buffaloes in Southeast Asia agreed the following Vision: "*We envision viable, ecologically functioning populations of wild cattle and buffalo that are appreciated by humankind. These populations will represent the species' genetic diversity, in well-managed landscapes, replicated across their original ecological settings and in all range States*".

- To develop the Goals, this Vision statement was broken down into its components; these included population viability, ecological functionality, appreciation by humankind, etc. Each component was then converted into a measure which could be applied to particular populations; for example, for gaur a viable population was considered to be one numbering ≥500 animals, and an ecologically functional population was considered to be one which coexisted with a complete (or almost complete) set of native competitors and predators. These measures were then used to characterize each extant population according to whether or not it currently contributed to each component of the Vision (e.g., Figure 6.1).

- Characterizing the extant populations in this way allowed participants to determine how the conservation or management of each population would contribute to the Vision. For example, some populations were already considered viable, ecologically functional, and appreciated by humankind; maintaining such populations was considered important to achieving the Vision, and the sites where this was needed were therefore specified in the Goals (Table 2.1). Elsewhere, management was needed to achieve the population characteristics defined in the Vision (e.g., population size needed to be increased); once again, sites needing such management were specified in the Goals (Table 2.1).

- Characterizing the extant populations also allowed participants to conduct a form of gap analysis, determining what more would need to be achieved in order to reach the Vision. For example, the Vision for wild cattle and buffaloes in Southeast Asia specifically expressed an aspiration to have viable, ecologically functional populations in all range States. Achieving this for some species in some range States would require that reintroductions be conducted; once again, likely sites were specified (Table 2.1).

- In performing these gap analyses, participants used information from the Status Review to ensure that Goals were realistic, in relation to the remaining geographic range of the species. For example, while the Goals for gaur (a species with a broad geographic distribution) specified that at least 30 large, ecologically functional populations would be needed to achieve the Vision, the Goals for tamaraw (a species endemic to a single small island) aimed for just three ecologically functional populations, of which only two could be expected to be viable.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Species:**	Tamaraw											
2			**population viability**		**geographical representation**				**ecological functionality**			**appreciation by humankind**	
3	**Polygon ID**	**Range type**	**population size**	**habitat well managed?**	**range state**	**habitat type**	**subspecies or race (if relevant)**	**wild or feral/ hybrid? (in native range)**	**coexisting with other extant native bovids?**	**coexisting with non-bovid competitors?**	**coexisting with native predators?**	**local people sensitised to population?**	**wider community aware of population?**
4	A	confirmed	<100 individuals	habitat secure but inadequately managed	phillipines	mixed grassland and secondary forest	not applicable	wild	no native bovidae	all native competitors present	no native predators	yes	yes
5	B	confirmed	<100 individuals	habitat not secure or inadequately managed	phillipines	mixed grassland and secondary forest	not applicable	wild	no native bovidae	all native competitors present	no native predators	yes	yes

Figure 6.1 Part of a spreadsheet used to compare extant populations of tamaraw (*Bubalus mindorensis*) with components of the Vision agreed for wild cattle and buffaloes in Southeast Asia

The method used to develop these Goals is described in Box 6.3.

6.3 Should the Goals be population- or site-specific?

Ideally the Goals should be population- or site-specific, because some, but not all, populations may have to be maintained or expanded. Thus, if possible, the analysis and discussion that are involved in setting the Vision and Goals should aim to identify a minimum set of populations (or sites) necessary to save the species (see the Banteng example above; also see Table 2.1 and Box 6.3). Note that the desired minimum set may be larger than the current number of extant populations (or sites), in which case restoration would be necessary. Other sites (outside this minimum set) may be identified and included in an additional set of populations (or sites), for example, to satisfy stakeholders' aims (e.g., the resource needs of local communities, national agendas, or NGOs' programme aims). Such sites could be added in the course of preparing the range-wide or regional SCS, or in subsequent preparation of national Action Plans (see section 9.5).

Sometimes the information available may be insufficient to define site-specific Goals. In such cases the Goals will need to be phrased in broader terms (e.g., the number of populations per region and/or subspecies).

While Goals are written using operational terms, they still have the same range-wide and, most importantly, long-term temporal scale as the Vision statement. It is also necessary, therefore, to derive shorter-term Goal Targets for the SCS in order to facilitate and promote its implementation.

6.4 What are Goal Targets?

Goal Targets represent a medium-term (typically 5–10 years) subset of the Goals. Thus Goal Targets represent those Goals that can realistically be achieved over the lifetime of the SCS (and/or those steps towards achieving the Goals that can realistically be achieved over the lifetime of the SCS). Like all targets, Goal Targets should be SMART, i.e., Specific, Measurable, Attainable, Realistic, and Time-bound (see Chapter 2 for a definition of the SMART acronym, and Section 7.5 for a more detailed description of its components).

Photo 6.1 Female Banteng (*Bos javanicus*) at Huai Kha Khaeng Wildlife Sanctuary, Thailand © WCS – Thailand Program

To continue the Banteng example from above, at the June 2008 Asian Wild Cattle and Buffaloes Conservation Strategy Workshop, the following Goal Targets were set for Banteng (note that while the Goals, given above, were long-term like the Vision, the Goal Targets apply to the 10-year lifetime of the Strategic Plan):

- *Maintain the secure Banteng populations in Ujung Kulon NP in Java (Indonesia) and Huai Khai Khaeng WS and the Eastern Forest Complex in Thailand.*

- *Increase Banteng numbers in:*
    - *Nam Nao NP, Kaeng Krachan NP, and Dong Phra Yayen–Khao Yai Forest Complex (Thailand) by 2013;*
    - *Baluran NP (Java, Indonesia) by 2011, and Alas Purwo*

    - *and Meru Betiri NPs (Java, Indonesia) by 2013;*
    - *Alaungdaw Kathapa NP, Bago Yoma Reserved Forest, and the proposed Mahamyaing WS (Myanmar) by 2013;*
    - *all Cambodian protected areas by 2018;*
    - *stabilize the populations in the Ea So area and Yok Don NP (Vietnam) by 2013 and increase them by 2018.*

- *Determine the species' range and status in Cambodia, China, Kalimantan (Indonesia), 6 protected areas in Lao PDR, and Myanmar by 2013, and in Sabah (Malaysia) by 2018.*

- *Reintroduce Banteng to Leuweung Sancang NR and Cikepuh GR in Java (Indonesia; both evergreen habitat types) by 2018 and Om Koi WS (dry forest mosaic) and Chumporn Forest Complex (evergreen forest) in Thailand by 2018.*

6.5 The process for developing the Vision and Goals

The essence of the process is a range-wide analysis of the Status Review followed by discussion within a participatory workshop environment. As already discussed (see Chapter 5), a Status Review for the species should have been initiated before any workshops are held, but it should also be discussed and revised at a range-wide SCS workshop. Range State stakeholders (especially government staff) should participate in the range-wide Status Review alongside other, non-government, species specialists (e.g., NGO staff and academics) to help ensure that there is broad agreement about the species' status. Workshop organisers should be aware that some range-wide Status Reviews, which have been conducted without the participation of those range State agencies with the authority and responsibility to implement conservation, have subsequently been rejected by some of those agencies. Involving multiple stakeholders at this stage also ensures that all participants in the visioning process are familiar with the species' status across its geographic range, leading to a well-informed consensus on what needs to be done in order to save the species.

Developing the Vision, Goals, and Goal Targets (as well as the Objectives, Objective Targets, and Actions) should also take place in a participatory workshop setting (ideally at the same range-wide strategic planning workshop that discusses and revises the Status Review) to ensure adequate participation of all relevant stakeholder groups. For the majority of species, which inhabit multiple countries, such a range-wide SCS workshop is likely to be followed a series of national action planning workshops. (See also Chapter 4 on who should be involved in preparing a SCS.)

Boxes 6.2 and 6.3 provide, respectively, examples of the development of a Vision and associated Goals within a workshop setting. In these examples, the range-wide Status Review and Strategic Plan were developed at an international workshop attended by higher-level range State agency representatives, species specialists, and representatives of major relevant NGOs, and then this workshop was followed by a national action planning workshop for Vietnam attended by many more range State government staff including lower-level staff (e.g., park staff), national and international NGOs, and other species specialists.

6.6 Minimizing tension between range-wide or regional Goal Targets and national or local Action Plans

Having detailed site-specific Goals Targets should not create a problematic tension between range-wide or regional SCSs and national or local Action Plans, because national government officials, national NGO staff, and other national species specialists and conservationists will have participated in the SCS writing process, and should have added sites to the minimum set identified at the range-wide level (this was the case, for example, in the recently completed draft National Action Plan for the Conservation of Vietnam's Wild Cattle and Buffaloes which has additional sites to those identified during the earlier Strategic Planning Workshop for Southeast Asia's Wild Cattle and Buffaloes; see section 9.5).

Furthermore, there should be different time-scales for the range-wide and national processes, with the national action plans more concerned with determining the Actions needed in the short-term (1–5 yrs).

6.7 The advantages of having explicit Vision statements, Goals, and Goal Targets

Explicitly stating and building consensus around a long-term range-wide Vision and its associated Goals and Goal Targets is likely to lead to effective conservation because:

- It allows all the participants to explicitly discuss what saving the species actually means;
- The Vision, Goals, and Goal Targets provide a mechanism to align conservation partners, including range State authorities, around a unified effort;
- The Vision, Goals, and Goal Targets make it clear to range States, the donor community, and the wider public what the SCS aims to achieve;
- The Goal Targets provide the basis for establishing indicator metrics to measure the effects of Actions so that it is possible to demonstrate successes or modify the interventions when they are failing or underperforming.

7. Objectives

This chapter describes the process of developing Objectives which must be met in order to achieve the SCS's Vision and Goals. It explains how to undertake a problem analysis using the problem tree method (one of several methods that could be used for this purpose), and how to use the results of this analysis to define the Objectives and to develop Objective Targets. The chapter also emphasizes the need to ensure that Objective Targets are "SMART".

7.1 Introduction: what are Objectives?

Attaining the Vision and Goals of a SCS will inevitably require overcoming a number of obstacles. The SCS's Objectives summarise the approaches to be taken in overcoming those obstacles. Obstacles are identified using some form of problem analysis (described below) which builds on the threat analysis conducted as part of the Status Review (see Chapter 5) but also identifies a broader array of constraints on achieving the Vision and Goals. Once these threats and constraints have been agreed, the ways to tackle them are summarised as Objectives.

Broadly speaking, Objectives outline how the Vision and Goals of the SCS will be turned into reality: the Vision and Goals describe a future scenario that the participants would like to achieve, and the Objectives signpost the multiple routes to achieving that scenario. For example, if over-harvest is identified as a major threat to species persistence, one Objective might be to reduce offtake to levels which would allow population recovery. Likewise, if lack of capacity is identified as a constraint on effective conservation of the species, then one Objective would be to develop capacity.

Achieving the SCS's Vision and Goals is likely to require a number of different Objectives covering diverse subjects. Typically strategic planners recommend a relatively small number of Objectives (usually 4–12). For species conservation, a SCS's Objectives will often address needs such as ensuring appropriate policies are established and implemented, raising public awareness, or filling information gaps. What is sought is not a perfect balance in terms of how many Objectives address each major threat, nor, conversely, weighting high-priority threats with more Objectives. Instead, what is hoped for is an approach that attacks all of the major issues on all the necessary fronts. Objectives should be clear and understandable, allow Actions to be derived from them, and should be realistic. It should also be possible to track progress towards achieving Objectives, through the use of Objective Targets (see below). Examples of Objectives are given in Box 7.1.

7.2 One method for conducting a problem analysis

One widely used method for developing Objectives is to first conduct a detailed problem analysis. The problem analysis seeks to identify all the proximate and ultimate factors that hinder attainment of the SCS's Goals. Many of these factors will be the threats which were identified in the threat analysis conducted as part of the Status Review (e.g., hunting for bushmeat or habitat loss due to logging). Other factors will represent constraints which hinder mitigation of those threats; examples of constraints include gaps in knowledge, lack of capacity, lack of resources, and lack of appropriate policy frameworks. Constraints are often linked to threats; for example, poverty (a constraint on effective conservation) might drive local people to hunt for bushmeat, contributing to over-exploitation (a threat). Additionally, corruption and lack of capacity (constraints) might impede effective law enforcement, allowing over-exploitation (a threat) to continue.

Like many other aspects of strategic planning for species conservation, problem analyses are likely to be most useful when conducted by interdisciplinary teams of stakeholders with a diverse array of expertise and experience. This should ensure that all of the key threats and constraints are incorporated into the analysis. In a workshop setting, threats will usually have been identified as part of the Status Review, while the constraints may be identified through sharing of the group's collective knowledge of the social, economic, information, and policy environment within which conservation efforts would be conducted. Since the problem analysis seeks to identify such a broad array of problems, wherever possible all workshop participants should be involved in conducting the analysis. In many cases, species specialists will be most aware of the proximate threats to the species, but representatives of range State governments will often be best able to identify higher-level constraints on effective species conservation. Where feasible, involvement from local communities is also valuable at this step, as stakeholders from within those communities can often identify very practical constraints relevant to their own needs and interests.

Box 7.1 Examples of Objectives taken from a variety of conservation strategies

- Raise awareness for the conservation of the Arabian leopard at all levels (Arabian leopard – Edmonds 2007).
- Reinforce and re-establish populations where appropriate (Arabian leopard – Edmonds 2007).
- Build adequate region-wide capacity for all aspects of Arabian oryx conservation (Arabian oryx – Mallon, Kiwan and Qarqaz in press).
- Secure coordination between range States (Arabian oryx 2007 – Mallon, Kiwan and Qarqaz in press).
- Maintain and, where appropriate, expand the area of wild cattle and buffalo habitat, and increase the proportion of that habitat that is well managed, to ensure the viability and ecological functionality of wild cattle and buffalo populations (Asian wild cattle and buffaloes – IUCN/SSC in review).
- Inform effective conservation and management of wild cattle and buffaloes by collecting, analysing, interpreting and exchanging high-quality and timely data, in collaboration with key stakeholders locally, nationally and internationally (Asian wild cattle and buffaloes – IUCN/SSC in review).
- Undertake research activities designed to better understand predation as it relates to mortality of Greater Sage Grouse (*Centrocercus urophasianus)* populations at all life stages (Greater Sage Grouse – Schnurr *et al*. 2006).
- Develop protocols to equally and fairly share costs of species and habitat management among all stakeholder groups (Butler's gartersnake (*Thamnophis butleri*) – Hyde *et al.* 2007).
- Regular communication between representatives of the livestock industry and environmental organizations should be initiated to more effectively discuss prairie dog (*Cynomys)* biology and its relationship to livestock grazing management (White-tailed (*C. leucurus*) and Gunnison's (*C. gunnisoni*) prairie dogs – Schnurr, Seglund, and Miller 2008).

Problem analysis first involves asking the workshop participants to review the key threats to the species or populations concerned. The key threats should have been identified previously during the Status Review. For a range-wide or regional SCS, the problem analysis typically concentrates on those threats which are broadly applicable: a minor threat operating in only one or a few populations in just one range State might be put to one side at this stage. These key threats should be agreed by the group. One way of doing this (though by no means the only way) is to ask participants to write each threat clearly and succinctly on a large index card, with index cards then being displayed to the group on a wall or board. If multiple species are being considered, it may be helpful to colour-code the cards, for example, using one colour per species, and another colour for threats that apply to all or multiple species (see Photos 7.1 and 7.2).

Once key threats have been identified and agreed (usually straightforward as the threats were identified during the Status Review), participants are then asked to consider constraints that may hinder achieving the strategy's Goals. Often these constraints will be factors which contribute to or compound the threats. For example, lack of political will and resources might contribute to a lack of law enforcement, leading in turn to over-exploitation. Likewise, lack of knowledge about a species' status and biology might lead to setting of

Photo 7.1 Example of using coloured cards to identify species-specific threats
© R. Woodroffe
In this example, taken from one working group participating in a workshop on the conservation of African wild dogs and cheetahs in eastern Africa, the yellow cards indicate threats specific to cheetahs, the pink cards show threats specific to wild dogs, and the white cards apply to both species. A problem tree incorporating these cards is shown in Figure 7.1 below.

Photo 7.2 Participants use coloured cards
© R. Woodroffe
In this example, coloured index cards were used to highlight threats and constraints affecting the anoas at a conservation planning workshop for Asian wild cattle and buffaloes in Vietnam in 2008.

inappropriate use quotas and hence further contribute to over-exploitation. Some constraints may be beyond the group’s ability to address (e.g., corruption, warfare) but if such factors contribute to the threats they should be stated nonetheless. Once again, the constraints should be agreed by the whole group. One way to do this is to display them clearly on index cards, in the same way as for threats.

When all of the major threats and constraints have been identified, it is often helpful to organize them into a “problem tree”, which links proximate threats with their ultimate causes and constraints. The problem tree provides a useful way to visualize the threats and constraints, and hence to ensure that no important issues have been omitted. An example of a problem tree is given in Figure 7.1 . The process of developing a problem tree is similar to a procedure called “causal flow diagramming”, a graphical technique for describing and analysing real or hypothesized cause-and-effect relationships. Causal flow diagramming is a component of the PHVA process (summarised in Chapter 10), and is illustrated in Figure 7.2.

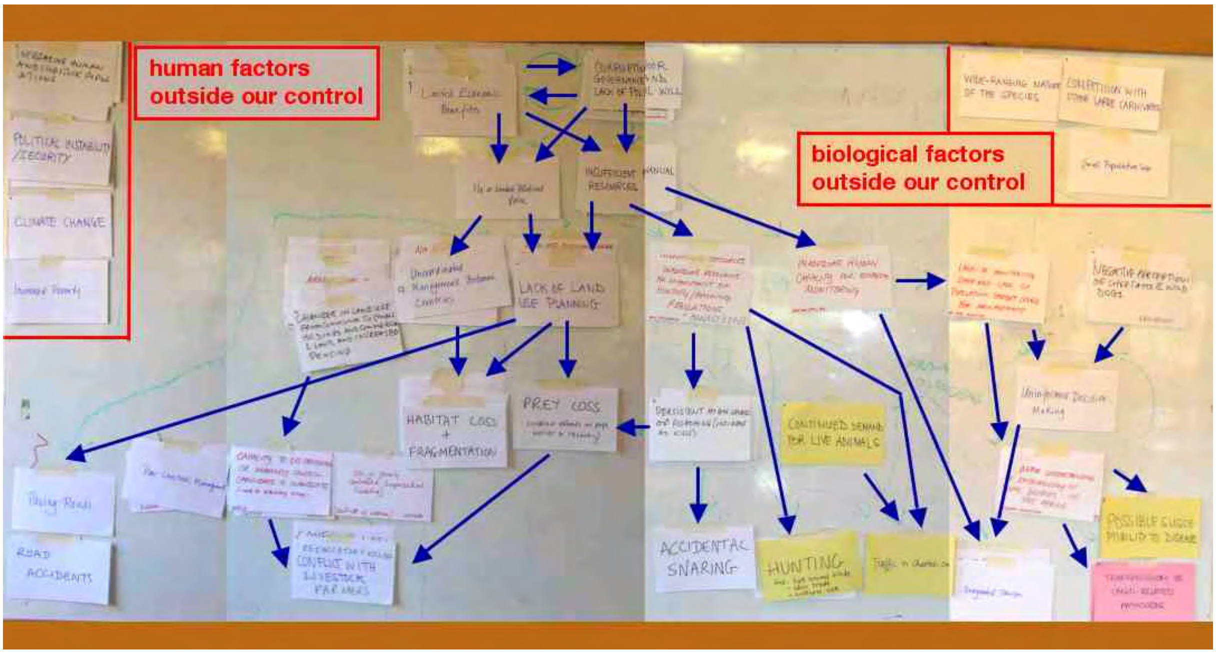

Figure 7.1 Example of coloured cards assembled into a problem tree
The problem tree shown in Figure 7.1 was developed for African wild dogs and cheetahs in eastern Africa. The yellow cards indicate problems specific to cheetahs, the pink cards show problems specific to wild dogs, and the white cards apply to both species. Arrows link causes to consequences. Problems beyond the remit of the group were set aside. The preponderance of white cards revealed by this analysis showed that it was appropriate to develop Objectives for both species together.

Building a problem tree is usually most straightforward if initially conducted by a small working group of two to four people: the other participants can subsequently comment on the problem tree and alter it if necessary. If several working groups have been identifying threats and constraints (e.g., different working groups for threats to different species), many issues will have been raised more than once (sometimes with different phrasing). If the index card approach is being used, then cards summarising such issues can be stacked or stapled together. The cards can then be assembled into a problem tree, with the proximate threats at the bottom, and their drivers above them, with arrows indicating causation. Problem trees are most easily constructed and visualized by sticking the cards to a wall. A large whiteboard is ideal since this allows arrows to be easily drawn linking the cards. Problem trees are much easier to see (and to photograph for future reference) when constructed on a wall than when laid out on a table or floor.

Problem trees may be constructed by working up from the proximate threats to their drivers, or down from the constraints to their (multiple) consequences; often a combination of the two is needed. One method to help build problem trees, and to ensure that all relevant threats and constraints have been identified, is to repeatedly ask why a particular threat is occurring (to work “up” the tree from consequences to causes), and likewise to ask why a factor represents a threat (to work “down” the tree from causes to consequences). Members of the engineering community often refer to this as “The Power of Five Whys”, since the root cause of a problem can almost always be identified by asking such a question over five iterations. For example, when a process (e.g., abnormally high nest predation) has been identified as a threat to a species, participants might ask why that predation is occurring (perhaps fragmentation of the species’ habitat has opened up easy access to nest sites for predators). Next, participants may ask why that fragmentation is occurring (perhaps roads were built through the species’ habitat), and then ask why those roads were built (perhaps the area is close to a new housing development), and so on – until the participants feel comfortable that they have identified the full causal chain that creates the links in the problem tree. Working in the other direction, a participant may have initially identified the expansion of housing as a threat. Asking why such development is a threat can lead participants through specifying that the development is leading to road construction, which contributes to fragmentation, which in turn allows more access to nest sites by predators and hence leads to high nest predation and low recruitment. Sometimes the answers to these successive “why” questions will be straightforward, but in other cases asking “why” can help participants to understand and describe the threats more fully, and to ensure that the problem analysis provides as complete a representation as possible of the threats and constraints impeding conservation of the species. It would be unusual for this process to identify threats in addition to those agreed at the Status Review stage, but the process nevertheless provides a useful check that all key threats and constraints have been identified.

Specifying all the links in the problem tree, from the most proximate consequences to the most ultimate causes, is helpful because it identifies multiple levels at which Actions can be implemented. For example, in the scenario described above, Actions might in principle be targeted at land use planning (e.g.,avoiding construction of more housing developments), at habitat management (e.g., ensuring roads are constructed in ways which minimize habitat fragmentation) or at the predation itself (e.g.,through predator control). Chapter 8 provides real-world examples of such multi-level approaches to what is essentially a single problem.

In developing the problem tree, some constraints may be identified which cannot be addressed by the SCS, for example because they are immutable aspects of the species’ biology (e.g., sensitivity to infectious disease), or because they fall far outside the ability of conservation professionals to influence (e.g., political instability within key range States). Such constraints are often set to one side of the tree, in recognition of their immutability (see Figure 7.1).

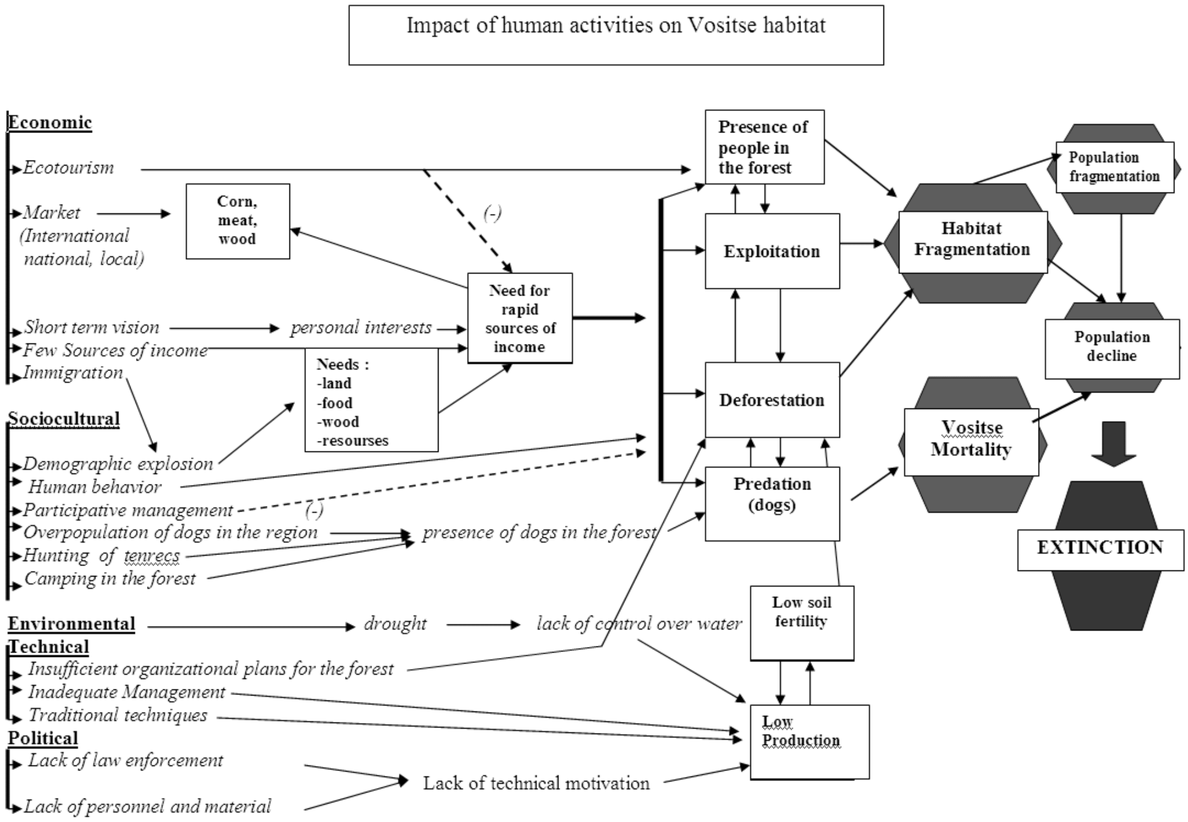

Figure 7.2 Causal flow diagram for threats affecting the Malagasy giant jumping rat (*Hypogeomys antimena*), developed at the species PHVA workshop (CBSG 2002)

7.3 How to use the problem analysis to set Objectives

Once the problem tree has been developed, it can be used to identify suites of factors which constrain achievement of the agreed Goals. These general problems can be inverted to form the Objectives. For example, if a lack of relevant policies were identified as a general problem for conservation of a species, then developing more appropriate policies would be an appropriate theme for an Objective. Box 7.2 provides an example of this process.

The problem tree provides a useful framework for considering which components of the network of threats and constraints can be most easily and effectively addressed with coherent Objectives, and ameliorated with implementable Actions. Several themes will often become apparent within the problem tree, each representing a coherent set of problems which may be addressed in a coordinated manner. Such themes are appropriate bases for developing Objectives (see Box 7.2 for an example). Importantly, because these themes are identified using a method which formally recognises the obstacles that need to be overcome in order to achieve the Goals, they generate Objectives which are logically related to the Goals and, ultimately, to the Vision.

Once the themes have been agreed by the participants, they can be given to a drafting group (or groups) to develop appropriate wording for the associated Objectives. Draft Objectives should be presented to the whole group of participants for discussion and comment, and can be returned to the same or a different working group for re-drafting. Objectives often go through three or four drafts before they are finally agreed by

Box 7.2 An example of using a problem tree to develop Objectives

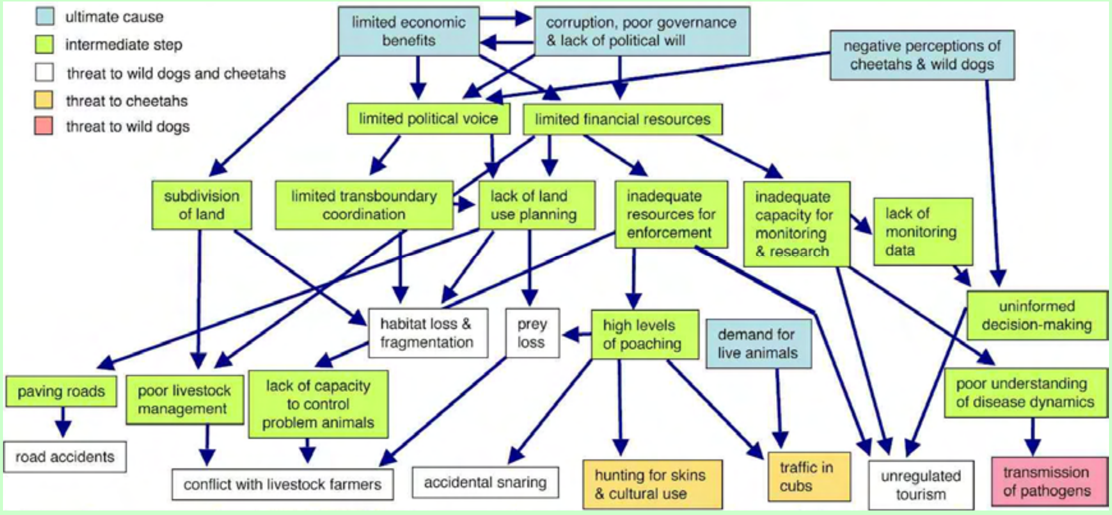

Figure 7.3(a) The problem tree shown in Figure 7.1, redrawn for greater readability.

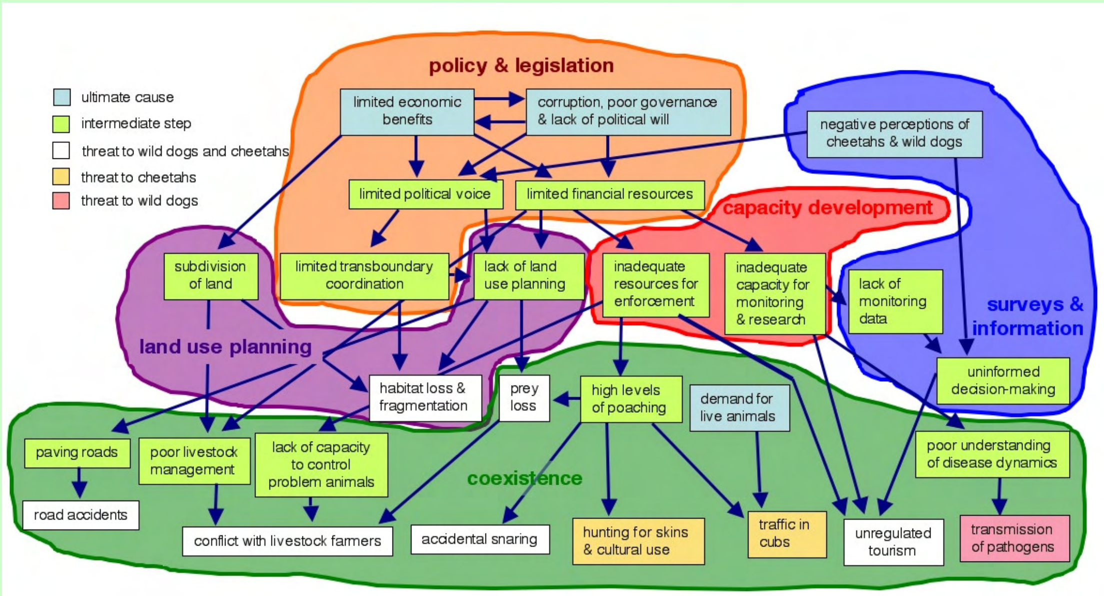

Figure 7.3(b) Themes within the problem tree, which were used to develop Objectives.

Each of the five themes identified within the problem tree (in *italics* below) was used to develop an Objective (in plain type below), thus:

- *Coexistence:* Develop and implement strategies to promote coexistence of cheetah and wild dogs with people and domestic animals.
- *Surveys and information:* Provide relevant stakeholders and managers with scientific and timely information on the status of, and threats to, cheetah and wild dog populations.
- *Capacity development:* Strengthen human, financial and information resources for conserving cheetah and wild dogs in collaboration with stakeholders.
- *Policy and legislation:* Review and harmonize existing legislation, and, where necessary, develop new legislation, for conservation across cheetah and wild dog range at national and international levels.
- *Land use planning:* Mainstream cheetah and wild dog conservation in land use planning and its implementation.

A sixth Objective of this regional strategic plan expressed the need for development of national Action Plans.

participants. Examples of agreed Objectives are provided in Box 7.1.

In developing the problem tree, some threats or constraints may be identified which are outside the remit of the conservation sector (e.g., human population growth or corruption) and hence difficult for stakeholders in species conservation to address. Depending on the possibilities for developing Actions to address such issues, participants may choose to include or exclude them from the Objectives.

Lack of knowledge is an issue likely to appear in any problem tree, and hence one likely to be addressed by any SCS. One way of dealing with lack of knowledge is to identify a "research" theme, and hence a "research" Objective. However, there are likely to be information gaps in many parts of the problem tree (e.g., knowledge may be lacking about species distribution and status, and about the most effective tools to reduce conflict with people, and about the most successful educational tools) and hence research needs will emerge under multiple Objectives. In such cases, it may be most useful to address research needs at the Actions level of the SCS, rather than cross-referring all research needs to a single "research" Objective.

7.4 Developing Objective Targets

In general, implementation of SCSs and Action Plans is greatly facilitated if Targets are set. Target-setting has already been discussed in Chapter 6 (Vision and Goals) with specific reference to setting Goal Targets. However, it is also useful to set Objective Targets associated with each Objective. Objectives summarise the broad approaches to be taken in working towards the Vision and Goals, while Objective Targets provide more detailed definitions of what needs to be done, and by what date. Objective Targets help to group related Actions into logically related clusters, which helps to promote implementation (see Chapter 8). The timelines associated with Objective Targets can also be used as a way of prioritizing different clusters of Actions; for example, if a particular threat requires urgent Action, its associated Objective Targets might have short timelines. Examples of Objectives and Objective Targets are shown in Box 7.3.

Box 7.3 Examples of Objectives and Objective Targets

Example 1: Extract from the strategic plan for conservation of African wild dogs and cheetah in eastern Africa (IUCN/SSC in press)

Objective:

4 Review and harmonize existing legislation, and, where necessary, develop new legislation, for conservation across cheetah and wild dog range at national and international levels.

Photo 7.3 Cheetahs (*Acinonyx jubatus*) in Masai Mara National Reserve, Kenya
IUCN Photo Library © IUCN / Sue Mainka

Objective Targets:

4.1 Gaps in information on positive and negative effects of hunting on cheetah and wild dog conservation which can assist in policy evaluation and development are identified within one to three years.

4.2 Information on the extent of illegal wildlife related activities within cheetah and wild dog ranges for relevant authorities to strengthen policy/law enforcement and quality tourism provided within one to three years.

4.3 Explicit information provided to the management authorities to support identification and prioritization of corridor and dispersal areas for improved connectivity of cheetah and wild dog ranges within one to three years.

4.4 A memorandum of understanding to co-ordinate eastern African country management and its enforcement relevant to cheetah and wild dog conservation developed within one to three years.

Example 2: Extract from the Conservation Strategy for Wild Cattle and Buffaloes in Southeast Asia (IUCN/SSC in review)

Objective:

1 Maintain and, where appropriate, expand the area of wild cattle and buffalo habitat, and increase the proportion of that habitat that is well managed, to ensure the viability and ecological functionality of wild cattle and buffalo populations.

Objective Targets:

1.1 Well managed protected areas with priority populations of wild cattle and buffaloes maintain, or where appropriate, improve, their management standards by 2013.

1.2 Appropriate management practices developed for other priority protected areas with wild cattle and buffaloes by 2013.

1.3 Appropriate management practices implemented for existing second priority protected areas with wild cattle and buffaloes by 2018.

1.4 Potential, currently unsecured, wild cattle and buffalo habitat assessed by 2018.

1.5 Unprotected habitat put under appropriate management by 2018 (and beyond).

7.5 Ensuring Objective Targets are "SMART"

Objective Targets should be SMART (Specific, Measurable, Achievable, Realistic, and Time-bound). The SMART acronym was introduced in Chapter 6, in relation to Goal Targets, but is equally applicable to Targets at the Objectives level. The components of the SMART acronym are as follows:

- *Specific*
  Objective Targets should be defined in sufficient detail, and written in such a way, that (a) an explicit outcome is stated and (b) it is clear that action is needed to achieve this outcome. For example, the Strategic Plan for the Conservation of Asian Wild Cattle and Buffaloes (IUCN/SSC in review) includes an Objective Target requiring "*Surveys using appropriate peer reviewed methods to measure population size and trend conducted in priority sites by 2018*". This Objective Target is specific in that it states clearly what needs to be achieved (surveys of population size and trends need to be completed), how (using appropriate peer-reviewed methods), and where (in priority sites – which in this case were identified in the Goal Targets).

- *Measurable*
  Objective Targets should be measurable, so that it is clear when they have been met. In the example given above, the Objective Target is measurable since it will be apparent when the surveys have been completed.

- *Achievable*
  Objectives Targets need to be achievable. If the Targets are too ambitious, then they are unlikely to be achieved, and people working towards them may lose motivation. In assessing whether or not an Objective Target is achievable, it may be helpful to consider whether others have achieved something similar in a similar timeframe. It is also helpful to ensure that there are no insurmountable obstacles to achieving the Target, such as civil unrest. In the example given above, the Objective Target is considered to be achievable because the surveys of population size and trend are restricted only to priority sites, not to all sites where the species occur.

- *Realistic*
  An Objective Target may be achievable because it could be attained in principle, but not be realistic because there are insufficient resources (e.g., money, skills, or commitment) available, or there is no chance of obtaining them.

- *Time-bound*
  Each Objective Target should specify the time within which (or the date by which) the Target should be reached. Setting a deadline creates a sense of urgency because there is a clear date by which the Objective Target should be met. It also makes the Objective Target measurable. As noted above, timelines can be used as a way of prioritising among Objective Targets, with shorter timelines given to Targets addressing more urgent threats (though timelines should not be so short as to make the Target unachievable or unrealistic). The timeline for each Objective Target should be less than, or equal to, the timescale for the SCS as a whole.

8. Actions

This chapter describes Actions necessary to achieve the Objectives, and ultimately the Goals and Vision of a SCS. It defines Actions as any activity which will contribute to improving the conservation status of the species of concern. The chapter provides guidance on identifying Actions and sites for Action, determining timelines, identifying actors, and prioritizing Actions within the framework of a SCS. It also explains the necessity of monitoring the effectiveness of Actions through indicators of success.

8.1 Introduction

Actions are the activities which need to be implemented to achieve the SCS's Objectives and, ultimately, its Goals and Vision. Proposed Actions are likely to be diverse, including activities such as the protection of populations and their habitats, surveys of distribution and status, captive breeding, and research, as well as capacity development, education, policy development, advocacy and fundraising.

It is important to bear in mind that, while many species inhabit landscapes or seascapes administered by multiple countries and therefore require conservation across or beyond international boundaries, the majority of Actions will be governed by national policies. Developing national Action Plans (or Action Plans at the local or regional level if these are the scales at which policy is determined) will be vital under such circumstances. The SCSs developed under the auspices of SSC, at scales which will usually be range-wide or regional, can provide excellent templates for national Action Plans. Chapter 9 provides greater detail on how such Plans may be developed. Using SCSs in this way can help ensure that national Action Plans adopted by neighbouring countries complement one another.

It is almost inevitable that information and experience will be gained in the course of implementing a SCS: some Actions may succeed and others may fail. It is important that the SCS be devised in a way which allows managers to learn from these successes and failures and to modify Actions accordingly. Hence, where possible, all management Actions should be developed and implemented in association with appropriate monitoring programmes. Most or all SCSs should list monitoring as an Action.

This chapter provides guidelines on how to identify appropriate Actions within the framework of a SCS.

8.2 What are Actions?

8.2.1 How Actions fit within the SCS

The term "Action" here describes any conservation activity which will, directly or indirectly, contribute to improving the conservation status of the species involved. Actions form the most crucial component of a SCS: it is these Actions which, if correctly identified and fully implemented, should achieve the SCS's Objectives and hence, in turn, contribute to achieving its Goals and Vision. For this reason, almost all aspects of the strategic planning process are designed to ensure that the right Actions are recommended, and that these recommendations have the greatest probability of being implemented.

Within the framework of the SCS, Actions fall below Objectives (see Figure 2.1). However, because Objectives can be rather broad in their scope, whereas Actions are often most useful if very specifically defined, it is helpful to group Actions under a number of Objective Targets associated with each Objective (Figure 2.1; also see Table 8.1). Each of the Actions proposed should be necessary to achieve the Objective Target with which it is associated. Additionally, the Actions listed under an Objective Target should, together, be sufficient to reach that Target.

Table 8.1 – An example of Actions grouped under an Objective Target;

Extracted from the Regional Strategy for the conservation of African wild dogs and cheetahs in eastern Africa (Note that only one of several Objective Targets is listed here.)

Objective	Objective Target	Action
1. Develop and implement strategies to promote coexistence of cheetah and wild dogs with people and domestic animals	1.1 Sustainable tools to reduce wild dog and cheetah impacts on livestock developed and disseminated across the region within three years	1.1.1 Identify areas where cheetah and wild dog populations are significantly threatened by conflict with livestock farmers
		1.1.2 Identify the circumstances that contribute to livestock depredation by cheetah and wild dogs in the identified areas
		1.1.3 Develop effective strategies for disseminating existing information on reducing cheetah and wild dog impacts on livestock to relevant parties across eastern Africa

Source: IUCN/SSC in press.

8.2.2 How specifically should Actions be defined?

All SCSs should list Actions. However, SCSs will vary in how specifically those Actions are defined. Range-wide or regional SCSs which are likely to involve implementation by diverse management authorities, or those which concern multiple species, may include recommended Actions which are fairly broad in their scope. By contrast, national or local Action Plans, or SCSs concerning single species, may include Actions which are much more specific. Whatever the geographic scope of a SCS or Action Plan, lists of Actions will often be most useful if they are highly specific, detailing not only what needs to be done (see section 8.3), but also by whom ("actors"; see section 8.7), where (see section 8.5), and by what date ("timeline"; see section 8.6 below). In addition, indicators of success should ideally be defined for each Action ("indicators"; see section 8.4); these help to define what each Action is intended to achieve, and to determine when the Action has been performed successfully. To ensure that it is apparent whether or not indicators have been achieved, it will often be helpful to define monitoring needs for each Action (see section 8.4). Finally, it may sometimes be useful to attach priority rankings to particular Actions (see section 8.8).

This level of detail is appropriate within a local or national Action Plan; whether it is useful or necessary in regional or range-wide SCSs will vary on a case-by-case basis. Such detail should be viewed as optional. Crucially, the amount of specific detail associated with a particular Action should not go beyond the data available (e.g., reintroduction sites should not be specified if they have not been carefully evaluated; instead, evaluation of potential sites might be listed as an Action). In addition, consideration needs to be given to how the provision of detailed prescriptions may influence the probability that a SCS will be implemented. Overly detailed SCSs can appear daunting or prescriptive, and are likely to alienate stakeholders who were not involved in developing them. As discussed in Chapter

9, action planning workshops at the national (or local) level can accommodate many more key stakeholders than can be involved in range-wide or regional workshops, and it will often be most appropriate to add detail at this national level. As an extreme example, it would rarely be appropriate to nominate actors to perform specific Actions if those individuals or institutions had not participated in the strategic planning process.

Table 8.2 An example of Actions with their associated actors, timelines and indicators of success

Extracted from the National Action Plan for the Conservation of Cheetahs and Wild Dogs in Kenya, developed using as a template the regional Strategy mentioned in Table 8.1. (Note that neither sites nor monitoring needs were defined in this national Plan.)

Objective Target	Action
1.1 Sustainable tools to reduce wild dog and cheetah impacts on livestock developed and disseminated across the region within three years	1.1.1 Identify areas where cheetah and wild dog populations are significantly threatened by conflict with livestock farmers *Timeline:* 6 months *Actors:* Kenya Wildlife Service and NGO partners *Indicators:* Distribution map of areas in Kenya where cheetah and wild dog populations are significantly threatened by conflict with livestock farmers
	1.1.2 Identify the circumstances that contribute to livestock depredation by cheetahs and wild dogs in the identified areas *Timeline:* 3 years *Actors:* Kenya Wildlife Service, Cheetah Conservation Fund-Kenya, Samburu-Laikipia Wild Dog Project, Ijara-Lamu Wild Dog Project, East African Wildlife Society, African Wildlife Foundation, local communities *Indicators:* Report on circumstances that contribute to livestock depredation by cheetahs and wild dogs

Source: KWS in press.

8.2.3 Dealing with uncertainty

In developing almost any SCS, it will become clear that knowledge is imperfect, and that better information would foster more effective conservation. Such data needs are likely to be diverse, and may relate to knowledge of distribution and status, the effectiveness of particular management approaches, and how to measure the effectiveness of particular Actions.

Some data deficiencies present only trivial barriers to conservation; others are substantial. For example, knowing whether there were 873 Grevy's zebra (*Equus grevyi*) in northern Kenya's Ewaso ecosystem, or 854, would be unlikely to influence management, since such a small difference is within the range of annual fluctuation in population size. In contrast, knowing that the population had declined to 200 animals would be a cause for concern; hence recommended Actions should include monitoring programmes sensitive enough to detect marked changes in population size with sufficient statistical power. Likewise, conservation efforts for the last potentially viable population of the highly endangered Ethiopian wolf (*Canis simensis*) would be greatly influenced by knowing whether – in the face of endemic rabies, densities of domestic dogs high enough to maintain rabies infection for the foreseeable future, and recurrent rabies epizootics among wolves – vaccinating dogs or wolves would be most likely to prevent wolf extinction. Research to answer this question might therefore be recommended as an Action. Where the process of developing Objectives and Objective Targets highlights important information needs, the recommended Actions should specify means of addressing these needs.

In some cases, there may be considerable uncertainty about the environmental, social or political conditions under which species conservation will be attempted. For example, some parts of the world are prone to political instability; elsewhere, the effects of climate change on future habitat suitability may be uncertain. It may be helpful, in developing SCSs, to explicitly recognise such uncertainty where it exists, and to consider the potential of particular Actions to achieve their Targets under different plausible scenarios. In some cases it may be possible to develop contingency plans to deal with alternative future scenarios.

8.3 How to identify which Actions to recommend?

In a well-designed SCS, the Objectives (see Chapter 7) should be carefully formulated to address the key threats and constraints identified in the Status Review (see Chapter 5) and wider problem analysis (see Chapter 7). The Actions identified as necessary to reach each Objective should therefore mitigate the threats or constraints faced by the species of concern. Although the structure of the SCS process should ensure that this is the case, in preparing such a strategy it is still worth checking that all of the Actions address the threats and constraints, and that, in turn, all of the key threats and constraints are addressed by the Actions. For example, if a species' persistence were threatened by widespread habitat destruction, taking measures to secure or restore habitat would be appropriate Actions; in contrast, captive breeding might not be appropriate.

Some constraints on successful conservation may not feasibly be mitigated by those responsible for developing or implementing the SCS (e.g., climate change, human population growth, or large infrastructure projects). In such cases, Actions will often need to focus on proximate threats. However, the need to address ultimate threats and/or constraints still needs to be clearly stated; it may also be appropriate to include Actions such as lobbying or sensitizing those organizations which do have power to influence such factors.

In deciding which Actions to recommend, it may be helpful to consider multiple Actions to ameliorate the same threat or constraint. Many threats will be multi-faceted and several Actions will be required to reduce their impact. For example, reducing illegal logging might require a combination of increased patrol effort by forest rangers, environmental education to explain the ecosystem services provided by intact forest, and capacity development to allow initiation of forest-based tourism enterprises at the local scale, while legal action, advocacy, or consumer-boycott initiatives might be needed at the national or international scale. Box 8.1 provides some real-world examples of multiple approaches to particular threats.

Once possible management approaches have been identified, but before any Actions are definitively recommended in the SCS, their likely effectiveness should be evaluated and documented. This is critically important: ineffective Actions waste money and other resources without contributing to the conservation of the species concerned. Indeed, there are sufficient examples of well-intentioned Actions which could reasonably have been expected to improve species' conservation status, but in fact made matters worse (for the same or another species), to warrant routine evaluation of conservation measures, particularly for critically endangered species (see Table 8.3). The need to conduct such

Box 8.1 Real-world examples of threats addressed using multiple approaches

Threat: Wild populations of seahorses declining due to over-harvest for traditional medicines, curios and the aquarium trade.

Actions taken include:
- Encouraging the designation of marine protected areas;
- Helping to develop alternative livelihoods for seahorse fishers;
- Regulating international trade through the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- Developing aquaculture methods to reduce pressure on wild populations;
- Educating local and global communities about the impacts of the seahorse trade;

(Source: Forrest *et al*. 2007)

Threat: Ethiopian wolves at risk of extinction due to infectious diseases caught from domestic dogs.

Actions taken include:
- Vaccination of domestic dogs;
- Emergency vaccination of Ethiopian wolves;
- Testing of methods to reduce domestic dog ranging in Ethiopian wolf habitat;
- Strengthening the capacity of authorities charged with protecting Ethiopian wolf habitat;
- Outreach to local communities in and around Ethiopian wolf habitat.

(Sources: Sillero-Zubiri and Macdonald 1997; Laurenson *et al*. 1998; Haydon *et al*. 2006)

Threat: Asian elephant population in Indonesia’s Way Kambas National Park threatened as a result of conflict with farmers on neighbouring land.

Actions taken include:
- Surveys and monitoring to assess population size and to identify and quantify threats;
- Mathematical modelling to quantify impact of poaching;
- Human–elephant conflict mitigation methods tested and demonstration sites established;
- Training in law enforcement methods provided in collaboration with the CITES/MIKE Programme;
- Legal support for prosecution of poachers provided to the park authorities by NGO-run “Wildlife Crimes Unit”;
- Lobbying to overturn national policy on capturing elephants as a response to conflict with farmers;
- Outreach/education work conducted in local communities.

(Sources: Hedges *et al*. 2005; Hedges and Gunaryadi in press; Tyson *et al*. in review; Wildlife Conservation Society, unpublished data.)

Threat: Florida manatees threatened by collisions with boats.

Actions taken include:
- Establishment of manatee protected areas and no-boat zones;
- Boat slow-speed zones established in areas of high manatee use;
- Marinas harbouring fast-moving large-propeller boats relocated away from areas of high manatee use;
- Awareness campaign throughout Florida spearheaded by regional groups and celebrities.

(Source: Marine Mammal Commission 2003)

evaluations can, of course, be a recommended Action within the SCS, if this has not been completed at the time of developing the Plan.

Table 8.3 Real-world examples of Actions which could reasonably have been expected to have beneficial effects, but proved damaging in practice

Citing of these examples implies no criticism of the conservation programmes involved; all went on to achieve growing populations, with spectacular success in some cases.

Species	**Action**	**Outcome**	**Reference**
Black-footed ferret *Mustela nigripes*	Vaccination of newly captured animals with modified live vaccine against canine distemper virus	Vaccine caused clinical distemper and death	Carpenter *et al.* 1976
Large blue butterfly *Maculina arion*	Exclusion of livestock from reserve to reduce disturbance	Loss of grazing made habitat unsuitable for the butterfly's host species and the butterfly became locally extinct	Thomas 1980
Wood duck *Aix sponsa*	Installation of large numbers of nest boxes to encourage population growth	Conspicuous nest boxes encouraged brood parasitism and reduced hatching success	Eadie, Sherman and Semel 1998
Kakapo *Strigops habroptilus*	Supplementary feeding of females to encourage successful breeding	Artificial food attracted Polynesian rats, which are nest predators	Merton 1989, cited in Caughley and Gunn 1996
San Clemente loggerhead shrike *Lanius ludovicianus mearnsi*	Euthanasia (and more recently live capture) of critically endangered island foxes (*Urocyon littoralis*) during the shrike (and fox) breeding season to avoid nest predation	Fox population declined but shrike population did not increase; cessation of this management did not reduce shrike recruitment	Roemer and Wayne 2003; Swarts 2006

Evidence of the effectiveness of particular management approaches should be provided, or cited, in the narrative sections of the SCS, to give managers and decision-makers confidence that recommended Actions will work. Tests of particular management approaches may be recommended as Actions, if (as will often be the case) they have not been conducted prior to the development of the SCS.

The sections below detail methods that can be used to evaluate potential Actions. These methods are discussed in approximate order of data quality, with the first methods discussed being those which provide the strongest evidence of success and, hence, give greatest confidence of effectiveness if applied widely. Not all of the methods discussed will be appropriate in all circumstances. Nevertheless, conservationists are increasingly recognising the importance of basing management on good evidence (Sutherland *et al.* 2004), and efforts should be made to evaluate proposed Actions to the highest standard that is practicable. Documenting management approaches that have failed is as important as describing those which have been successful, to avoid repetition of the same (undoubtedly well-intentioned) mistakes. Information sharing resources such as http://ww.conservationevidence.com and http://ww.environmentalevidence.org may be useful in this regard, and those developing SCSs should draw on such resources, as well as contributing to them.

8.3.1 Experimental field tests of management Actions

The gold standard for evaluating the effectiveness of a particular management method is an experimental trial conducted under field conditions. Although it is not always possible or appropriate to conduct such experiments, this approach should be considered where possible. Even if other approaches (detailed below) are used to identify promising methods, it is still advisable – once again where possible – to conduct field trials or pilot studies to confirm the methods' utility for conservation of the species concerned, in the circumstances under which management would be implemented. Not only does this ensure that the management is effective, it can also confirm that threats to the species' conservation have been correctly diagnosed (Caughley 1994).

Photo 8.1 Flightless cormorant (*Phalacrocorax harrisi*) in Fernandina Island, Galapagos Islands, Ecuador © Robert Lacy

Table 8.4 Real-world examples of Actions which have been subjected to experimental testing in the field

Species	Action	Results	Reference
Asian elephant *Elephas maximus*	Coordinated guarding of fields, and construction of chilli-grease fences, intended to reduce damage to crops and hence hostility to elephants	Coordinated guarding was highly effective but addition of chilli-grease fences led to no further improvements and their use was discontinued	Hedges and Gunaryadi in press
Black petrel *Procellaria parkinsoni*	Dripping shark oil behind longline fishing boats, intended to deter seabirds from diving after baits and drowning	Shark oil significantly reduced diving rates relative to vegetable oil and sea water controls	Pierre and Norden 2006
Black-footed ferret *Mustela nigripes*	Release of captive bred animals intended to re-establish wild populations	On release, ferrets given experience of natural habitat (prairie dog burrows) dispersed shorter distances and appeared to survive better than those raised in cages	Biggins *et al.* 1999
Pacific halibut *Hippoglossus stenolepis*	Grating inserted into trawl nets to exclude protected pacific halibut	Nets with the grating caught 94% fewer halibut than did similar nets lacking the grating, used under identical conditions	Rose and Gauvin 2000
Multiple species	Educational leaflet mailed to residents living near protected areas in California	Only 21% of recipients recalled receiving the leaflet and there were negligible differences in attitudes between neighbours who were, and were not, sent the leaflet	George and Crooks 2006

Table 8.4 provides some examples of Actions which have been subjected to experimental tests in the field. Experimental evaluations have been conducted for a variety of methods involving management of particular populations (See Table 8.4). In contrast, there are few examples of experimentation being used to evaluate broader-based Actions such as community conservation programmes or establishment of protected areas (Ferraro and Pattanayak 2006). This is unfortunate, especially as such trials need not be arduous, and can often be conducted in the course of implementing Action (this approach is termed "active adaptive management", Parma *et al.* 1998).

8.3.2 Correlational studies to interpret “natural variation” in management practices

Even in the absence of formally-designed experiments, it may be possible to evaluate the past effectiveness of different management approaches by comparing their outcomes using a variety of statistical methods. For example Leader-Williams and Albon (1988) compared rates of change in black rhino populations in different countries and were able to conclude that expenditure of resources on anti-poaching patrols was a key to successful conservation of this species. Other such correlational studies are summarised in Table 8.5.

Table 8.5 Real-world examples of Actions evaluated using correlational approaches

Species	Measured outcome	Comparison method	Conclusion	Reference
Loggerhead turtle *Caretta caretta*	Nesting success among turtles being observed by tourist groups	Compared nesting attempts observed by groups of tourists with those not visited by tourists, using a case-control approach	Observation by tourists did not reduce nesting success and should therefore be continued for its educational value	Johnson, Bjorndal and Bolten 1996
Loggerhead turtle *Caretta caretta* Kemp's ridley *Lepidochelys kempii*	Turtle stranding rates under different management conditions	Analysed temporal trends in stranding rates as use of turtle excluder devices varied	Enforcement of turtle excluder devices in shrimp fisheries reduced stranding rates	Lewison, Crowder and Shaver 2003
Black rhinoceros *Diceros bicornis*	Change in rhino numbers over time	Compared changes in rhino numbers in different countries with spending on patrol efforts	Declines in rhino populations were prevented only where sufficient resources were expended	Leader-Williams and Albon 1988
African wild dog *Lycaon pictus* Lion *Panthera leo*	Probability of livestock predation under different husbandry conditions	Compared husbandry of attacked herds with that of herds not attacked, using a case-control approach	Specific husbandry methods were effective at deterring attacks and likely to reduce killing of predators	Woodroffe *et al.* 2006
African wild dog *Lycaon pictus*	Survival of reintroduced animals	Compared multiple reintroduction attempts using information theory	Successful attempts entailed release of socially integrated groups into securely fenced areas	Gusset *et al.* 2008
Multiple species of large African ungulates	Enforcement of anti-poaching regulations	Compared enforcement of anti-poaching efforts in Serengeti National Park with illegal harvest and ungulate densities over 50 years	Periods of poor enforcement were associated with ungulate decline and re-establishment of anti-poaching was followed by ungulate recovery	Hilborn *et al.* 2006
Multiple species	Various measures of human welfare	Compared people who have traditionally used resources from newly-established national parks in Gabon with people in similar areas beyond the influence of parks	Ongoing; intended to determine the impact of national parks on human welfare and hence to evaluate their long-term sustainability	Wilkie *et al.* 2006

Occasionally, particular management methods may be implemented sufficiently widely to allow structured data collection on their effectiveness. For example, Woodroffe *et al.* (2006) used a case-control method to determine which forms of livestock husbandry were most effective at deterring predator attacks and hence avoiding lethal control of large carnivores such as lions and African wild dogs. They collected data on the husbandry of each herd that was attacked, and then collected the same data on 1–3 neighbouring herds which were present in the same area at the same time but were not attacked. By comparing the husbandry of these two herd types, they were able to identify those characteristics which predisposed herds to attack, and those which were protective. Since more predators were killed by farmers where more depredation occurred (Ogada *et al.* 2003), encouraging the adoption of the most effective husbandry methods carried a reasonable expectation of reducing carnivore mortality.

8.3.3 Case studies

Perhaps the most widely available form of evidence for the effectiveness of particular actions will be case studies. Usually, published case studies describe the consequences of action implemented at one or a few sites. Strictly speaking, case studies cannot demonstrate conclusively that any effects observed definitely occurred as consequences of the action(s) implemented, because they are not replicated and lack control sites where no such action took place. Despite this, case studies provide a wealth of information that is extraordinarily valuable for deciding how to conduct future Actions. The features that make it difficult to generalize from case studies – including unique details of particular projects such as habitats, local cultures and economic circumstances – also provide insights into the complex factors which influence the outcomes of actions in the real world. In addition, case studies often provide the only evidence of actions which fail (since failed actions are (hopefully) rarely repeated).

Examples of case studies are legion; a few are given in Table 8.6. Sometimes, a particular form of Action has been implemented sufficiently widely that general conclusions can be drawn. Examples of such reviews are also given in Table 8.6.

Table 8.6 Real-world examples of case studies of Actions

Species	Action	Results	Reference
One-off case studies			
Giant weta *Deinacrida rugosa*	Eradication of exotic rats from Kapiti Island, New Zealand.	Weta numbers did not change significantly following rat eradication.	Sinclair *et al.* 2005
Dusky gopher frog *Rana sevosa*	Addition of well water to one of only two seasonal ponds used for breeding, to prolong availability of habitat for developing tadpoles.	Pond habitat was maintained and tadpoles survived to metamorphosis.	Siegel, Dinsmore and Richter 2006
Scarlet macaw *Ara macao*	Combination of actions including outreach, construction of artificial nests, and nest protection.	Years of highest recruitment coincided with periods of most intense anti-poaching effort.	Vaughan *et al.* 2005
Mountain gorilla *Gorilla gorilla*	Vaccination of free-ranging gorillas against measles virus following confirmation of a measles-related death.	No further gorilla mortalities occurred but it was not clear whether vaccination prevented infection.	Hastings *et al.* 1991
Reviews of multiple case studies			
African elephant *Loxodonta africana*	Monetary compensation of farmers experiencing elephant-caused damage to crops, to try to increase tolerance for elephants.	Compensation was not effective at reducing human–elephant conflict.	Human–Elephant Conflict Working Group 2000
Multiple species	Establishment of no-take marine reserves in temperate waters.	No-take areas appeared to increase density, biomass and species richness but conclusions were limited by small sample size.	Stewart *et al.* 2008

Photo 8.2 African elephants (*Loxodonta africana*) in Tarangire National Park, Tanzania
IUCN Photo Library © IUCN / Sue Mainka

8.3.4 Experience from, and tests on, similar species

Sometimes there may be prior experience of implementing the management approach on a similar species, and this experience can be collated and presented as evidence of its likely effectiveness in the species of concern. For example, when grey wolves (*Canis lupus*) were reintroduced to the northern Rocky Mountains of the USA, they were given “experimental – nonessential” (rather than fully protected) legal status under the US Endangered Species Act. This was partly because prior experience with the reintroduction of red wolves (*C. rufus*) suggested that “experimental – nonessential” status had allowed greater flexibility in dealing with problem animals, and this had been considered a key to the success of the red wolf programme (Phillips 1995).

In some cases, it may be appropriate to conduct experimental tests on surrogate species before implementing, or testing, particular management methods on the species of concern. Table 8.7 provides examples of such tests.

Table 8.7 Real-world examples of Actions which have been subjected to experimental testing on surrogate species.

Species of concern	Surrogate species	Action and results	Reference
Chatham Island black robin *Petroica traversi*	South Island robin *Petroica australis*	South Island robins' responses to being transported were investigated to determine how far black robins might safely be moved, informing the selection of a translocation site.	Butler and Merton 1992
Piping plover *Charadrius melodus*	Killdeer plover *Charadrius vociferus*	Behaviour, growth rates and survival were compared across wild, captive reared, and cross-fostered killdeer, to determine the most promising method for use in piping plovers.	Powell and Cuthbert 1993
Black-footed ferret *Mustela nigripes*	Steppe polecat *Mustela eversmanni*	Effects of different pre-release training regimens on survival and behaviour post-release were investigated using sterilised polecats before testing on ferrets.	Biggins *et al.* 1999

8.3.5 Tests on captive animals

A few forms of management under consideration for wild populations may be first tested on captive individuals. While this approach is not relevant to all Actions, it can be extremely valuable in some cases. Examples are given in Table 8.8.

Table 8.8 Real-world examples of Actions being considered for use in the wild which were tested using captive animals

Species of concern	Action	Outcome	Reference
Bighorn sheep *Ovis canadensis*	Vaccination against parainfluenzavirus III	Vaccine was safe and caused seroconversion in captivity (but did not reduce mortality of wild sheep).	Jessup, De Forge and Sandberg 1991
Asian elephant *Elephas maximus*	Estimation of population size by counting dung densities.	Defecation rates of elephants in natural habitats were measured using tame elephants and used to calibrate dung counts for wild elephants.	Tyson *et al.* in review
Several mammal species	Estimation of population size using camera trapping.	Density estimates calculated using a new method for analysing camera trap data correlated with known densities in an enclosed area.	Rowcliffe *et al.* 2008

8.3.6 Tests based on model simulation

Mathematical models may provide a valuable tool for evaluating some Actions. There are several ways in which such models may be used.

Occasionally, a species' biology may be sufficiently well characterized to allow population dynamic models (often PVA models) to be constructed. These models can then be used to simulate the effects of certain management interventions. Such model-based approaches will never produce results as reliable as those derived from empirical assessments of the outcomes of action, not least because it is rarely possible to be completely confident that population models have the appropriate structure and are correctly parameterized. Nevertheless, such simulations can be very useful in some circumstances. PVA modelling is often the only way to evaluate management approaches intended to prevent rare but catastrophic events (see example in Box 8.2).

Modelling can also explore the range of possible or likely outcomes that can arise from one or more uncertain and often interacting processes (see example in Box 8.3).

Box 8.2 An example of the use of PVA modeling to evaluate alternative management approaches: disease risks to island foxes.

Epidemic disease was known to be a threat to the Critically Endangered island fox since one subspecies had experienced a massive population crash associated with an outbreak of infection with canine distemper virus (Timm *et al*. 2000). In developing a recovery plan for island foxes under the US Endangered Species Act, two potential approaches to the management of epidemic disease were considered (USFWS in prep): (a) intensive monitoring to detect outbreaks, with vaccination and quarantine; or (b) pre-emptive vaccination of a small proportion of the population as had been proposed for other endangered canids (Haydon, Laurenson and Sillero-Zubiri 2002; Vial *et al*. 2006). However, experimentation was impossible since disease epidemics occur very rarely, and the existence of only one wild population of each island subspecies would effectively preclude replicated trials. The two approaches were therefore simulated within well-parameterised PVA models (Doak and Bakker unpubl. data); this indicated that, given the small size of the islands, it would be essentially impossible to detect and respond to an epidemic before infection had spread through the population, whereas pre-emptive vaccination could be expected to substantially reduce the risk of disease-associated extinction. The latter approach was therefore adopted by land managers responsible for island fox conservation, after captive trials had confirmed that vaccination conferred no ill effects (Swarts 2006; Timm *et al*. 2002).

Another area of Action in which mathematical modelling – particularly statistical modelling – is extremely useful is in the design of surveys and monitoring programmes. Estimates of population sizes, and trends in population size, are often considered critical for evaluating the outcomes of entire conservation programmes, as well as for measuring the effectiveness of particular Actions. However, the most appropriate methods vary greatly according to circumstances. General methodologies are available (see, for example, Buckland *et al.* 2001; Legg and Nagy 2006; MacKenzie *et al*. 2005; Shrader-Frechette and McCoy 1993; Williams, Nichols and Conroy 2002), but further modelling may be valuable for tailoring methods for particular species or circumstances (see, for instance, Barnes 2002; Karanth and Nichols 2002; Plumptre 2000; Sims *et al.* 2006; Taylor and Gerrodette 1993).

8.4 Monitoring the effectiveness of Actions: indicators of success

The implementation of any management approach should be combined with monitoring of its effectiveness, as this allows refinement of successful approaches and abandonment of unsuccessful ones. Such monitoring is especially important for novel approaches which have not been fully evaluated for a particular species or set of circumstances.

In many SCSs, monitoring of wildlife populations will be recommended as its own discrete Action, or set of Actions; such monitoring will be needed to determine whether progress has been made towards achieving the agreed Goals.

Box 8.3 An example of the use of PVA modelling to evaluate alternative management approaches: oil field development in habitat of the greater sage grouse.

In the state of Colorado, USA, extraction of petroleum and natural gas was identified as a primary threat to the greater sage grouse, primarily through the disruption of grouse lek sites and direct mortality of individuals. PVA modelling was used to evaluate the demographic impact of developing gas fields and, after careful validation and sensitivity analysis, to explore the likely consequences of different ways of conducting such development (Schnurr *et al*. 2006). PVA models were developed initially in a workshop setting, with direct involvement of representatives from the State's petroleum industry as well as representatives from the State's wildlife management authority. This diverse participation in the process, even by those largely unfamiliar with the techniques of PVA, was key to the success of the overall effort.

Detailed hypotheses concerning the relationship between petroleum extraction and sage grouse demography were created, and mitigation of these extraction activities was defined by altering the relative duration of high-intensity development of the gas field, and/or the length of time taken to achieve the transition from gas field development to production (Figure 8.1). Analysis of alternative mitigation strategies suggested that the critical variable was the duration of high-intensity development (Figure 8.2). This information was used to recommend management actions designed to minimize the impact of oil-field development in greater sage grouse habitat – if development were to proceed at all.

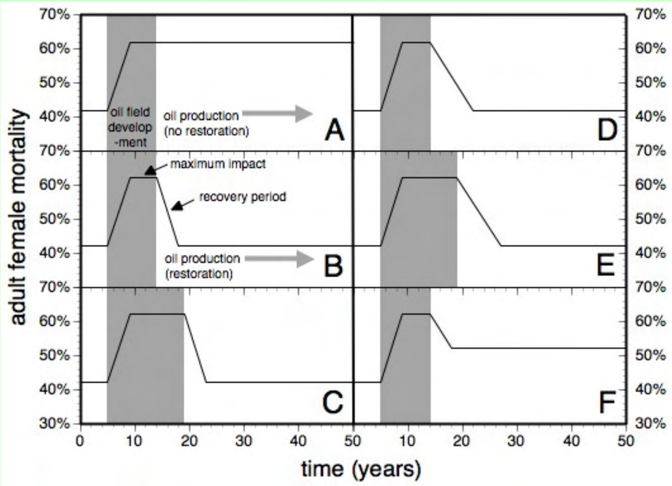

Figure 8.1 Alternative scenarios concerning the impact of oil field development on sage grouse mortality (Adopting different development scenarios is assumed to influence the magnitude and duration of mortality effects.)

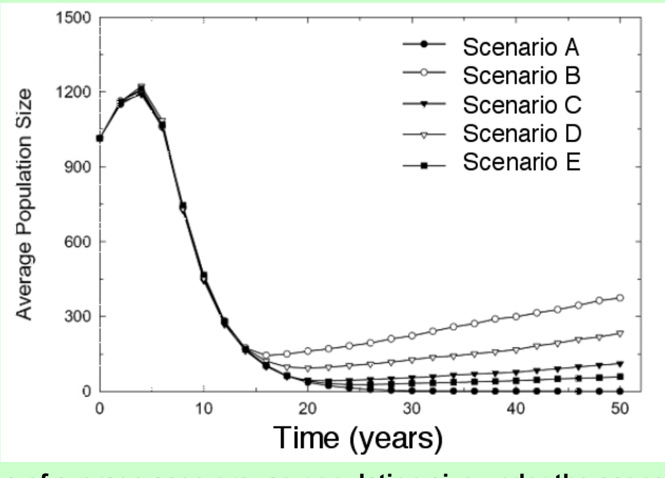

Figure 8.2 Projections of average sage grouse population size under the scenarios of oil field development depicted in Figure 8.1, based on PVA modeling
Source: Both Figures are adapted from Schnurr *et al*. 2006

Multiple forms of monitoring may be integral to the Actions proposed. For example, a SCS might recommend that illegal killing of elephants for their ivory be addressed by expanded anti-poaching efforts. In implementing this Action, it would be appropriate to record the level of effort expended on anti-poaching activities (e.g., the number of ranger patrol days per month in a given area), and the number of elephant carcasses detected for a given search effort. In this example, the measure of anti-poaching effort could be compared with past levels to determine whether the Action had been performed, while the rate of carcass detection would provide an indication of whether the Action had been successful in reducing elephant mortality.

In recognition of this need for continual evaluation of progress and success, each Action within a SCS should ideally be associated with one or more indicators of success. An indicator is a description of the conditions that would show that a particular Action had been implemented successfully. Good indicators are measurable, precise, consistent, and sensitive. Examples of indicators of success are shown in Table 8.2.

It will often be useful to record not only the indicator (including, where appropriate, the units by which it can be measured), but also the monitoring that needs to be conducted to provide the indicator. In many cases, the forms of monitoring that need to be integrated within an Action will be self-evident once the indicators of success have been specified; in other cases careful consideration will be needed to determine monitoring needs. In the anti-poaching example given above, success could be measured by recording indicators such as "*(a) ranger patrol efforts increased to X patrol days per km^2 per month; (b) evidence that elephant poaching has declined*". Monitoring needs might be defined as "*record (a) number of ranger patrol days per km^2 per month; and (b) number of elephant carcasses discovered per km^2 surveyed per year".* The monitoring needed to provide indicators of success has not been recorded in conservation strategies to date (e.g., IUCN 2005; IUCN 2006; IUCN/SSC in press); however their inclusion under some circumstances (especially in local or national Action Plans) may provide a useful clarification.

Indicators of success may highlight intermediate steps on the path to achieving Objective Targets, as well as evaluating progress towards the SCS's Objectives, Goal Targets and Goals. For example, one Goal of a SCS for snow leopards might be to achieve a stable or increasing snow leopard population in a particular area, and one Action within such a SCS might be to resolve conflicts with local livestock farmers. In such circumstances, monitoring might measure trends in the number of livestock killed by snow leopards, farmer attitudes to snow leopards, and the numbers of snow leopards killed by farmers. Reduced numbers of livestock killed, and improved farmer attitudes, are intermediate steps indicating that conservation activities are having positive effects likely to benefit snow leopards. However, only evidence of reduced snow leopard mortality would indicate definite progress towards the ultimate Goal of stable or increasing snow leopard numbers.

Wherever possible, monitoring approaches should be developed alongside the management intervention being proposed. Monitoring methods will be highly specific to the species or management intervention concerned. In developing SCSs, participants should ideally discuss, review and present not only methods for collecting monitoring data but also approaches to data analysis and interpretation; note that in many cases these can be very simple and non-technical. In most SCSs, population monitoring is likely to be specified as an Action in itself, as well as providing an indicator of the success of multiple other Actions.

8.5 Recommending sites for Action

Ultimately, it will be important to decide not only what Actions should be performed, but also where they should be conducted. Whether or not it is appropriate to specify the sites where Action should be carried out will depend on the scope of the SCS. In general, specifying sites will be especially appropriate for national or local Action Plans dealing with one or a few species, but may also be valuable in SCSs covering multiple range States or species.

In many SCSs, determining sites for conservation activity will be among the recommended Actions (see, for example, the first Actions given in Tables 8.1 and 8.2). In other cases, the circumstances operating at particular sites may already be well known, and Actions may be linked to particular sites. Specification of sites for Action is especially likely if site-specific Goals or Goal Targets have been developed (see Chapter 6). For example, if the analysis conducted in developing the Goals led to a recommendation for species restoration at a particular site, then Actions concerned with re-introduction efforts might well specify the site at which activities would be targeted. Lists of sites need not be exhaustive. For example, a specified Action might be to "*construct artificial nests at sites where nesting habitat has been lost, including sites XX, YY and ZZ*".

It is important to note that sites might be specified for some, but not all, Actions within a SCS. The amount of detail associated with each recommended Action should be determined by what is appropriate under particular circumstances (see section 8.2.2 above).

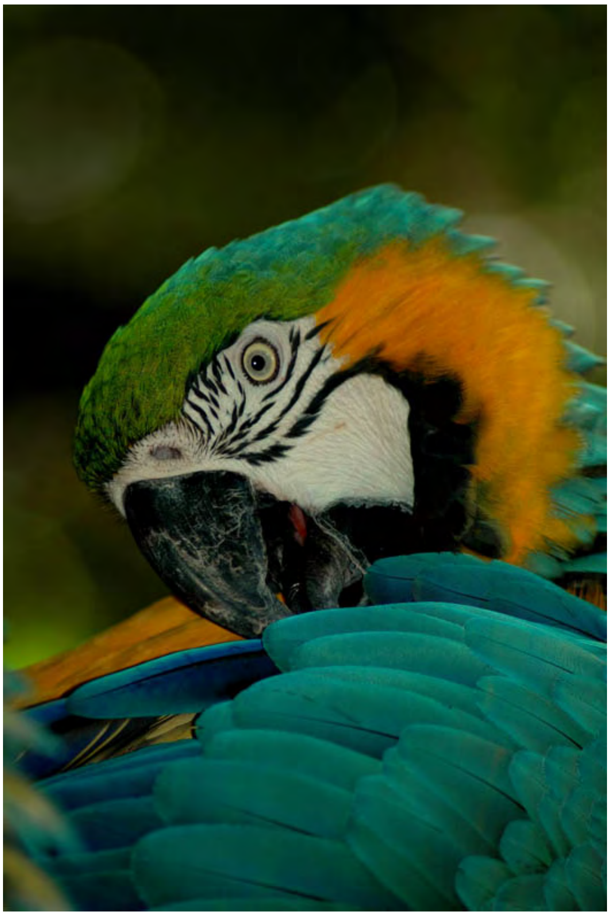

Photo 8.3 A Blue-and-yellow-macaw (*Ara ararauna*) in the Bird Park of Iguaçu, Brazil IUCN Photo Library © Imène Meliane

8.6 Determining timelines for Action

Where possible, a SCS should specify not only what Actions need to be taken, but also on what timescale. Specifying timelines will be especially appropriate for national or local Action Plans, for which the recommended Actions may be highly specific (see section 8.2 above). The timeline for each Action should be equal to, or shorter than, the timeline specified within its associated Objective Target; this ensures that the Target will be achieved if its associated Actions are all performed successfully. Some examples of timelines are given in Table 8.2.

Nominated timelines should be appropriate to the Actions proposed and the biology of the species. For example, if an Action was intended to achieve increasing population size, one would expect to have to perform it over a longer period for a species of rhinoceros than for a species of beetle. Likewise, Actions recommended within a

SCS for a poorly-known species in a developing country might depend upon a great deal of capacity development and data collection, and hence might reach their Objective Targets more slowly than those within a SCS involving a well-studied species in a developed country.

8.7 Identifying actors

Where possible, a SCS should specify not only what Actions need to be taken, but also by whom. Nominated actors (ideally individuals but sometimes organizations) will be much more likely to carry out the recommended Actions if they were involved in developing the recommendations; indeed, it is rarely appropriate to nominate individuals or institutions to perform particular Actions without their consent. This is one reason why participatory workshops play such an important role in developing management recommendations. The need for involvement of nominated actors may constrain the identification of specific actors to national or local Action Plans, which allow participation by greater numbers of local stakeholders than is possible at the regional or range-wide level. Where possible, individuals (usually workshop participants) should be identified to assume primary responsibility for initiating particular Actions, even if their primary role is to ensure that other individuals – in the same or another organization – take responsibility for implementing the Action. Some examples of actors, nominated within a national Action Plan, are given in Table 8.2.

8.8 Attaching priorities to Actions

In a well designed SCS, all of the Actions should be necessary to achieve the Objective Targets; hence, none of the recommended Actions should be superfluous. Nevertheless, it is highly likely that some Actions will make a greater contribution towards achieving the Goals of the SCS than will others, and may thus be considered to have higher priority. For example, if a Status Review for an endangered primate indicated that the bushmeat trade represented a more urgent threat than did infectious disease, then tackling hunting would be expected to have higher overall priority than developing guidelines for health management. In some cases, groups engaged in developing SCSs may choose to classify Actions according to their priority, perhaps ranking them as “high”, “medium” and “low” priority. Priorities may also be attached to Actions through their timelines, or through the timelines attached to their associated Objective Targets. Hence, in the example cited above, a SCS might require that Actions to reduce hunting for bushmeat be implemented within one year, with guidelines for health management being developed within five years. Alternatively, depending on circumstances, participants may consider it unhelpful or inappropriate to prioritize among Actions which have all been identified as necessary for conservation of the species concerned.

Any such priority-setting should recognise that threats vary between sites, and over time, so that priorities need to vary accordingly. As an example, a meta-analysis of mortality causes among African wild dogs revealed that accidental capture in snares set for wild ungulates was a major threat to several populations, but non-existent elsewhere, dependent largely on the hunting traditions of local people (Woodroffe *et al.* 2007a). This means that addressing snaring would be the highest priority for conservation of some populations, and completely unnecessary for others. Variation of this kind could be encompassed within the strategic planning process by attaching priorities to Actions within local or national Action Plans, but not at the regional or range-wide level.

Another important consideration in prioritizing Actions is that different organizations and individuals have different expertise, and hence different capacities to conduct Actions. For example, a zoo might have the capacity to conduct captive breeding but not habitat restoration, even if the latter was considered a higher priority Action. Thus, different organizations may work to implement different Actions, not always in sequence with any defined priorities. This is in fact useful, as it would be problematic if all actors focused only on the top priority Actions and left lower priority, but still necessary, Actions unattended.

9. Using a Species Conservation Strategy to develop national or local Action Plans

This chapter discusses how the SCS process is also helpful for the preparation of national or local Action Plans. It argues that the Vision, Goals, Objectives, and Actions agreed by participants preparing the SCS can be readily adapted to the national or local level. The chapter re-emphasises the continued need for broad-based participation in conservation planning. It also provides some guidance on possible content and tools to be used in national action planning workshops.

9.1 Introduction

Although species conservation requires planning at the range-wide or regional level, almost all conservation activities are conducted under the authority of national or local governments. This should present few problems when planning for the conservation of species restricted to the area covered by single government authority (usually a single range State). However, many species' geographic ranges overlap areas administered by multiple authorities. For these species, it is essential that range-wide (or regional) SCSs can be readily translated into a number of Action Plans which can be implemented under the authority of particular governments. In most cases, this will entail developing national action plans; however in some cases it may be more appropriate to develop such Action Plans at the state or provincial level, or at the supra-national level.

Fortunately, experience has shown that national Action Plans can be produced (or, where appropriate, updated) easily and quickly where range-wide or regional SCSs have been developed along the lines described in Chapters 5–8 (e.g., TAWIRI 2007, KWS in press, DWNP in prep). Indeed, serving as a template for national Action Plans is one of the most effective uses for a SCS. Not only does this approach encourage the development of national Action Plans, it should also ensure that the Action Plans developed by multiple range States within a region complement one another. This makes it more likely that the range-wide or regional Goals and Vision will be achieved and also facilitates a co-ordinated regional approach to implementation.

Some examples of agendas for national workshops can be downloaded from the web at: http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_cheetwd_BOT.pdf (national workshop on cheetahs and wild dogs in Botswana) and http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_AWCB_VIE.pdf (national workshop on Asian wild cattle and buffaloes in Vietnam).

9.2 Participation

If a range-wide or regional SCS is to be acceptable for use as a template to develop national Action Plans, it is essential that it be developed with participation from key stakeholders from each range State (particularly range State wildlife authorities). Such participation in the range-wide or regional process should ensure that the resulting SCS takes into account the species' status in each range State, and also that it tackles key issues affecting species conservation in each range State. Participation also instils a sense of national ownership of the range-wide or regional SCS which is extremely important for fostering acceptance at the national level.

At a range-wide or regional workshop, the number of participants from each range State will be constrained by the need to keep discussions manageable, as well as by limited space and resources. As described in Chapter 4, this means that participants need to be chosen carefully. At least some of the participants at range-wide or regional workshops should not only be able to ensure that issues relevant to their range State are incorporated into the SCS, but should also be recognised and trusted to do so by their national colleagues. While the former will ensure that the range-wide or regional SCS can serve as a template for a national Action Plan, the latter will help to encourage acceptance of this approach at the national level.

Only a limited number of participants from each range State can be accommodated at range-wide or regional workshops (since it is difficult to ensure full participation by groups numbering more than about 40 participants, and often these must include delegates from multiple range States). However, this constraint is lifted, to some extent, at the national level. This means that many participants who could not be accommodated in a range-wide or regional workshop can (and should) be invited to national workshops. As for the range-wide or regional workshop(s), participants in national workshops should be those stakeholders most likely to be involved in implementing the national Action Plan, be that through habitat or population management, capacity development, research, policy development, fundraising, or other means. In practice, this means that participants will include representatives from wildlife authorities (often from both national and local levels), park managers, representatives of national and international NGOs, researchers, and others able to make a practical contribution to the development and implementation of the national Action Plan. The people who represented the range State at the range-wide or regional workshop are vital participants in the national workshop, since they are best placed to explain the range-wide or regional SCS to their compatriots.

Figure 9.1 Participants in the Kenya national Action Planning workshop for cheetahs and African wild dogs, conducted immediately after the eastern Africa regional strategic planning workshop in February 2007 © R. Woodroffe
Red circles indicate Kenya national participants, and green circles show observers from other range States.

In some cases, it may be appropriate to allow a number of people to attend the national workshop as observers (i.e., to observe the discussions but not to influence or participate in them). For example, national planning workshops for cheetahs and African wild dogs in Kenya and Botswana included all participants from the preceding regional workshops (for eastern and southern Africa respectively), providing delegates from multiple range States with an opportunity to learn at first hand how a national Action Plan can be developed from a regional SCS (see, for example, Figure 9.1).

9.3 Status Review

A first step in conducting a national action planning workshop is to present the best available data on the species' distribution and status and, where appropriate, to provide an opportunity to update this information. In many cases, the "best available data" will be those collated in developing the range-wide or regional Status Review. The need to update these data will depend on the expertise available at the national workshop, and on the time elapsed since the preparation of the range-wide or regional Status Review. If a significant period of time has elapsed since development of the range-wide or regional SCS, then a full revision of data may be necessary at the national level.

It is often useful to present data on national status and distribution in a regional context. This helps to reveal the importance of the particular range State for the conservation of the species as a whole, and also highlights any trans-boundary populations for which international cooperation is likely to be required.

9.4 Vision

It is rarely necessary or appropriate to develop a national Vision for conservation of a species, since many of the usual components of a Vision (e.g., representation across ecological settings) can only be achieved at the range-wide level. It is, however, useful to review the range-wide or regional Vision, and to seek comments on its applicability to the national situation. As an example, the Vision for cheetah and wild dog conservation in eastern Africa, "*To secure viable and ecologically functional cheetah and wild dog populations as valued components of development in eastern Africa*", was broadly accepted by participants in the Kenya national workshop (KWS in press). In particular, it was noted that, within Kenya, this view of wild dogs and cheetahs as "*valued components of development*" incorporates reduction in conflict between people and wildlife, and promotion of economic benefits from wildlife, in a sustainable manner. Tourism was also recognised as a key component of such development. Reviewing the range-wide or regional Vision in this way need not be time-consuming (see example agenda at http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_cheetwd_BOT.pdf), but it is important that national participants consider and register their national interpretation of all aspects of the range-wide or regional Strategy, as this enables national participants to claim ownership of the strategy.

9.5 Goals and Goal Targets

Like the Vision, the Goals of a range-wide SCS cannot meaningfully be modified for use in a national Action Plan, although registering the national interpretation is appropriate.

In contrast with the Goals, the Goal Targets for a range-wide or regional strategy may be modified for a national Action Plan. Where range-wide or regional Goal Targets are site-specific, it may be possible to extract those that apply to the range State in question, and consider these as a first draft of the national Goal Targets. For example, in developing the Vietnam national Action Plan for wild cattle and buffaloes, the Goal Targets from the Southeast Asian regional Strategy which applied to Vietnam were considered by national participants as possible Goal Targets for the national Action Plan. While the regional Goal Targets for one species, the gaur (*Bos gaurus*), largely concerned two key populations which helped to fulfil the regional Vision, participants in the national workshop felt that all five remaining Vietnamese gaur populations should be included at the national level. The national Goal Targets were therefore drafted to mention all five existing populations specifically (i.e., "*Double gaur numbers nationally, by increasing Gaur numbers in Yok Don National Park, the Ea So area, Cat Tien National Park, Bu Gia Map National Park, and Chu Mom Ray National Reserve by 2018. In the long term, reintroduce Gaur where appropriate").* This national Goal Target may be compared with the Southeast Asian Strategy's Goal Targets for gaur, which are partly shown in Chapter 2.)

Photo 9.1 Group of gaur (*Bos gaurus*) at Huai Kha Khaeng Wildlife Sanctuary, Thailand
© WCS – Thailand Program

9.6 Objectives

The Objectives developed as part of the range-wide or regional SCS should address the key obstacles to the species' conservation. These Objectives are usually framed sufficiently broadly that they can be adopted for use at the national level with relatively few adjustments. However, sometimes entire Objectives may be irrelevant at the national level, and can be dropped. For example, the regional conservation strategy for cheetahs and wild dogs in eastern Africa included an Objective concerned entirely with the development of national Action Plans in all range States. This was clearly unnecessary within a national action planning process and was excluded. The same approach might be adopted if a range-wide or regional Objective was designed to address a threat not in operation within a particular range State. Occasionally, it might be appropriate to add one or more Objectives to the national Action Plan, to address problems not considered at the range-wide or regional level. However, this should rarely be needed if the range-wide or regional SCS was well constructed using inputs from all the range States.

Although it is important to discuss the applicability of range-wide or regional Objectives to national Action Plans, in most cases the original Objectives can be used in their original wording; it is rarely useful to take up time re-drafting them, but a national interpretation can be registered where necessary.

9.7 Objective Targets and Actions

The majority of work at a national planning workshop is usually concerned with adapting the range-wide or regional Objective Targets and Actions to the national context. Particular Objective Targets may be dropped or, less commonly, added, to address particular threats or constraints operating at the national level. Likewise, Actions may be added, dropped, or clarified.

In addition to selecting the appropriate Actions for the national Action Plan, participants in the national workshop should also expand the details associated with each Action. This includes adding timelines, actors, and indicators of success. All of these are defined and described in detail in Chapter 8. The most effective way of achieving this with a large number of participants is to divide the Objectives among working groups, and ask each working group to develop and flesh out the associated Objective Targets and Actions. Time should be set aside in the agenda to allow each working group to present their conclusions to the whole group for discussion. Structuring the agenda in this way provides a means for all participants to contribute to all aspects of the national Action Plan.

9.8 Presentations at the national workshop

In many cases, it may be useful to include additional talks in the agenda for a national workshop. This may provide an opportunity to share experiences of particular conservation tools, such as survey methods, means of encouraging coexistence of people and wildlife, educational tools, and so forth. Such talks provide national participants with a further opportunity to ensure that the most nationally-relevant conservation tools are adopted. The proportion of workshop time allocated to background talks will vary greatly, depending on the number of participants, the level of resources and capacity, the amount and quality of data to be presented, and a number of other factors. However, it is important to bear in mind that devoting too much time to talks risks creating an atmosphere of “presenters” and “listeners” which can undermine participation in the main business of the workshop.

10. Integration of the SCS process with other conservation planning efforts

This chapter reviews how the SCS process, as described in this Handbook, can be connected with other conservation planning efforts, both for species and for areas. Because the conservation planning literature is so large and diverse, this review can not claim to be exhaustive. Rather we focus on two kinds of conservation planning most relevant to SCSs: (a) other approaches focused on species which parallel or complement SCSs as described here and (b) approaches to area or landscape planning which include an explicit species planning element. We are aware that this chapter raises several issues that would deserve much more extensive treatment, but it would go beyond the scope of this Handbook to go into more depth than we have done here.

10.1 Introduction

Protecting species from threats, whether locally or globally, has been central to conservation since the first recognition that "nature conservation" was worthwhile. These guidelines on preparing SCSs represent the latest manifestation of this interest in saving species. Of equal longevity has been the desire to conserve natural areas, whether for their scenic values, cultural and spiritual importance or, more recently, for the values they provide as habitat for species and for ecosystem services.

Today, the conservation of biological diversity encompasses both species-focused and ecosystem- or area-based approaches (also formally referred to as "systematic conservation planning" – see, for example, Margules and Pressey 2000). Today, the conservation of biological diversity encompasses both species-focused and ecosystem- or area-based approaches (also formally referred to as "systematic conservation planning" – see, for example, Margules and Pressey 2000). Most conservationists agree that these two approaches represent different sides of the same coin, complementing each other. While it is now recognised that many species require conservation effort, how to use limited and usually inadequate human and financial resources most effectively remains a critical issue when designing practical conservation strategies. Should funds be used to pursue the conservation of particular species or to invest in the management and protection of areas that are of notable biological value? Within IUCN, SSC, and the World Commission on Protected Areas (WCPA) represent the two different, but closely interrelated sets of interests and both approaches are critical to saving the world's biodiversity.

Fortunately, the importance of integrating species and habitat conservation is beginning to be fully appreciated at the global level. Since 1992, the global Convention on Biological Diversity (CBD) has led the way in promoting an integrated approach by including "diversity within species, between species and of ecosystems" in its definition of biological diversity (CBD 2001).

This is of general importance, but is particularly useful when considering the high diversity and overall importance of the invertebrates, which are often overlooked in conservation planning. Use of species groups links closely with the interests of the WCPA, particularly in assessing the biodiversity value of particular sites, their management, and the creation of protected area networks. It is worth remembering here that in an era of climate change, species and groups of species are being forced to move – locally upwards in elevation, regionally towards the poles, so that present protected areas are unlikely to be in the correct places for future species protection needs. Managing protected areas for sustainable provision of ecosystem services by particular species or species groups also envelops the activities of the Commission on Environmental, Economic and Social Policy (CEESP), which provides expertise on economic and social factors for the conservation and sustainable use of biodiversity, and the Commission on Ecosystem Management (CEM), which provides expertise on integrated ecosystem approaches to management of natural and modified ecosystems. These and related issues are likely to come to the fore in many new ways in the near future with the recent advent of "Community Conserved Areas" (CCAs), which are "natural and modified ecosystems with significant biodiversity,

Photo 10.1 Lake Elmenteita, Soysambu Conservancy, Kenya, with a flock of lesser flamingos (*Phoenicopterus minor*) © Karin Svadlenak-Gomez

ecological and related cultural values, voluntarily conserved by indigenous peoples and local communities through customary laws or other effective means" (Kothari 2006). In CCAs ecosystem service provision and socio-economics play central roles.

The integration of species-focused and area-based and/or ecosystem-based approaches is reflected within the present SCS initiative in a variety of ways. For example, conservation planning is not restricted to single species, but may refer to groups of species of similar phylogeny, geographic occurrence, or ecological function as appropriate. The necessity of area-based conservation for species has long been an integral part of the activities of SSC, though mainly in relation to the specific demands of the particular species, since protection of threatened populations requires protection of the habitat in which they occur. The threat criteria for species' Red-Listing include "extent of occurrence" and "area of occupancy", both explicitly reflecting spatial requirements important for continued persistence of species populations (IUCN 2001; IUCN 2008).

The rapidly changing demands of practical biodiversity conservation in the 21st century arising from global warming and other environmental change make it particularly important to continue efforts to increase the integration of species-focused conservation strategies with area-oriented and other conservation planning efforts. There have been recent major shifts of conservation emphases worldwide. Species-oriented conservation has changed from simply considering the number of species to instead recognising the wide variety of functional roles that species play within ecosystems. This realization has evolved to encompass the idea of ecosystem services – acknowledging the value that biodiversity brings to humans either directly (e.g., food and fibre production) or indirectly (e.g., pollination and erosion control). Many of these ideas are referred to in earlier chapters of this Handbook (e.g., see Chapter 6 on Vision and Goals).

A similar situation has arisen for conservation centred on protected areas. During the 20th century effort has gradually been shifting from an emphasis on designing protected areas and identifying the species within them, to much greater emphasis on effective management of protected areas for various purposes, including poverty reduction, and, more generally, for the benefit of people, as evidenced by the IUCN Protected Areas Management Categories[6] (IUCN 1994); "*Parks are no longer allowed to simply "protect" but are charged with providing ecosystem services and facilitating poverty reduction via local development, ecotourism, and sustainable resource use*" (Redford, Wilkie, and Fearn 2007). While parks' core function remains the conservation of biodiversity, other roles may include the maintenance of ecosystem services, links to human livelihoods through the sustainable use of natural resources, and the preservation of cultural values. There is also increased emphasis on involving indigenous and local communities in protected area management, as important stakeholders in their own right (West and Brechin 1991; Stevens 1997; Posey 2000; Oviedo, Maffi, and Larsen 2000; Phillips 2002; Wilson 2003).

Moreover, it is now recognised that biodiversity "*…benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions*" (MA 2005). The recent United Nations-sponsored Millennium Ecosystem Assessment (MA 2005) distinguishes four broad groups of ecosystem services: provisioning, regulating, cultural, and supporting, with further categories and subcategories.

The results of these trends in conservation have been hotly debated; for examples, see commentary by Haslett (2002), McCauley (2006), Armsworth *et al.* (2007), and Boitani *et al.* (2008). Nevertheless, many conservation practitioners recognise that management of landscapes to include the protection of ecosystem services can be a "value-added strategy" to support and complement existing conservation efforts based on species and their habitats, which may offer a potentially highly effective means of improving overall conservation success, both within and outside designated protected areas (Haslett, Berry, and Zobel 2007), and that the integration of different (but complementary) approaches can

6 There are currently six Protected Area Management Categories, ranging from strictly protected to managed mainly for sustainable use of natural ecosystems (see http://www.unep-wcmc.org/protected_areas/categories/index.html accessed 24 July 2008).

be effective for achieving Goals.

IUCN, and SSC in particular, have to consider and also ensure close co-ordination with the conservation planning activities of the different IUCN Commissions. For example, while the Species Conservation Planning Task Force has been preparing this document, a separate Task Force, co-convened by SSC and WCPA, has been preparing a new set of guidelines on systematic conservation planning (Bottrill and Pressey in press).

We outline here briefly just a few distinct conservation planning approaches, methods and tools that can be useful when preparing SCSs, or that contain elements of the SCS process we have described.

10.2 Species-focused conservation planning approaches

10.2.1 Population and Habitat Viability Assessment

A variety of different tools and processes exist for developing strategic plans for endangered species conservation. These efforts typically have either a strong quantitative scientific focus with emphasis on such techniques as PVA or GIS-based habitat evaluations, or alternatively they emphasise a more discussion-based approach engineered to encourage largely qualitative input from a broad range of stakeholders. While each of these methods has its advantages, a focus on a given approach almost inevitably leaves out many values inherent in the other. In order to produce a more effective strategic plan for species conservation, the planning process should combine both biological and human social dynamics into a comprehensive package. The PHVA workshop process[7], designed and primarily implemented by SSC's Conservation Breeding Specialist Group (CBSG), is a clear example of this integrated approach to species conservation planning (Westley and Miller 2003).

Photo 10.2 PHVA workshop on the maned wolf (*Chrysocyon brachyurus*) in Brazil
© Philip Miller

The conceptual foundation of the PHVA process, first promoted by CBSG's founder Dr. Ulysses Seal and colleagues, is rooted in theoretical treatments of inter-organizational collaboration within the social science domain (Westley and Vredenburg 1997). As in many inter-organizational collaborative efforts, the process of endangered species conservation

[7] See the CBSG website for a listing of PHVA workshops held under the auspices of the CBSG and associated workshop reports (http://www.cbsg.org/cbsg/workshopreports/ accessed 24 July 2008).

planning is often quite difficult, with highly complex problems leading to species threats, multiple stakeholders with different value systems, and incomplete information on the species and habitats of interest. Moreover, stakeholders often come from different cultures with different collaboration styles – thereby adding to the difficulty in collectively moving a group of people in a coherent way through a group process of information analysis and decision-making. The PHVA workshop process specifically deals with these issues, and uses the theoretical foundations of inter-organizational collaboration to generate an effective species conservation strategy.

The PHVA process has distinct scientific and social goals. In the scientific context, the workshop explicitly incorporates methods for PVA to assess the risks of threatened population decline or extinction in the presence of destabilizing human activities. The method of choice for conducting a PVA is computer simulation modelling, in which detailed information on species demography (birth and death rates and their annual fluctuations caused by environmental variability) and habitat ecology are used to create a reasonable representation of the species or population of interest. This model can then be used to make basic predictions of future population demographic behaviour in the presence of those threats known to affect the species or thought to affect it (or them) in the future. The models typically used in PVAs are stochastic, meaning that attempts are made to incorporate the uncertainty, randomness, or unpredictability of life history and environmental events into the modelling process.

From a sociological perspective, the PHVA workshop is designed to encourage creative thinking and open communication among all participants – from the local village representative to the internationally-recognised academic scientist or the federal government official. As an outcome of this free flow of information and expression of ideas, increased trust among stakeholder groups can emerge, which is advantageous since trust is a critical precursor to effective consensus building.

This workshop environment of active participation encourages group ownership of the information used in the analysis, which ultimately leads to a corresponding level of local ownership of the proposed solutions. This local ownership greatly increases the likelihood of successful implementation of recommendations that come from the workshop.

Because of its highly focused nature – usually concentrating on a single species or perhaps only a subset of populations of a given species – the PHVA process is an excellent example of the single-species end of the taxonomically-defined SCS process continuum. While applicable in theory to a larger number of species, the highly structured facilitated workshop process would be stretched beyond its limits if multiple species, each requiring its own demographic risk analysis using PVA methodologies, were to be included in a single planning process. When applied to a small number of related species, the PHVA process incorporates nearly all elements of the SCS process described here. Specific emphasis on the establishment of a meaningful Vision for species conservation receives little direct attention in a PHVA, although such a Vision emerges secondarily through the identification of the broad criteria that the workshop participants use to prioritize the Goals and Actions that will lead to effective conservation activities. Recently, CBSG has employed more explicit methods to facilitate the conduct of a Status Review in advance of the traditional stakeholder-driven SCS-style workshop, thereby allowing adequate time to evaluate the data and use them more effectively to derive effective Actions.

10.2.2 Range-wide Priority-Setting

RWPS is an expert-based, geographically-explicit planning method for widely distributed species, first applied to jaguars in 1999 and subsequently used for other species (Sanderson *et al.* 2002). RWPS draws significantly from past priority setting efforts for species (e.g., for the tiger, Wikramanayake *et al.* 1998, and various IUCN Action Plans) and for regions (e.g., ecoregions, Olsen and Dinerstein 1998; site portfolios, TNC 1997). RWPS exercises have been conducted for jaguars (Sanderson *et al.* 2002; Medellin *et al.* 2002), American crocodile (*Crocodylus acutus;* Thorbjarnson *et al.* 2006), Mongolian gazelle (*Procapra gutturosa;* Zahler *et al.* in prep.), lowland tapir (*Tapirus terrestris;* Taber *et al.* 2008), white-lipped peccary (*Tayassu pecari*; Taber *et al.* 2008), African lion (IUCN CSG 2006a, 2006b), and snow leopards (McCarthy *et al.* in prep.) Modified versions of the approach have been applied to North American bison (Sanderson *et al.* 2008) and tigers (Dinerstein *et al.* 2007).

The RWPS process is based on the premise that saving a species requires:

- consideration of the species across its historical range;
- recognition that populations exist in different ecological settings, which are assumed to capture genetic, ecological, and behavioural distinctiveness; and
- identifying those existing populations and/or opportunities for sites for restoring populations where the potential for long-term conservation is greatest based on population factors and threats.

These considerations overlap significantly with the recommendations made in Chapter 6 (Vision and Goals).

The actual process of RWPS consists of two steps. First, a geographically-based, systematic evaluation of the status and distribution of the species across its historical range is conducted (with similarities to the Status Review component described here, see Chapter 5). Second, a prioritization method is used to identify populations needing management and/or areas offering restoration opportunities based on their ecological importance (with parallels to Goal setting, see Chapter 6). “Ecological importance” is typically judged based on population status and level of threat within each of the ecological settings where the species occurs. The experts at each workshop define this “importance” value in terms of weighted combinations of standardized measures of population viability and threats, in the context of long-term conservation efforts. Conservation organizations, national agencies, and local conservation groups can then take these results into account as they plan their conservation investments.

RWPS leans strongly on GIS-based analysis, both in its conceptualization and presentation. Map layers representing historic range, expert knowledge, current distribution, and “Species Conservation Units” are used in a logical framework which allows planners to distinguish unknown areas from areas where the species has been extirpated. In recent years, RWPS has also occasioned the development of Visions for a species, most notably the bison (Sanderson *et al.* 2008). Recently attempts have been made to translate the range-wide results into the political arenas where conservation decisions are made, for example for the African lion (IUCN Cat Specialist Group 2006a, 2006b) and snow leopard (McCarthy *et al*. in prep.).

10.2.3 Red Listing and Assessments

Through its Species Survival Commission (SSC) and Species Programme, IUCN has been assessing, for more than four decades, the conservation status of species, subspecies, varieties, and even selected subpopulations on a global scale in order to highlight species

Photo 10.3 A road frog (*Rana japonensis*) in Dujiangyan, China
IUCN Photo Library © IUCN/Sue Mainka

threatened with extinction, and therefore promote their conservation. As mentioned in earlier chapters, the result is the IUCN Red List, which provides taxonomic, conservation status, and distribution information on species that have been globally evaluated using the Red List Categories and Criteria. This system is designed to determine relative risk of extinction, and the main purpose of the Red List is to catalogue and highlight those species that are facing a higher risk of global extinction (those classified as Critically Endangered, Endangered, and Vulnerable, together defined as Threatened). The Red List also includes information on taxa that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (these are classified as “Data Deficient”); and on taxa that are either close to meeting the Threatened thresholds or that would be Threatened, were it not for an ongoing taxon-specific conservation programme (classified as “Near Threatened”). The Global Amphibian Assessment (IUCN, CI, and NatureServe 2006) is now complete, and similar exercises for birds, mammals and global marine species are currently underway (IUCN/SSC 2008).

Many of the data required for the Red List process are similar in kind to those required for the SCS, particularly for the Status Review process (see Chapter 5); in fact the Status Review guidelines suggest explicit reference to the Red List status of the species under consideration. Some of these data will be captured in the Species Information Service (SIS), which is currently being constructed, and which aims to become a worldwide species information resource, with interlinked databases of species-related information managed by SSC's network of Specialist Groups. In most cases, however, additional information, and broader participation, are necessary to develop a SCS. In this sense, Red Listing can be seen as a useful prelude to preparing a SCS. Moreover, ultimately a successful SCS should lead to a reduction in the level of threat for the species. Across species, various indicators based on trends in Red List categorizations can be used as broad-scale measures of progress in species conservation.

10.2.4 Species Recovery Plans

Under the United States Endangered Species Act (ESA) of 1973, United States government agencies are charged with developing recovery plans for listed endangered and threatened species. Many other countries around the world have similar or analogous legislation related to species. Recovery plans in the US context guide agencies in restoring listed species and the ecosystems that support them, and recovering these species so that further listing under the ESA is no longer required (NMFS 2006; Crouse *et al.* 2002). Similar to SCSs as outlined here, recovery plans typically include delineating those aspects of the species’ biology, life history, and threats that are pertinent to its endangerment and recovery (comparable to the Status Review process, see Chapter 5), identifying criteria by which to measure the species’ recovery (comparable to Goals, see Chapter 6), and outlining site-specific actions to achieve recovery (comparable to Actions, see Chapter 8). However, critics of the Recovery Plan development process note that many planning processes do not involve the full range of relevant stakeholders (Hatch *et al*. 2002), and they do not incorporate important analytical tools such as population viability analysis in their decision-making process (Morris *et al*. 2002).

Like SCSs, Recovery Plans are communication tools for stakeholders, plans for monitoring of success, and fundraising documents. In some countries, such plans also carry legal mandates for species conservation. In the US, for example, these legal mandates have a restricted focus on species recognised as being endangered within the country (and, indeed, are only developed for such species) and are often tightly prescriptive. Interestingly, however, some of the recent shifts in the US Recovery Planning process – such as a recent mandate that recovery teams should include many stakeholders who together help develop the Plans – are quite similar to the guidance that we provide for preparing SCSs[8].

10.3 Area or landscape approaches to conservation planning with an explicit species component

10.3.1 Conservation Action Planning

The Nature Conservancy (TNC) developed Conservation Action Planning (CAP) to help conservation projects develop strategies, take action, and measure success over time in an adaptive framework (TNC 2007). The CAP process is the most recent development in a long series of project-level planning approaches prepared by TNC, including Site Conservation Planning, Conservation Area Planning, and the 5-S Framework. CAP includes mechanisms for defining the conservation team and project scope, selecting conservation targets (i.e., the species, communities, or ecological systems chosen to represent biodiversity in the project area), assessing the viability of the focal conservation targets, identifying threats, developing strategies, including specific objectives, actions, and measures of success. TNC has also developed a suite of decision support tools which are available online (http://www.conservationgateway.org/cap).

CAP integrates with SCSs most closely at the level of objective setting (see Chapter 7) and identifying actions (see Chapter 8), particularly when the species featured in the SCS are selected as a focal conservation target[9] for an area. CAP also includes a qualitative viability analysis and identification process for critical threats which can feed directly into the Status Review (see Chapter 5).

10.3.2 Habitat Conservation Plans

In the United States, under the Endangered Species Act, a Habitat Conservation Plan (HCP) may be developed to form partnerships between private individuals and the government to "minimize or mitigate" reductions in populations of endangered species. Plans vary widely in the area and number of species covered. The more than 200 approved HCPs collectively cover millions of acres: approximately 25 exceed 10,000 acres, 25 exceed 100,000 acres, and 18 exceed 500,000 acres. HCPs must include an assessment

[8] Examples of Recovery Plans can be accessed at http://www.fws.gov/endangered/RECOVERY/index.html#plans (accessed 20 September 2008). Reviews of recovery planning can be found in Gerber and Hatch 2002; Clark *et al*. 2002; and Crouse *et al*. 2002.

[9] Conservation target here refers to the entity to be conserved.

of impacts likely to result from activities which might reduce the species abundance, suggestions of measures that the landowner will take to monitor, minimize and mitigate impacts on species, alternatives activities that could be implemented that would not result in any harmful effects on the species of concern, and additional regulatory measures required by the appropriate federal agency (Audubon Society undated; USFWS 2000).

HCPs relate mainly to setting Objectives, as they require a threat-based analysis (Chapters 5 and 7) and to determining Actions which will alleviate those threats (see Chapter 8).

10.3.3 Landscape Species Approach

The Wildlife Conservation Society's Landscape Species Approach is a landscape conservation planning tool which builds conservation efforts for a particular area around "landscape species," that is, species which use large, ecologically diverse areas and have a significant impact on the structure and function of natural ecosystems (Sanderson *et al.* 2002). These species are selected using a standardized evaluation system and in complementary suites that represent all the major habitat types and threats within a landscape area (Coppolillo *et al.* 2004; Strindberg, Didier, and the Living Landscapes Program 2006). For each species, the landscape potential for the species is mapped and then assessed against maps representing the threats to the species in a GIS. From these assessments of the "conservation landscape" and relative to defined population target levels for each species (Sanderson 2006), actions are proposed to restore or conserve the species (Didier and the Living Landscapes Program 2006). By conserving an entire suite of landscape species, the conservation planning team hopes to conserve not only those species, and the species on which they directly depend, but also the landscape as a whole.

The LSA intersects with SCSs at several junctures. First the LSA process could be used to plan actions for species conservation (see Chapter 8). Through the LSA process, the landscape is analysed in terms of its biological potential for the species and the extent to which that potential is reduced through human-mediated threats. The resulting analysis provides information on where threats can be alleviated to provide the greatest return in terms of species abundance (Didier and the Living Landscapes Program 2006). The landscape species selection process and the landscape planning maps may provide information relevant to the Status Review (see Chapter 5) and Objective setting (see Chapter 7). The mechanisms for establishing population target levels developed initially for landscape species also have parallels with the setting of Goal Targets (see Chapter 6).

In conclusion, it is important to recognise that the various approaches to species conservation being developed and employed by governments and NGOs are neither contradictory to nor full substitutes for the approach to developing SCSs that we describe in this Handbook. The SCS process and product described in this document are not fully encompassed by any one of these other species conservation planning methods, but they are complementary, and elements from various tools and approaches can be combined when preparing SCSs.

We expect that future versions of this Handbook will include brief descriptions of additional tools and approaches for aspects of species conservation planning that are compatible with and could contribute to the SCS approach presented here.

Photo 10.4 A cloud forest in Rwenzori Mountains National Park in western Uganda, one of Africa's most beautiful alpine areas IUCN Photo Library © Jim Thorsell

Literature Cited

Anon. 1998. *Policy and Management Plan for the black rhinoceros. Diceros bicornis in Tanzania*. United Republic of Tanzania – Department of Wildlife, Dar-es-Salaam, Tanzania.

Anon. 2000a. *Zimbabwe Rhino Policy and Management Plan-2000 Revision*. Zimbabwe. Ministry of Environment and Tourism, Department of National Parks and Wildlife Management Harare, Zimbabwe.

Anon. 2000b. *A strategy for the conservation and sustainable use of wild populations of southern white rhino Ceratortherium simum simum in South Africa*. (Version as approved by South African Government MinMec 29 Feb 2000).Rhino Management Group, South Africa.

Anon. 2001a. *Conservation and Management Srategy for the White Rhinoceros Ceratotherium simum and the Black Rhinoceros Diceros bicornis in Botswana*. Botswana Department of National Parks, Gaberone, Botswana.

Anon. 2001b. *Revised Black Rhino Conservation Plan for Namibia.* Namibian Ministry of Environment and Tourism, Windhoek, Namibia.

Armsworth, P.R., Chan, K.M.A., Daily, G.C., Ehrlich, P.R., Kremen, G., Ricketts, T.H., and Sanjayan, M.A. 2007. Ecosystem-service science and the way forward for conservation. *Conservation Biology* **21(6):** 1383-1384.

Audubon Society. Undated. A Citizen's Guide to Habitat Conservation Plans. Published online at http://www.audubon.org/campaign/esa/hcp-guide.html#what (accessed 28 September 2008).

Avise J. C. 2000. Phylogeography, the history and formation of species. Harvard University Press, Cambridge, Massachusetts, USA

Baillie, J.E.M., Hilton-Taylor, C., and Stuart, S.N. (eds). 2004. *2004 IUCN Red List of Threatened Species. A Global Species Assessment*. IUCN, Gland, Switzerland and Cambridge, UK.

Barnes, R.F.W. 2002. The problem of precision and trend detection posed by small elephant populations in West Africa. *African Journal of Ecology* **40**: 179-185.

Biggins, D.E., Vargas, A., Godbey, J.L., and Anderson, S.H. 1999. Influence of prerelease experience on reintroduced black-footed ferrets. *Biological Conservation* **89**: 121-129.

BirdLife International. 2001. *Threatened birds of Asia: the BirdLife International Red Data Book.* BirdLife International, Cambridge, UK.

Blanc, J.J., Barnes, R.F.W., Craig, G.C., Dublin, H.T., Thouless, C.R., Douglas-Hamilton, I., Hart, J.A. 2007. *African Elephant Status Report 2007: An update from the African Elephant Database, IUCN, Gland, Switzerland and Cambridge, UK*

Boitani L, Cowling R.M., Dublin H.T., Mace G.M., Parrish J., *et al.* 2008. Change the IUCN Protected Area Categories to Reflect Biodiversity Outcomes. *PLoS Biol* **6(3)**: e66

Boitani, L. 1992. Wolf research and conservation in Italy. *Biological Conservation* **61**: 125-132.

Bottrill, M., and Pressey, R. In press – 2009. *Designs for nature: regional conservation planning, implementation and management.*IUCN, Gland, Switzerland.

Breitenmoser, U., Breitenmoser-Würsten, C., Mörschel, F.I., Zazanashvili, N., and Sylvén, M. 2007. General Conditions for the Conservation of the Leopard in the Caucasus. *Cat News* Special Issue no **2**: 34-39.

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., and Thomas, L. 2001. *Introduction to distance sampling: estimating abundance of biological populations.* Oxford University Press, Oxford, UK.

Butler, D. and Merton, D. 1992. *The black robin: saving the world's most endangered bird* Oxford University Press, Oxford, UK.

Carpenter, J.W., Appel, M.J.G., Erickson, R.C., and Novilla, M.N. 1976. Fatal vaccine-induced canine distemper virus infection in black-footed ferrets. *Journal of the American Veterinary Medical Association* **169**: 961-964.

Carroll, C. 2007. Interacting effects of climate change, landscape conversion, and harvest on carnivore populations at the range margin: marten and lynx in the northern Appalachians. *Conservation Biology* **21**: 1092-1104.

Carroll, C., Noss, R.F., Paquet, P.C., and Schumaker, N.H. 2004. Extinction debt of protected areas in developing landscapes. *Conservation Biology* **18**: 1110-1120.

Caughley, G. and Gunn, A. 1996. *Conservation biology in theory and practice* Blackwell, Cambridge, MA., USA.

Caughley, G. 1994. Directions in conservation biology. *Journal of Animal Ecology* **63**: 215-244.

CBD 2001. Convention on Biological Diversity. Article 2. Online at http://www.cbd.int/convention/convention.shtml (accessed 16 September 2008)

Clark, J., Hoekstra, J., Boersma, P., and Kareiva, P. 2002. *Improving U.S. Endangered Species Act Recovery Plans: key findings and recommendations of the SCB recovery plan project*. Final report to the USFWS. Washington, DC, USA.

Clifford, D.A., Mazet, J.K., Dubovi, E.J., Garcelon, D.K., Coonan, T.J., Conrad, P.A., and Munson, L. 2006. Pathogen exposure in endangered island fox (Urocyon littoralis) populations: implications for conservation management. *Biological Conservation* **131**: 230-243.

CMS. 2006. *Medium term international work programme for the saiga antelope*. Convention on Migratory Species, Bonn

Conservation Breeding Specialist Group (SSC/IUCN). 2002. *Evaluation et Plans de Gestion pour la Conservation (CAMP) de la Faune de Madagascar: Lémuriens, Autres Mammifères, Reptiles et Amphibiens, Poissons d'eau douce et Evaluation de la Viabilité des Populations et des Habitats de Hypogeomys antimena (Vositse).*CBSG, Apple Valley, MN, USA.

Coppedge, B.R., Fuhlendorf, S.D. , Engle, D.M. , Carter, B.J., and Shaw, J.H. 1999. Grassland soil depressions: relict bison wallows or inherent landscape heterogeneity? *American Midland Naturalist* **142**:382-392.

Coppedge, B.R. and Shaw, J.H. 1997. Effects of horning and rubbing behavior by bison (*Bison bison*) on woody vegetation in a tallgrass prairie landscape. *American Midland Naturalist* **138**:189–96.

Coppolillo, P., Gomez, H., Maisels, F., and Wallace, R., 2004. Selection criteria for suites of landscape species as a basis for site-based conservation. *Biological Conservation* **115**: 419–430.

Crooks, K.R., Scott, C.A., and Van Vuren, D.H. 2001. Exotic disease and an insular endemic carnivore, the island fox. *Biological Conservation* **98**: 55-60.

Crouse, D., Mehrhoff, L., Parkin, M., Elam, D., Chen, L. 2002. Endangered species recovery and the SCB study: A U.S. Fish and Wildlife Service perspective. *Ecological Applications* **12(3):** 719-723.

Didier, K. and the Living Landscape Program. 2006. *Building Biological and Threats Landscapes from ecological first principles, a step-by-step approach*. Technical Manual 6, Wildlife Conservation Society, Living Landscapes Program, Bronx, NY.

Dinerstein, E., Loucks, C., Wikramanayake, E., Ginsberg, J., Sanderson, E., *et al.* 2007. The Fate of Wild Tigers. *BioScience* **57(6)**: 508–514

Durant, S.M. 1998. Competition refuges and coexistence: an example from Serengeti carnivores. *Journal of Animal Ecology* **67**: 370-386.

DWNP. In prep. *Conservation Strategy for the cheetah and African wild dog in Botswana*. Botswana Department of Wildlife and National Parks, Gaborone.

Eadie, J., Sherman, P., and Semel, B. 1998. Conspecific brood parasitism, population dynamics, and the conservation of cavity-nesting birds. In: T.M. Caro (ed.), *Behavioural ecology and conservation biology*, pp. 306-340. Oxford University Press, Oxford.

Edmonds, J.A. 2007. A Framework for the Conservation of the Arabian Leopard. *Cat News* **46**:32-33.

Emslie, R.H. (compiler). 2007. *Conservation Plan for the black rhino, Diceros bicornis, in South Africa, 2003-2012* (updated 2007 version). Jointly developed by South African members of the SADC Rhino Management Group (RMG). SADC Rhino Management Group, South Africa.

Ferraro, P.J. and Pattanayak, S.K. 2006. Money for nothing? A call for empirical evaluation of biodiversity conservation investments. *PLOS Biology* **4**: e105.

Fischer, L.A. and Gates, C.C. 2005. Competition potential between sympatric woodland caribou and wood bison in southwestern Yukon, Canada. *Canadian Journal of Zoology-Revue Canadienne De Zoologie* **83**:1162-1173.

Forrest, R., Caldwell, I., O'Donnell, K., and Vincent, A. 2007. *Project Seahorse 2006 annual report* University of British Columbia, Vancouver.

Frank, D.A. and Evans, R.D. 1997. Effects of native grazers on grassland N cycling in Yellowstone National Park. *Ecology* **78**: 2238-2248.

Fuhlendorf, S.D. and Engle, D.M. 2001. Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. *Bioscience* **51**:625-632

George, S.L. and Crooks, K.R. 2006. Education and conservation on the urban-wildland interface: testing the efficacy of informational brochures. *Southwestern Naturalist* **51**: 240-250.

Gerber, L. and Hatch, L. 2002. Are we recovering? An evaluation of recovery criteria under the U.S.

Endangered Species Act. *Ecological Applications* **12(3):** 668-673.
Green, G.I., Mattson, D.J., and Peek, J.M. 1997. Spring feeding on ungulate carcasses by grizzly bears in Yellowstone National Park. *Journal of Wildlife Management* **61**: 1040-1055.
Gusset, M., Ryan, S.J., Hofmeyr, M., Van Dyk, G., Davies-Mostert, H.T., Graf, J.A., Owen, C., Szykman, M., Macdonald, D.W., Monfort, S.L., Wildt, D.E., Maddock, A.H., Mills, M.G.L., Slotow, R., and Somers, M.J. 2008. Efforts going to the dogs? Evaluating attempts to re-introduce endangered wild dogs in South Africa. *Journal of Applied Ecology* **45**: 100-108.
Haines, F. 1995. *The Buffalo: the story of American Bison and their hunters from prehistoric times to the present*. University of Oklahoma Press, Norman, Oklahoma.
Harcourt, A.H. 1995. Population viability estimates: Theory and practice for a wild gorilla population. *Conservation Biology* **9**: 131-142.
Haslett, J.R. 2007. *European Strategy for the conservation of invertebrates. Nature and Environment Series 145.* Council of Europe Publishing, Strasbourg.
Haslett, J.R., Berry P.M., and Zobel, M. 2007. *European habitat management strategies for conservation: Current regulations and practices with reference to dynamic ecosystems and ecosystem service provision.* RUBICODE report, at http://www.rubicode.net/rubicode/RUBICODE_Review_on_Habitat_Management.pdf (accessed 31 August 2008)
Haslett, J.R. 2002. European protected areas go upmarket. *Trends in Ecology and Evolution* **17**: 541-542.
Hastings, B.E., Kenny, D., Lowenstine, L.J., and Foster, J.W. 1991. Mountain gorillas and measles: Ontogeny of a wildlife vaccination program. In: R.E. Junge (ed.), *Annual Meeting of the American Association of Zoo Veterinarians*, pp. 198-205.
Hatch, L., Uriarte, M., Fink, D., Aldrich-Wolfe, L., Allen, R.G., Webb, C., Zamudio, K., and Power, A. 2002. Jurisdiction over endangered species' habitat: The impacts of people and property on recovery planning. *Ecological Applications*. **12(3)**: 690-700.
Hawley, A.W.L. and Reynolds, H.W. 1987. Management alternatives for ungulate production in the Slave River Lowlands. In: H.W. Reynolds and A.W.L. Hawley (eds.), *Bison ecology in relation to agricultural development in the Slave River Lowlands. N.W.T. Occasional paper No. 63*, pp.63–66. Minister of Supply and Services Canada, Ottawa, Ontario.
Haydon, D.T., Laurenson, M.K., and Sillero-Zubiri, C. 2002. Integrating epidemiology into population viability analysis: managing the risk posed by rabies and canine distemper to the Ethiopian wolf. *Conservation Biology* **16**: 1372-1385.
Haydon, D.T., Randall, D.A., Matthews, L., Knobel, D.L., Tallents, L.A., Gravenor, M.B., Williams, S.D., Pollinger, J.P., Cleaveland, S., Woolhouse, M.E.J., Sillero-Zubiri, C., Marino, J., Macdonald, D.W., and Laurenson, M.K. 2006. Low coverage vaccination strategies for the conservation of endangered species. *Nature* **443**: 692-695.
Hedges, S. and Gunaryadi, D. In press. Reducing human–elephant conflict: do chillies help deter elephants from entering crop fields? *Oryx*
Hedges, S. and Tyson, M.J. 2002. Conflict between endangered species, extinction risk, and the agony of choice: Dholes and Banteng in Java. In: Society for Conservation Biology Annual Meeting, Canterbury, England.
Hedges, S., Tyson, M.J., Sitompul, A.F., Kinnaird, M.F., Gunaryadi, D., and Aslan. 2005. Distribution, status, and conservation needs of Asian elephants (Elephas maximus) in Lampung Province, Sumatra, Indonesia. *Biological Conservation* **124**: 35-48.
Hilborn, R., Arcese, P., Borner, M., Hando, J., Hopcraft, G., Loibooki, M., Mduma, S., and Sinclair, A.R.E. 2006. Effective enforcement in a conservation area. *Science* **314**: 1266.
Human–Elephant Conflict Working Group. 2000. *Technical brief: Review of compensation schemes for agricultural and other damage caused by elephants*. http://data.iucn.org/themes/ssc/sgs/afesg/hec/comreview.html (accessed 10 September 2008), African Elephant Specialist Group.
Hyde, T., Paloski, R., Hay, R., and Miller, P.S. (eds.). 2007. *Butler's Gartersnake* (Thamnophis butleri) *in Wisconsin:Population and Habitat Viability Assessment – The Stakeholder Workshop Report.* IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN, USA
IUCN Cat Specialist Group. 2006a. *Conservation Strategy for the Lion in West and Central Africa*. IUCN –Regional Office of Central Africa (BRAO) and the West and Central African Lion Conservation Network (ROCAL). Yaounde, Cameroon.
IUCN Cat Specialist Group. 2006b. *Regional conservation strategy for the lion* Panthera leo *in eastern and southern Africa*. IUCN Cat Specialist Group.http://www.catsg.org/catsgportal/

bulletin-board/05_strategies/Lion%20Conserv%20Strat%20E&S%20Africa%202006.pdf
IUCN, Conservation International, and NatureServe. 2006. *Global Amphibian Assessment*. http://www.globalamphibians.org (accessed 22 July 2008).
IUCN. 1994. *Guidelines for Protected Areas Management Categories.* IUCN, Cambridge, UK and Gland, Switzerland.
IUCN. 2001. *IUCN Red List Categories and Criteria : Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
IUCN. 2005. *Strategy for the conservation of West African elephants.* IUCN, Gland, Switzerland.
IUCN. 2006. *Regional conservation Strategy for the lion Panthera leo in Eastern and Southern Africa.* IUCN, Gland, Switzerland.
IUCN. 2008. *An Overview of the IUCN Red List*. Published online at http://www.iucnredlist.org/info/programme (accessed 28 September 2008).
IUCN/SSC. 2002. *Species Survival Commission Action Plan Evaluation*. Unpublished report. IUCN/Species Survival Commission, Gland, Switzerland. Available at http://cmsdata.iucn.org/downloads/ssc_action_plan_eval.pdf (accessed 13 September 2008)
IUCN/SSC. 2008. Biodiversity Assessments and Indicators work. Website http://cms.iucn.org/about/work/programmes/species/red_list/biodiversity_aassessments/index.cfm (accessed 28 September 2008).
IUCN/SSC. In press. *Regional conservation Strategy for the cheetah and wild dog in eastern Africa.* IUCN, Gland, Switzerland.
IUCN/SSC. In review. *Regional conservation Strategy for Wild Cattle and Buffaloes in Southeast Asia.* IUCN, Gland, Switzerland.
IUCN/CMP. 2006. *Unified Classification of Direct Threats*, Version 1.0. http://www.iucn.org/themes/ssc/sis/classification.htm .(accessed 28 July 2008).
Jessup, D.A., De Forge, J.R., and Sandberg, S. 1991. Biobullet vaccination of captive and free-ranging bighorn sheep. In: L.A. Renecker and J.R. Hudson (eds.), *Wildlife production: Conservation and sustainable development*, pp. 429-434. University of Alaska, Fairbanks, USA.
Johnsgard, P.A. 2005. *Prairie dog empire: a saga of the shortgrass prairie*. University of Nebraska Press, Lincoln, USA.
Johnson, S.A., Bjorndal, K.A., and Bolten, A.B. 1996. Effects of organised turtle watches on loggerhead (Caretta caretta) nesting behaviour and hatchling production in Florida. *Conservation Biology* **10**: 570-577.
Kampamba, G. and Chansa, W. 2003. *Rhino Conservation Plan*. Zambian Wildlife Authority (ZAWA) Chilanga, Zambia.
Karanth, K.U. and Nichols, J.D. 2002. *Monitoring tigers and their prey: A manual for researchers, managers and conservationists in tropical Asia..* Centre for Wildlife Studies, Bangalore.
KWS. In press. *Conservation Strategy for the cheetah and African wild dog in Kenya.* Kenya Wildlife Service, Nairobi.
Laurenson, M.K., Sillero-Zubiri, C., Thompson, H., Shiferaw, F., Thirgood, S., and Malcolm, J. 1998. Disease as a threat to endangered species: Ethiopian wolves, domestic dogs and canine pathogens. *Animal Conservation* **1**: 273-280.
Leader-Williams, N. and Albon, S.D. 1988. Allocation of resources for conservation. *Nature* **336**: 533-535.
Legg, C.J. and Nagy, L. 2006. Why most conservation monitoring is, but need not be, a waste of time. *Journal of Environmental Management* **78**: 194-199.
Lewison, R.L., Crowder, L.B., and Shaver, D.J. 2003. The impact of turtle excluder devices and fisheries closures on loggerhead and Kemp's ridley strandings in the western Gulf of Mexico. *Conservation Biology* **17**: 1089-1097.
Linnell, J.D.C., Swenson, J.E., and Andersen, R. 2001. Predators and people: Conservation of large carnivores is possible at high human densities if management policy is favourable. *Animal Conservation* **4**: 345-349.
MacKenzie, D.I., Nichols, J.D., Royle J.A., Pollock, K.H., Bailey, L.L., and Hines, J.E. 2005. *Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence*. Academic Press, San Diego CA.
Mallon, D.P., Kiwan, K., and Qarqaz, M. In press. *Arabian Oryx Conservation Strategy and Action Plan*. Abu Dhabi, EAD.
Mallon, D.P. Pers. comm. *Przewalsky Gazelle Conservation Strategy and Action Plan*. Prepared in a 2004 workshop, still awaiting formal approval by the Government of the People’s Republic of

China.
Margules, C. and Pressey, R. 2000. Systematic Conservation Planning. *Nature* **405**: 243–253.
Marine Mammal Commission. 2003. Florida manatee (*Trichechus manatus latirostris*). In: Marine Mammal Commission (ed.), *Annual Report to Congress 2002*, pp.127-139. Marine Mammal Commission, Bethesda, MD.
McCauley, D.J. 2006. Selling out on nature. *Nature* **443**: 27-28.
McCarthy, T., Hunter, L., Mallon, D., Zahler, P., Sanderson, E., and Fisher, K. In prep. Conservation assessment for the snow leopard. Snow Leopard Trust, Snow Leopard Network, Panthera, and Wildlife Conservation Society.
McGowan, P. and Gillman, M. 1997. Assessment of the conservation status of partridges and pheasants in South east Asia. *Biodiversity and Conservation* **6**: 1321-1337.
McGowan, P., Gillman, M., and Dodd, M. 1998. Assessing the status of poorly known species: lessons from partridges and pheasants of South east Asia. *Biological Conservation* **83**: 1-7.
Medellin, R. A., Chetkiewicz, C., Rabinowitz, A., Redford, K., Robinson, J.G., Sanderson, E.W., and Taber, A. (eds.). 2002. *Jaguars in the new millennium: an evaluation of the status, priority-setting and recommendations for the jaguars in the Americas*. National Autonomous University of Mexico and Wildlife Conservation Society. Mexico D.F.
Meine, C.D., Archibald, G.W., and the IUCN/SSC Crane Specialist Group. 1996. *The Cranes: Status Survey and Conservation Action Plan*. IUCN, Gland, Switzerland.
MA. 2005. *Ecosystems and Human Well-being: Biodiversity Synthesis*. Millennium Ecosystem Assessment. World Resources Institute, Washington, DC, USA
Moore, N.W. and the IUCN/SSC Odonata Specialist Group. 1997. *Dragonflies: Status Survey and Conservation Action Plan*. IUCN, Gland, Switzerland.
Moritz, C. 1994. Applications of mitochondrial DNA analysis in conservation: a critical review. *Molecular Ecology* **3**: 401–411.
Morris, J.M. 1991. *Report of FFPS/SSC Meeting: Action Plans and their implementation*. Held on 26 April 1991 at the Meeting Rooms, Zoological Society of London, Regent's Park, London. Unpublished report. Fauna and Flora Preservation Society (now Fauna & Flora International, FFI), London.
Morris, W.F., Bloch, P.L., Hudgens, B.R., Moyle, L.C., and Stinchcombe, J.R. 2002. Population viability analysis in endangered species recovery plans: Past use and future improvements. *Ecological Applications*. **12(3)**: 708-712.
National Marine Fisheries Service (NMFS). 2006. *Interim Endangered and Threatened Species Planning Guidelines*. Published online at http://www.nmfs.noaa.gov/pr/pdfs/recovery/guidance.pdf (accessed 29 June 2008).
Nawaz, M.A., Swenson, J.E., and Zakaria, V. In press. Pragmatic management increases a flagship species, the Himalayan brown bears, in Pakistan's Deosai National Park. *Biological Conservation.* Available online 9 August 2008 doi:10.1016/j.biocon.2008.06.012.
NEWFS. 2007. *Vision Statement. New England Wildflower Society.* http://newfs.org/about/vision-statement.html#the-vision (accessed 22 July 2008).
Novaro, A.J. and Walker, R.S. 2005. Human-induced changes in the effect of top carnivores on biodiversity in the Patagonian steppe. In: J.C. Ray, K. Redford, R.S. Steneck, and J. Berger (eds.), *Large carnivores and the conservation of biodiversity*, pp. 268-288. Island Press, Washington, USA.
Ogada, M.O., Woodroffe, R., Oguge, N., and Frank, L.G. 2003. Limiting depredation by African carnivores: the role of livestock husbandry. *Conservation Biology* **17**: 1521-1530.
Okita-Ouma, B., Amin, R., and Kock, R. (compilers). 2007. *Conservation and management strategy for the black rhino and management guidelines for the white rhino in Kenya*, Third Edition (2007-2011), published together with Okita-Ouma, B., Amin, R., Adcock, K., Emslie, R., Pearce-Kelly, P., and Kock, R. 2007. *A positive turning point in black rhino conservation in Kenya – Background and review of the Strategic Plan and Actions* (2001-2006). Kenya Wildlife Service, Nairobi, Kenya.
Oldfield, S. and IUCN/SSC Cactus and Succulent Specialist Group. 1997. *Cactus and Succulent Plants: Status Survey and Conservation Action Plan*. IUCN, Gland, Switzerland.
Olsen, D.M. and Dinerstein, E. 1998. The Global 200: A representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* **12**: 502-515.
Ottichilo, W.K. 2001. Population trends of resident wildebeest (Connochaetes taurinus hecki (Neumann)) and factors influencing them in the Masai Mara ecosystem, Kenya. *Biological Conservation* **97**: 271-282.

Oviedo, G., Maffi, L., and Larsen, P.B. 2000. *Indigenous and Traditional Peoples of the World and Ecoregion Conservation: An Integrated Approach to Conserving the World's Biological and Cultural Diversity*. WWF-International and Terralingua, Gland, Switzerland.

Parma, A.M., Amarasekare, P., Mangel, M., Moore, J., Murdoch, W.W., Noonburg, E., Pascual, M.A., Possingham, H.P., Shea, K., Wilcox, C., and Yu, D. 1998. What can adaptive management do for our fish, forests, food and biodiversity? *Integrative Biology, Issues, News and Reviews* **1**: 16–26.

Pearson, R.G. and Dawson, T.P. 2003. Predicting the impacts of climate change on the distribution of species: are bioclimate envelope models useful? *Global Ecology and Biogeograpy* **12(5):** 361-371.

Phillips, A. 2002. *Management Guidelines for IUCN Category V Protected Areas: Protected Landscapes/Seascapes*. Best Practice Protected Area Guidelines Series. IUCN, Gland, Switzerland and Cambridge, UK.

Phillips, M. 1995. Conserving the red wolf. *Canid News* **3**: 13-17.

Phillips, S., Anderson, R., and Schapire, R. 2006. Maximum entropy modeling of species geographic distributions. *Ecological Modelling* **190**: 231-259.

Pierre, J.P. and Norden, W.S. 2006. Reducing seabird bycatch in longline fisheries using a natural olfactory deterrent. *Biological Conservation* **130**: 406-415.

Plumptre, A.J. 2000. Monitoring mammal populations with line transect techniques in African forests. *Journal of Applied Ecology* **37**: 356-368.

Polley, H.W. 1984. Relationships of vegetation and environment in Buffalo Wallows. *American Midland Naturalist* **112:** 178-86.

Posey, D. A. (ed.). 2000. Cultural and spiritual values of biodiversity. UNEP. Intermediate Technology, London, UK.

Powell, A.N. and Cuthbert, F.J. 1993. Augmenting small populations of plovers: an assessment of cross-fostering and captive rearing. *Conservation Biology* **7**: 160-168.

Red List. 2001. 2001 Categories and Criteria (version 3.1). Published online at http://www.iucnredlist.org/info/categories_criteria2001#critical (accessed 25 July 2008).

Redford, K., Wilkie, D., and Fearn, E. 2007. Protected Areas and Human Livelihoods: Experiences from the Wildlife Conservation Society. In: K. Redford and E. Fearn (eds.), *Protected Areas and Human Livelihoods. Working Paper No. 32*. Wildlife Conservation Society, New York, USA.

Roemer, G.W. and Wayne, R.K. 2003. Conservation in conflict: the tale of two endangered species. *Conservation Biology* **17:** 1251-1260.

Roemer, G.W., Coonan, T.J., Garcelon, D.K., Bascompte, J., and Laughrin, L. 2001. Feral pigs facilitate hyperpredation by golden eagles and indirectly cause the decline of the island fox. *Animal Conservation* **4**: 307-318.

Roemer, G.W., Donlan, C.J., and Courchamp, F. 2002. Golden eagles, feral pigs and island carnivores: how exotic species turn native predators into prey. *Proceedings of the National Academy of Sciences, USA* **99:** 791-796.

Rose, C.S. and Gauvin, J.R. 2000. Effectiveness of a rigid grate for excluding Pacific halibut, *Hippoglossus stenolepis*, from groundfish trawl catches. *Marine Fisheries Review* **62:** 61-66.

Rowcliffe, J.M., Field, J., Turvey, S.T., and Carbone, C. 2008. Estimating animal density using camera traps without the need for individual recognition. *Journal of Applied Ecology* **45(4):** 1228-1236.

Ryder, O.A. 1986. Species conservation and systematics: the dilemma of subspecies. *Trends in Ecology and Evolution* **1**: 9–10.

Sanderson, E. 2006. How many animals do we want to save? The many ways of setting population target levels for conservation. *BioScience* **56**: 911–922.

Sanderson, E., Redford, K., Weber, B., Aune, K., Baldes, D., Berger, J., Carter, D., Curtin, C., Derr, J., Dobrott, S., Fearn, E., Fleener, C., Forrest, S., Gerlach, C., Gates, C.C., Gross, J., Gogan, P., Grassel, S., Hilty, J., Jensen, M., Kunkel, K., Lammers, D., List, R., Minkowski, K., Olson, T., Pague, C., Robertson, P., Stephenson, B. 2008. The Ecological Future of the North American Bison: Conceiving Long-Term, Large-Scale Conservation of Wildlife. *Conservation Biology.* **22(2)**:252-266.

Sanderson, E., Redford, K., Chetkiewicz, C., Medellin, R., Rabinowitz, A., Robinson, J., Taber, A. 2002. Planning to Save a Species: the Jaguar as a Model. *Conservation Biology*, **16(1)**: 58-72.

Schnurr, P., Seglund, A., and Miller, P.S. (eds.). 2008. *White-Tailed and Gunnison's Prairie Dogs in*

Colorado: Statewide Conservation Planning Workshop Final Report. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN, USA.
Schnurr, P., Remington, T., Apa, T., Petch, B., Sell, R., Eichoff, K., Kaal, K., and Miller, P.S. 2006. *Greater sage grouse in Colorado: statewide conservation planning workshop report* IUCN/SSC Conservation Breeding Specialist Group; http://cbsg.org/cbsg/workshopreports/23/greater_sage_grouse.final.pdf (accessed 10 September 2008), Apple Valley, MN, USA.
Scott, M.J., Heglund, P.J., and Morrison, M.L. (eds.). 2002. *Predicting Species Occurrences: Issues of Accuracy and Scale*. Island Press, Washington DC.
Shrader-Frechette, K.S. and McCoy, E.D. 1993. *Method in Ecology: Strategies for Conservation* Cambridge University Press, Cambridge,UK.
Siegel, R.A., Dinsmore, A., and Richter, S.C. 2006. Using well water to increase hydroperiod as a management option for pond-breeding amphibians. *Wildlife Society Bulletin* **34:** 1022-1027.
Sillero-Zubiri, C. and Macdonald, D.W. 1997. *The Ethiopian wolf: Status survey and Conservation Action plan.* IUCN, Gland, Switzerland.
Sims, M., Wanless, S., Harris, M.P., Mitchell, I., and Elston, D.A. 2006. Evaluating the power of monitoring plot designs for detecting long-term trends in the numbers of common guillemots. *Journal of Applied Ecology* **43:** 537-546.
Sinclair, L., McCartney, J., Godfrey, J., Pledger, S., Wakelin, M., and Sherley, G. 2005. How did invertebrates respond to eradication of rats from Kapiti Island, New Zealand? *New Zealand Journal of Zoology* **32**: 293-315.
Smith, D.W., Mech, L.D., Meagher, M., Clark, W.E., Jaffe, R. , Phillips, M.K., and Mack, J.A. 2000. Wolf-bison interactions in Yellowstone National Park. *Journal of Mammalogy* **81**:1128-1135.
Stevens, S. (ed.). 1997. Conservation through Cultural Survival. Island Press, Washington DC,USA. In: G. Borrini-Feyerabend, A. Kothari, and G. Oviedo. 2004. *Indigenous and Local Communities and Protected Areas: Towards Equity and Enhanced Conservation*. p.1. IUCN, Gland, Switzerland and Cambridge, UK.
Stewart, G.B., Côté, I.M., Kaiser, M.J., Halpern, B.S., Lester, S.E., Bayliss, H.R., Mengerson, K., and Pullin, A.S. 2008. *Are marine protected areas effective tools for sustainable fisheries management? I. Biodiversity impact of marine reserves in temperate zones.* Systematic Review No. 23, Centre for Evidence-Based Conservation http://www.environmentalevidence.org/CEE%20SR%2023.htm (accessed 10 September 2008), Bangor.
Stockwell, D. and Peters, D. 1999. The GARP modelling system: problems and solutions to automated spatial prediction. *International Journal of Geographical Information Science* **13 (2)**:143 – 158.
Strindberg, S., Didier, K., and the Living Landscapes Program. 2006. *A quick reference guide to the Landscape Species Selection Software, version 2.1*. Technical Manual 5, Wildlife Conservation Society, Living Landscapes Program, Bronx, NY.
Sutherland, W.J., Pullin, A.S., Dolman, P.M., and Knight, T.M. 2004. The need for evidence-based conservation. *Trends in Ecology and Evolution* **19**: 305-308.
Swarts, H.M. 2006. Annual integrated fox recovery team meeting summary USFWS, Ventura, CA.
Taber, A., *et al.* (48 other authors). 2008. El Destino de Los Arquitectos de Los Bosques Neotropicales: Una Evaluación de la Distribución y el Estado de Conservación de los Pecaries Labiados y Los Tapires de Tierras Bajas. Grupos de Especialistas en Suiformes y Tapires (UICN/SSC), Wildlife Conservation Society and Wildlife Trust.
TAWIRI. 2007. Proceedings of the first Tanzania lion and leopard conservation action plan workshop. Tanzania Wildlife Research Institute, Arusha. http://www.habari.co.tz/carnivores/Media/Carnivore%20Action%20Plan/Tanzania%20Lion%20and%20leopard%20CAP.pdf (accessed 19 September 2008).
Taylor, B.L. and Gerrodette, T. 1993. The uses of statistical power in conservation biology: the vaquita and the northern spotted owl. *Conservation Biology* **7**: 489-500.
Thomas, C.D., Cameron, A., Green, R.E., Bakkenes, M., Beaumont, L.J., Collingham, Y.C., Erasmus, B.F.N., Ferreira de Siqueira, M., Grainger, A., Hannah, L., Hughes, L., Huntley, B., van Jaarsveld, A.S., Midgley, G.F., Miles, L., Ortega-Huerta, M.A., Peterson, A.T., Phillips, O.L., and Williams, S.E. 2004. Extinction risk from climate change. *Nature* **427**: 145-148.
Thomas, J.A. 1980. Why did the large blue become extinct in Britain? *Oryx* **15:** 243-247.
Thorbjarnson, J., Mazzotti, F., Sanderson, E., Buitrago, F., Lazcano, M., Minkowski, K., Muniz, M., Ponce, P., Sigler, L., Soberon, R., Trelancia, A.M., and Velasco, A. 2006. Regional habitat conservation priorities for the American crocodile. *Biological Conservation*. **128(1)**: 25-36.

Timm, S.F., Barker, W.D., Johnson, S.A., Sewell, J.H., Sharpe, P.B., Schmidt, G.A., and Garcelon, D.K. 2002. *Island fox recovery efforts on Santa Catalina Island, California, September 2000 – October 2001*. Institute for Wildlife Studies, Arcata, CA, USA.
Timm, S.F., Stokely, J.M., Gehr, T.B., Peebles, R.L., and Garcelon, D.K. 2000. *Investigation into the decline of island foxes on Santa Catalina Island*. Institute for Wildlife Studies, Arcata, CA, USA.
TNC. 1997. *Designing a Geography of Hope*. The Nature Conservancy, Arlington, Virginia, USA.
TNC. 2007. *Conservation Action Planning: Developing Strategies, Taking Action, and Measuring Success at Any Scale (Overview of Basic Principles)*. The Nature Conservancy, Seatlle, WA, USA.
Towne, E.G. 2000. Prairie vegetation and soil nutrients responses to ungulate carcasses. Oecologia **122**: 232-239.
Tudge, C. 2000 (reprinted 2006). *The Variety of Life: A Survey and a Celebration of All the Creatures That Have Ever Lived*. Oxford University Press, New York, USA.
Tyson, M.J., Hedges, S., Sitompul, A.F., Sukatmoko, and Gunaryadi, D. In review. Defecation rates of Asian Elephants in Sumatra, and implications for elephant surveys in Southeast Asia.
USFWS. 2003. *Final Revised Recovery Plan for the Southern Sea Otter (Enhydra lutris nereis)* US Fish and Wildlife Service, Portland, USA.
USFWS. In prep. *Recovery plan for the Island Fox.* US Fish and Wildlife Service, Ventura, USA.
USFWS. 2000. *Habitat Conservation Planning Handbook*. US Fish and Wildlife Service. At http://www.fws.gov/Endangered/hcp/hcpbook.html . (accessed 30 June 2008).
Van Dyk, G. and Slotow, R. 2003. The effect of fences and lions on the ecology of African wild dogs reintroduced into Pilansberg National Park, South Africa. *African Zoology* **38**: 79-94.
Vaughan, C., Nemeth, N.M., Cary, J., and Temple, S. 2005. Response of a scarlet macaw *Ara macao* population to conservation practices in Costa Rica. *Bird Conservation International* **15**: 119-130.
Vial, F., Cleaveland, S., Rasmussen, G.S.A., and Haydon, D.T. 2006. Development of vaccination strategies for the management of rabies in African wild dogs. *Biological Conservation* **131**: 180-192.
Walsh, P.D., Abernethy, K.A., Bermejo, M., Beyers, R., De Wachter, P., Ella Akou, M., Huijbregts, B., Idiata Mambounga, D., Kamdem Toham, A., Kilbourn, A.M., Lahm, S.A., Latour, S., Maisels, F., Mbina, C., Mihindou, Y., Ndong Obiang, S., Ntsame Effa, E., Starkey, M.P., Telfer, P., Thibault, M., Tutin, C.E.G., White, L.J.T., and Wilkie, D.S. 2003. Catastrophic ape decline in western equatorial Africa. *Nature*: **422**: 611-614.
Walters, C. 1986. *Adaptive Management of Renewable Resources*. Macmillan, New York, USA.
West, P.C. and Brechin, S.R. (eds.). 1991. *Resident Peoples and National Parks: Social Dilemmas and Strategies in International Conservation*. University of Arizona Press, Tucson, USA.
Westley, F. and Miller, P.S. (eds.). 2003. *Experiments in Consilience: Integrating Social and Scientific Responses to Save Endangered Species*. Island Press, Washington, D.C., USA.
Westley, F. and Vredenburg, H. 1997. Interorganizational collaboration and the preservation of global biodiversity. *Organization Science* **8(4)**: 381-403.
Wikramanayake, E.D., Dinerstein, E., Robinson, J.G., Karanth, U., Rabinowitz, A., Olson, D., Mathew, T., Hedao, P., Conner, M., Hemley, G., and Bolze, D. 1988. An ecology-based method for defining priorities for large mammal conservation: The tiger as case study. *Conservation Biology* **12**: 865-878.
Wilkie, D.S., Morelli, G.A., Demmer, J., Starkey, M., Telfer, P., and Steil, M. 2006. Parks and people: assessing the human welfare effects of establishing protected areas for biodiversity conservation. *Conservation Biology* **20**: 247-249.
Williams, B.K., Nichols, J.D., and Conroy, M.J. 2002. *Analysis and Management of Animal Populations* Academic Press, San Diego.
Wilson, A. 2003. All parks are peopled parks. *Policy Matters* **12**: 71–75.
Wilson, E. O. 1984. *Biophilia*. Harvard University Press, Cambridge.
Woodroffe, R. and Ginsberg, J.R. 1998. Edge effects and the extinction of populations inside protected areas. *Science* **280**: 2126-2128.
Woodroffe, R., Davies-Mostert, H., Ginsberg, J.R., Graf, J.A., Leigh, K., McCreery, E.K., Mills, M.G.L., Pole, A., Rasmussen, G.S.A., Robbins, R., Somers, M., and Szykman, M. 2007a. Rates and causes of mortality in endangered African wild dogs (*Lycaon pictus*): lessons for management and monitoring. *Oryx* **41**: 1-9.
Woodroffe, R., Frank, L.G., Lindsey, P.A., ole Ranah, S.M.K., and Romañach, S.S. 2006. Livestock

husbandry as a tool for carnivore conservation in Africa's community rangelands: a case-control study. *Biodiversity and Conservation* **16**: 1245-1260.

Woodroffe, R., Ginsberg, J., Macdonald, D., and the IUCN/SSC Canid Specialist Group. 1997. *The African Wild Dog: Status Survey and Conservation Action Plan*. IUCN, Gland, Switzerland.

Woodroffe, R., Lindsey, P.A., Romañach, S.S., and ole Ranah, S.M.K. 2007b. African wild dogs (*Lycaon pictus*) can subsist on small prey: implications for conservation. *Journal of Mammalogy* **88**:181-193.

Zahler, P., Fisher, T., Jiang, Z., Kiriliuk, V., Lhagvasuren, B., Lushchekina, A., Milner-Gulland, E., Olson, K., Sanderson, E., Schaller, G., and Takehiko, I. (in prep.) Synthesis of Mongolian Gazelle Status, Distribution and Range-wide Priorities. Wildlife Conservation Society.

Lead authors and contributors

This document should be seen as a product of the SSC Species Conservation Planning Task Force as a whole. However, within that group, a number of lead writers spearheaded individual chapters, supported by several others who contributed through comments on numerous drafts, examples, and sections of chapters. We sincerely thank the dedicated individuals from the writing team, who, despite otherwise full schedules, spent many days writing, fine-tuning, and trying to accommodate diverging or additional views on the approach we propose here.

The lead authors and substantive contributors for each chapter were as follows:

Preface:	Eric Sanderson, Robert Lacy, and Simon Hedges.
Chapter 1:	Philip McGowan and David Mallon.
Chapter 2:	Simon Hedges, with significant contributions from Holly Dublin, Dave Garshelis, Robert Lacy, David Mallon, Philip Miller, Philip McGowan, Eric Sanderson, Claudio Sillero-Zubiri, and Rosie Woodroffe.
Chapter 3:	Robert Lacy, Simon Hedges, with significant contributions from David Mallon, Philip McGowan, Patricia Medici, John Haslett, and Claudio Sillero-Zubiri.
Chapter 4:	Simon Hedges, with contributions from Richard Emslie, David Mallon, Patricia Medici, and Rosie Woodroffe.
Chapter 5:	Eric Sanderson, with significant contributions from Rosie Woodroffe, Simon Hedges, David Mallon, Philip McGowan, and Dave Garshelis.
Chapter 6:	Simon Hedges, with significant contributions from Eric Sanderson, Rosie Woodroffe, and David Mallon.
Chapter 7:	Rosie Woodroffe and Simon Hedges, with significant contributions from David Mallon, Philip Miller, Robert Lacy, Philip McGowan, Claudio Sillero-Zubiri, Holly Dublin, and Dave Garshelis.
Chapter 8:	Rosie Woodroffe, with significant contributions from Simon Hedges, Margaret Kinnaird, Claudio Sillero-Zubiri, and Philip Miller.
Chapter 9:	Rosie Woodroffe and Sarah Durant.
Chapter 10:	Philip Miller and Eric Sanderson.

Additional resources

IUCN policy statements on species-related issues

IUCN policy statements are available online, in English, French, and Spanish (http://cms.iucn.org/about/work/programmes/species/resources/publications/iucn_policy__statements_/index.cfm accessed 20 September 2008).

- *Guidelines for Application of IUCN Red List Criteria at Regional Levels* Version 3.0. 2003.
- *IUCN Technical Guidelines on the Management of Ex Situ Populations for Conservation*, approved at the 14th Meeting of the Programme Committee of Council, Gland Switzerland , 10 December 2002.
- *IUCN Policy Statement on Sustainable Use of Wild Living Resources* (Resolution 2.29) adopted at the IUCN World Conservation Congress, Amman, October 2000. (Also available in German.)
- *IUCN Red List Categories*: Version 3.1, approved by the 51st Meeting of the IUCN Council, February 2000.
- *Guidelines for the Placement of Confiscated Animals* approved by the 51st Meeting of the IUCN Council, February 2000.
- *Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species*, approved by the 51st Meeting of the IUCN Council, February 2000.
- *Guidelines for Re-Introductions*, approved by the 41st Meeting of the IUCN Council, May 1995.
- *IUCN Policy Statement on State Gifts of Animals*, approved by the 27th Meeting of the IUCN Council, Gland, Switzerland,14 June 1989.
- *IUCN Policy Statement on Research Involving Species at Risk Of Extinction*, approved by the 27th Meeting of the IUCN Council, Gland, Switzerland,14 June 1989.
- *IUCN Position Statement on Translocation of Living Organisms; Introductions, Reintroductions and Re-Stocking*, approved by the 22nd Meeting of the IUCN Council, Gland, Switzerland, 4 September 1987.

A number of additional IUCN guidelines and tools that may be of interest in specific situations are available here: http://cms.iucn.org/resources/tools/index.cfm (accessed 20 September 2008).

Other planning guidelines and tools for adaptive management

- The Conservation Measures Partnership, *Open Standards for the Practice of Conservation, Version 2.0,* October 2007, http://conservationmeasures.org/CMP/Site_Docs/CMP_Open_Standards_Version_2.0.pdf The Conservation Measures Partnership (CMP), a partnership of conservation NGOs that seek better ways to design, manage, and measure the impacts of their conservation actions, developed open standards to represent an idealized *adaptive management* process and provide a conceptual framework for good project design, implementation, monitoring, and evaluation, focused specifically on biodiversity conservation. These standards are the product of inputs, field tests, discussions, and debates among many CMP members and their partners. This version of the Open Standards comes three years after the release of Version 1.0 and reflects how thinking has evolved over time as various conservation organizations within and outside of CMP have tried to implement the Standards. As part of the adaptive management process, CMP members will continue to revise and improve it over time. The CMP website (http://www.conservationmeasures.org) will post updated versions as they are developed. In addition, guidance materials in support of the Standards can be viewed on the CMP website.

- *Miradi: Adaptive Management Software for Conservation Projects*

  Miradi – a Swahili word meaning "project" or "goal" – is a user-friendly program that allows nature conservation practitioners to design, manage, monitor, and learn from their projects to more effectively meet their conservation goals. It is a joint venture between the Conservation Measures Partnership and Benetech. The program guides users through a series of step-by-step interview wizards, based on the Open Standards for the Practice of Conservation. As practitioners go through these steps, Miradi helps them to define their project scope, and design conceptual models and spatial maps of their project site. The software helps teams to prioritize threats, develop objectives and actions, and select monitoring indicators to assess the effectiveness of their strategies. Miradi also supports the development of workplans, budgets, and other tools to help practitioners implement and manage their project. Users can export Miradi project data to donor reports or, in the future, to a central database to share their information with other practitioners.

  Go to http://www.miradi.org to learn more, or to download.

- *TNC/WWF Results Chain presentation* (click on http://conserveonline.org/workspaces/cbdgateway/cap/resources/wwf/index_html and save the file as a PPT presentation).

  This is a presentation from a 2006 workshop, which explains how a results chain analysis works. A results chain is a diagram of a series of “if…then” statements (“causal” chains). It defines how a project strategy or activity is going to contribute to reducing a threat and conserving biodiversity. It focuses on the achievement of results – not the execution of activities, and it is composed of assumptions that can be tested.

Stakeholder involvement and participatory approaches

- TNC. Defining people to involve in your project . In: TNC, 2007. *Conservation Action Planning: Developing Strategies, Taking Action, and Measuring Success at Any Scale (Overview of Basic Principles)*. The Nature Conservancy, Seatlle, WA, USA (http://conserveonline.org/workspaces/cbdgatewa y/cap/practices/bp_1 accessed 10 September 2008).

- Castillo, O., Clark, C., Coppolillo, P., Kretser, H., McNab, R., Noss, A., Quieroz, H., Tessema, Y., Vedder, A., Wallace, R., Walston, J., and Wilkie, D. *Casting for Conservation Actors: People, Partnerships and Wildlife*, Wildlife Conservation Society, New York, 2006 (http://www.wcs.org/media/file/wcswp28.pdf accessed 10 September 2008).

  Identifying actors with the interest and capacity to effect conservation under different conservation contexts, and adapting the cast of actors as contexts, capacities and interests change over time is a continuing challenge. How do conservationists recognise, support, and promote the appropriate mix of actors to conserve wildlife in different contexts? How do they articulate this process of building strong constituencies for wildlife conservation in the field? *Casting for Conservation Actors* attempts to provide the basis for the design of analytical tools and even suggest guidelines for partner engagement and promotion. It is not intended as a strict methodology, so much as a conceptual framework for describing the logical connections and relationships between management needs, the actors who may meet those needs, and the factors and conditions that influence them.

- Institute of Development Studies (IDS)/Participation Group. Pathways to Participation: Critical Reflections on PRA. IDS, University of Sussex. Brighton, UK (http://portals.wi.wur.nl/files/docs/msp/path2part.pdf accessed 10 September 2008).

  The label PRA originally meant "Participatory Rural Appraisal", but has come to refer to a range of different practices and interpretations of what participation is about or for. This magazine focuses its analysis on the use of participatory rural appraisal techniques, drawing on experiences of development professionals from across the world.

- The World Bank. Participation Website (http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/EXTPCENG/0,,menuPK:410312~pagePK:149018~piPK:149093~theSitePK:410306,00.html accessed 10 September 2008).

  The Participation and Civic Engagement Group of the Social Development Department promotes the participation of people and their organizations to influence institutions, policies and processes for equitable and sustainable development. The Group supports World Bank units, client governments, and civil society organizations to incorporate participatory approaches in the design, the implementation, the monitoring, and the evaluation of (World Bank-sponsored) operations.

Some further useful references on techniques for developing, managing, and sustaining collaborations and participatory processes

- Doyle, M. and Straus, D. 1982. *How to Make Meetings Work*. Jove Books, New York, USA.

  How do you know if a meeting works? What is an effective meeting, anyway? Questions such as these are explored by the authors as they reveal a new method of conducting meetings, called the Interaction Method. If your meetings are more than window dressing or hot air, they are critical to the health of your group or organization. Learn how to be a facilitator, a recorder and "group memory."

- Straus, D. and Layton, T.C. 2002. *How to Make Collaboration Work: Powerful Ways to Build Consensus, Solve Problems, and Make Decisions*. 2nd Ed. Berrett-Koehler Publishers Inc., San Francisco, USA.

  The co-author of "How to Make Meetings Work" offers five principles for making collaborative efforts more effective, efficient, and even enjoyable.

- Westley, F., Zimmerman, B., and Patton, M. 2007. *Getting To Maybe: How the World Is Changed*. Vintage Canada, Toronto, Canada.

  A practical guide to social innovation. By studying fascinating real-life examples of social change through this systems-and-relationships lens, the authors of Getting to Maybe tease out the rules of engagement between volunteers, leaders, organizations and circumstances – to lay out a brand new way of thinking about making change in communities, in business, and in the world (description edited from the Hardcover edition).

- Bolton, R. 1986. *People Skills: How to Assert Yourself, Listen to Others, and Resolve Conflicts*. Touchstone, New York, USA.

  Author Robert Bolton describes the twelve most common communication barriers, showing how these "roadblocks" damage relationships by increasing defensiveness, aggressiveness, or dependency. People Skills is a communication-skills handbook that can help you eliminate these and other communication problems. He explains how to acquire the ability to listen, assert yourself, resolve conflicts, and work out problems with others. These are skills that will help you communicate calmly, even in stressful emotionally charged situations. (product description from Amazon.com)

- Bolton, R. and Grover Bolton, D. 1996. *People Styles at Work: Making Bad Relationships Good and Good Relationships Better*. AMACOM, New York, USA.

  A sequel to Social Style, Management Style, this book presents a comprehensive behavioral science model for understanding four different "people styles." The authors explain how readers can: identify their own styles and how they appear to others; relate effectively – no matter how others react to them; create common ground with different people while retaining their own individuality; evaluate the "people styles" of others and discover how to "flex" their styles to match. Readers will learn the characteristic strengths and weaknesses of each style – driver, analytical, amiable, and expressive – and how these characteristics can create stress in the other behavior types. They'll discover how to minimize these stresses by getting "in synch" with the style-based behavior patterns of others" (from the product description at Amazon.com).

- Jones, M.D. 1995. *The Thinker's Toolkit: Fourteen skills for making smarter decisions in business and life*. Random House, New York, USA.

  The book explains in simple language a number of methods for making decisions, including Causal Flow Diagramming, use of Matrix grids for describing and understanding options, Decision Trees, Weighted Ranking for setting priorities, and the use of Probability Trees for evaluating uncertainty.

Examples of species-focused conservation strategies and action plans that contain elements of content and processes recommended for SCS development

Most of the IUCN/SSC Species Action Plans were produced before the SCPTF began developing the framework described in this Handbook. We are providing links to them because they contain some features of the SCS approach we describe and are good examples of some components of the SCS planning process. Indeed, the methods used and lessons learned in these earlier planning processes often helped to inform the development of the process and writing of this Handbook by the SCPTF.

IUCN/SSC Species Action Plans are available for download at this website: http://cms.iucn.org/about/work/programmes/species/resources/publications/species_actions_plans/index.cfm (accessed 11 September 2008).

In the text of this Handbook we have provided web links to some recently prepared species conservation strategies that have either wholly or to a large extent followed the participatory approach we have outlined here. These are provided again below for the reader's convenience:

- IUCN/SSC. In press. *Regional Conservation Strategy for the Cheetah and African Wild Dog in Eastern Africa.* IUCN, Gland, Switzerland (http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_Strategy_cheetwd.pdf).

- IUCN/SSC. In review. *Regional Conservation Strategy for Wild Cattle and Buffaloes in Southeast Asia.* IUCN, Gland, Switzerland (http://intranet.iucn.org/webfiles/doc/SSC/SCS/Strategy_AWCB.pdf).

- KWS. In press. *Conservation Strategy for the Cheetah and African Wild Dog in Kenya.* Kenya Wildlife Service, Nairobi. Associated national Action Plan from Kenya (http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_ntlAP_cheetwd_KEN.pdf).

Example data forms to be used in the Status Review process:
- http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch5_jaguar_forms.pdf,
- http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_AWCB_forms.pdf, and
- http://intranet.iucn.org/webfiles/docs/SSC/SCS/Ch5_cheetwd_forms.pdf.

Example agendas for regional workshops:
- http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_rgl_wkshp_agenda_AWCB.pdf (for Asian wild cattle and buffaloes) and
- http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch2_rgl_wkshp_agenda_cheetwd.pdf (for cheetahs and African wild dogs).

Example agendas for national workshops:
- http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_cheetwd_BOT.pdf (national workshop on cheetahs and wild dogs in Botswana) and
- http://intranet.iucn.org/webfiles/doc/SSC/SCS/Ch9_ntl_wkshp_agenda_AWCB_VIE.pdf (national workshop on Asian wild cattle and buffaloes in Vietnam).

IUCN, International Union for Conservation of Nature

Founded in 1948, IUCN brings together States, government agencies and a diverse range of non-governmental organizations in a unique world partnership: over 1000 members in all, spread across some 140 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. A central Secretariat coordinates the IUCN Programme and serves the Union membership, representing their views on the world stage and providing them with the strategies, services, scientific knowledge and technical support they need to achieve their goals. Through its six Commissions, IUCN draws together over 10,000 expert volunteers in project teams and action groups, focusing in particular on species and biodiversity conservation and the management of habitats and natural resources. The Union has helped many countries to prepare National Conservation Strategies, and demonstrates the application of its knowledge through the field projects it supervises. Operations are increasingly decentralized and are carried forward by an expanding network of regional and country offices, located principally in developing countries.

IUCN builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

The **IUCN Species Survival Commission (SSC)** is a science-based network of close to 8,000 volunteer experts from almost every country of the world, all working together towards achieving the vision of, *"A world that values and conserves present levels of biodiversity."*

IUCN

INTERNATIONAL UNION
FOR CONSERVATION OF NATURE

WORLD HEADQUARTERS
Rue Mauverney 28
1196 Gland
Switzerland
mail@iucn.org
Tel: + 41 22 999 00 00
Fax: + 41 22 999 00 15
www.iucn.org
Document available for downloading at:
http://intranet.iucn.org/webfiles/doc/SSC/SCSHandbook.pdf

SSC
Species Survival Commission