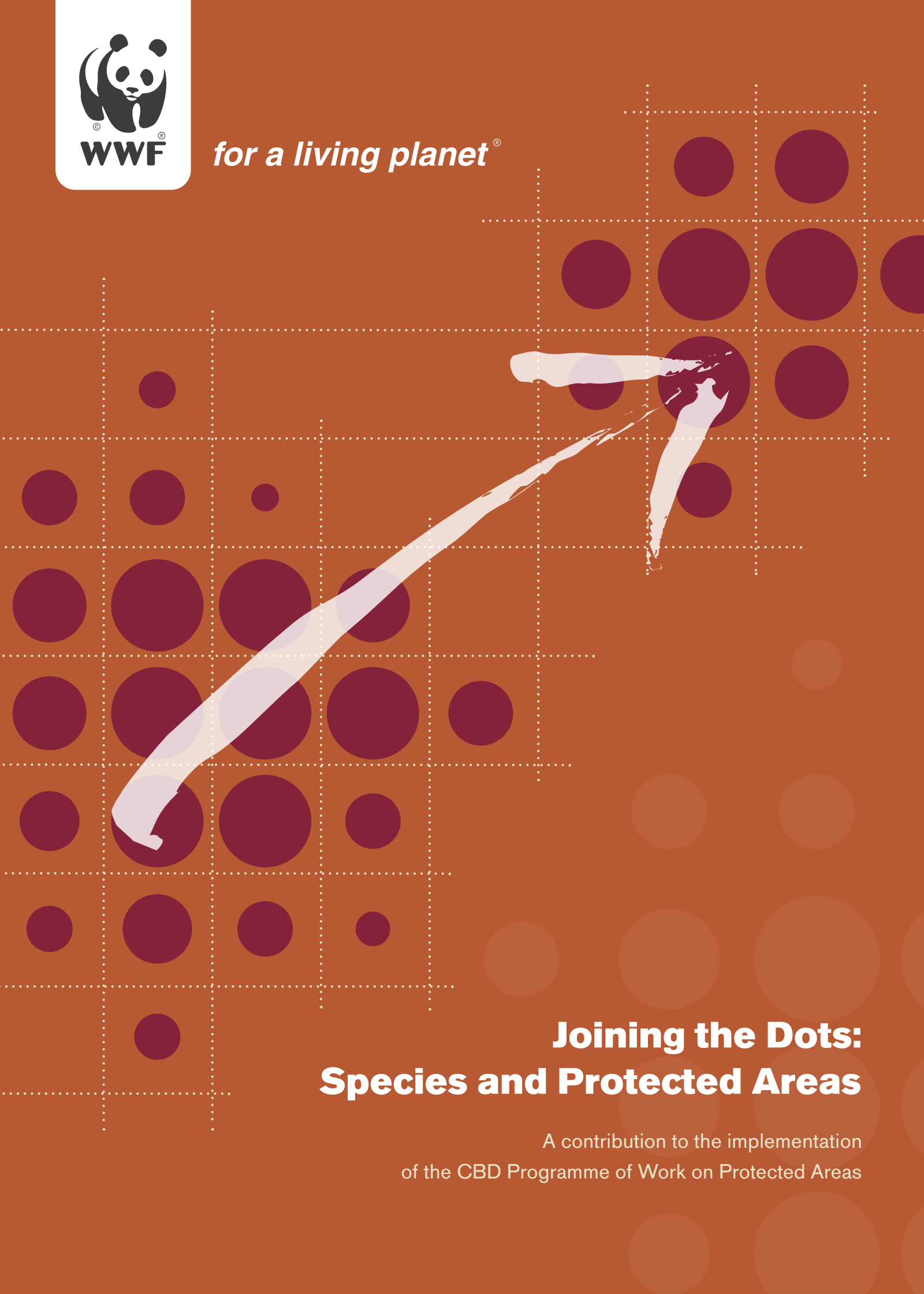


for a living planet®

Joining the Dots: Species and Protected Areas

A contribution to the implementation
of the CBD Programme of Work on Protected Areas

Joining the Dots: Species and Protected Areas

A contribution to the implementation of the CBD Programme of Work on Protected Areas

A WWF report presented on the occasion of CoP8 of the Convention on Biological Diversity, Curitiba, Brazil, 20–31 March 2006

WWF Global Species Programme
2006

This publication is also available as download from:
www.panda.org/species

Authorship:
This study was conducted for the WWF Global Species Programme by **Stephanie Mansourian**, Independent Consultant, with the technical support of **Gerald Dick**, Global Species Programme – Europe/ Middle East, WWF, and **Amanda Nickson**, Deputy Director, Global Species Programme, WWF.

Publisher:
WWF Global Species Programme

Editor:
Stephanie Mansourian
Gerald Dick, WWF

Suggested citation:
WWF, 2006. Joining the Dots: Species and Protected Areas – A contribution to the implementation of the CBD Programme of Work on Protected Areas.
WWF Global Species Programme, Wien, pp 94.

Contributors:
This report was completed with the extensive cooperation and help of the people working in the field where the case studies are based. We would like to thank them all for their help in conducting the field studies, collecting information and reviewing the drafts. Especially we are grateful to: **Luis Suarez** (Iberian lynx), **Michael Proschek** (brown bear), **Olga Pereladova** (saiga antelope, Persian leopard), **Vladimir Krever** and **Yuri Darman** and **Vadim Kirilliuk** (Amur tiger, Amur leopard) and **Onon Yondon** (saiga antelope, argali sheep). Further input was provided by **Rolf Hogan**, **Batnasan Nyamsuren**, **Georg Schwede**, **PJ Stephenson** and **Beate Striebel**.

Graphics and Layout:
Michal Stránský, Staré Město, Czech Republic.

ISBN 3-901458-21-2

Foreword

We are currently facing the most extreme species extinction crisis that this world has ever seen, with one in four mammals, one in three amphibians and almost half of all freshwater turtles threatened with extinction. The rapid loss of this wealth of biodiversity is putting at risk the very foundation of human society. The poorest 1 billion people on this planet obtain their livelihood from forests (which in turn harbour 80% of the world's biodiversity), and 75% of the world's population depend on natural remedies for their primary healthcare. The conservation of the world's biodiversity should therefore be of critical importance to us all.

The primary cause of species extinction is the increasing loss and fragmentation of species' habitat, and stemming this loss is critical to secure resources which provide for both humans and biodiversity. One of the best tools that has been used for achieving this is the creation of protected areas, which now cover 10% of the earth's surface. This is a significant first step. However, the increasing decline in the status of global biodiversity indicates that it is not enough. If we are to effectively conserve biodiversity into the future, and provide critical benefits for people, we need to plan our protected areas in a much broader and more effective way, addressing the specific needs of the biological diversity we are trying to safeguard. The use of species as a tool to plan and manage protected areas is the key to ensuring that protected areas work most effectively to fulfil the function for which they were intended.

Why is this? If a protected area network is established that accounts for the needs of species which require large habitat ranges for their survival (for example, if protected areas are large and well connected with effective corridors linking them together) it is much more likely to support the wider biodiversity of the ecosystem in a sustainable and long term way. The monitoring of wide-ranging species is also an extremely effective indicator to judge whether a protected area is effectively safeguarding the biodiversity it contains. If these species decline, it's likely other biodiversity will start declining soon after.

The conservation of migratory species also presents a unique but critical challenge. Protected area planning that considers the needs of migratory species will ensure the effective transboundary management and broad cross-country coordination and planning that is required to effectively stem biodiversity loss.

Furthermore, the need to ensure sustainable use of species, and mitigate threats to species (such as poaching and human-wildlife conflict) means that a species approach automatically necessitates community-level benefits sharing and strong community participation in planning.

Overall, the species approach to conservation management and planning ensures an integrated approach on a landscape level. The ecoregional work of WWF can be used as a model for this kind of approach, and is discussed in more detail in the report.

Foreword

The Convention on Biological Diversity's Programme of Work on Protected Areas, agreed in 2004, is a positive coordinated means for governments to further improve their networks of protected areas. An effective network of protected areas needs to have a clear focus and targets, to be connected, to be well managed and regularly monitored. Protected areas should be planned over large areas so that they can be an integral part of our landscapes. They should also include the needs of communities and fit with land use and development plans, if they are to be sustainable. By ensuring that species are an integral part of planning and management of protected areas, as both targets and indicators, we can ensure that the implementation of the Programme of Work on Protected Areas is successful in producing these kinds of effective protected area networks. This report, through a series of detailed case studies, demonstrates how this has already worked – successfully – for many member states, and provides concrete examples that can be extrapolated elsewhere.

The CBD Programme of Work on Protected Areas provides a unique opportunity to secure the wealth of our planet's biodiversity. It is essential to incorporate species as a critical component of this Programme of Work if we wish to ensure that we all make the most of this opportunity, before it is too late.

Dr. Susan Lieberman

Director, Global Species Programme, WWF International

ACRONYMS

ACBK	Association for Conservation of Biodiversity in Kazakhstan
ADCP	Altyn Dala Conservation Programme
AZE	Alliance for Zero Extinctions
CBD	Convention on Biological Diversity
CI	Conservation International
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
COP	Conference of the Parties
EIA	Environmental Impact Assessment
EU	European Union
FSC	Forest Stewardship Council
FZS	Frankfurt Zoological Society
GEF	Global Environment Facility
IUCN	The World Conservation Union
IUCN-WCPA	IUCN – World Commission on Protected Areas
MAB	Man and Biosphere
NGO	Non Governmental Organisation
PA	Protected area
PEEN	Pan-European Ecological Network
PES	Payment for Environmental Services
RSPB	the Royal Society for Protection of Birds
TBPA	Transboundary Protected area
UNEP	United Nations Environment Programme
WSSD	World Summit on Sustainable Development
WWF	World Wide Fund for Nature

Table of Contents

Executive summary

While the number of protected areas (PAs) increased more than 10 fold in the course of the 20th century, the struggle to conserve biodiversity continues. Leading scientists warn that we are currently facing the imminent extinction of 794 species, three times the number recorded as having become extinct in the last 500 years. We do not know the precise impact such a dramatic loss in natural resources may have on our planet but we do know that disrupting our environment can have far-reaching repercussions.

Habitat loss and fragmentation are the main causes of biodiversity loss. To address this concern, it is increasingly accepted that protected areas planned in isolation are not sufficient. Instead networks of larger, connected protected areas within managed landscapes are preferred, as they offer the possibility for species to follow natural movement and migration patterns and to find suitable food, shelter and reproductive partners. In addition larger areas harbour more viable populations, a greater diversity of species and habitat types, and are more resilient to large scale disturbances and climate change

WWF, as well as many other conservation organisations, has shifted its focus to larger scales (from sites to ecoregions and landscapes) in an effort to conserve entire ecosystems. The ecoregional approach reflects our understanding that the interplay of influences on natural systems extends far beyond the boundaries of a given site. In planning ecoregion conservation, priority species are identified which play an essential role within the ecosystem and require special conservation focus.

The Convention on Biological Diversity (CBD) and its programme of work on protected areas, ratified by most of the world's governments, reflects the global concern for the state of our planet. The programme of work's 16 goals and targets and 92 related activities highlight the importance of connectivity, ecological networks, integration into wider landscapes and migratory species. Within this framework governments are encouraged to define their own relevant targets at a national and regional level

In this report, we use priority species as the central planning unit to define a terrestrial protected area system including ecological corridors. Because they are integral components of ecosystems, addressing the needs of priority species (which are usually large terrestrial mammals) is key to support the effectiveness of protected areas.

In order for species to effectively support the planning of a PA network, key information on the priority species needs to be collected, including:

- sensitivity to disruptions from human activity (eg: roads, agriculture, settlements etc.);
- sensitivity to edge effect, which will affect the shape and width of habitat linkages;
- degree of specialisation in food and its availability;
- requirements in terms of habitat quality (eg: primary or secondary forest etc.);
- current distribution and range (which will affect the size of PAs and linkages within a landscape);
- viability of populations;
- movements and migration routes;
- existence of protected areas within their range;
- quality of their current habitat (species will require more habitat if it is of poor quality);
- relationship to local communities.

Executive summary

We look at seven large terrestrial mammal species in this study: the Iberian lynx (Lynx pardinus), the Amur tiger (Panthera tigris altaica), the argali sheep (Ovis ammon), the brown bear (Ursus arctos), the saiga antelope (Saiga tatarica), the Amur leopard (Panthera pardus orientalis) and the Persian leopard (Panthera pardus saxicolor). Six out of the seven species are threatened according to IUCN's Red List of Threatened Species, thus indicating that protected areas have not yet sufficiently and successfully contributed to the survival of those species. We investigate their needs and role as an integral part of ecosystems and use them to help define required protected areas and habitat linkages. In section 1 we introduce the framework provided by the programme of work on protected areas. We then look at conservation in large scales in section 2. Section 3 briefly describes the species selected for this report and the ecoregions which they inhabit. In section 4 we analyse in greater detail the needs of the species and how those can help identify necessary actions in terms of habitat protection. A number of recommendations specific to the use of species to define protected areas and linkages for implementation of the CBD programme of work on protected areas can be found in section 5 and are summarised below.

We conclude that large mammal species are important in defining protected areas' networks, framing landscapes and defining necessary linkages in the landscapes.

In order to ensure that effective protected area networks are established as a result of the implementation of the CBD's programme of work on protected areas, WWF recommends that governments:

1. Support research to improve knowledge about species and protected area gaps

A clear understanding of species' ecology, their habitat requirements, their sensitivities to different current and future threats etc., can support the planning of a viable network of PAs. The sort of information that needs to be collected includes understanding about the habitat requirements of priority species, their migration/movement patterns, their sensitivity to disturbance, their food requirements etc.

- **relevant to CBD Programme of Work on PAs targets: 1.1, 1.2, 1.3, 1.4, 3.3, 4.1, 4.4**

2. Establish an effective protected area network that ensures species' conservation and contributes to mitigating threats to species

Protected areas' networks should be planned in view of anticipated climate change scenarios, in order to provide threatened species with sufficient scope to adapt to climate change.

- **relevant to CBD Programme of Work on PAs targets 1.1, 1.3, 1.5, 4.1, 4.2**

3. Use the conservation of priority species as an objective to integrate protected areas within relevant national strategies by using the ecosystem approach or bioregional mechanisms (such as ecoregions)

Species and protected areas should be integrated into coherent broader national strategies.

- **relevant to CBD Programme of Work on PAs targets 2.2, 3.1, 3.2**

4. Focus on migrating and wide-ranging species to establish corridors via trans-border collaboration where necessary

Larger, connected protected areas within landscapes will often require cross-border collaboration. The legal obligation derived from article 10 of the EU-Habitats Directive, which is about connectivity, should be effectively applied in all EU member States as soon as possible, so as to ensure an adequate coherence of the European Natura 2000 network of protected areas.

- **relevant to CBD Programme of Work on PAs targets 1.3, 3.1**

5. Engage and involve local communities in species' protection and protected area management

Without local engagement, the long term viability of many species and protected areas remains at risk.

- **relevant to CBD Programme of Work on PAs targets 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3, 3.5**

6. Improve information collection and monitoring of species

Monitoring systems are essential to identify trends and to adapt management measures. Data on priority species can help monitor the effectiveness of protected area networks. Species can also act as a useful surrogate for a range of biodiversity indicators (such as habitat quality, ecosystem functions etc.).

- **relevant to CBD Programme of Work on PAs targets 3.3, 4.1, 4.2, 4.3**

7. Use species' data to improve effectiveness and planning of protected areas within a landscape

A renewed focus on species can help identify trade offs with different land uses and promote sympathetic practices as well as identify optimal PA sizes, locations and linkages to benefit both biodiversity and stakeholders within the landscape.

- **relevant to CBD Programme of Work on PAs targets 1.2, 3.1, 3.2, 4.1, 4.2**

8. Ensure adequate financial resources are available for protected areas and corridor establishment to meet their biodiversity targets

Increased funding through innovative schemes, as well as traditional ones like the GEF, is essential for urgent action to be implemented if the targets of the programme of work on protected areas are to be met. The cost of corridors and linkages needs to be calculated and should be included as part of the national assessments of protected area financial needs and the development of sustainable financing plans as required under the programme of work.

- **relevant to CBD Programme of Work on PAs target 3.4**

key recommendations

1. Introduction

Current rates of biodiversity loss are alarming and conservation efforts by governments, conservationists and others are still not sufficient to stop and reverse this trend. Protected areas remain the best available tool to preserve habitats and ensure biodiversity conservation. In 2003, a comprehensive analysis conducted by leading scientists concluded that for effective species' conservation the expansion of the global protected area network cannot be based on area targets: it must instead be based on biodiversity information[1].

Today, we are at a cross roads with the Convention on Biological Diversity (CBD) Programme of Work on Protected areas agreed by 188 Parties providing us with a valuable framework to protect effectively our biodiversity and meet the CBD's targets. The urgency now is to translate this programme of work into action to meet the 2010 objective to achieve **"a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth"**[2] which was adopted by the Conference of the Parties to the Convention on Biological Diversity in 2002 and endorsed by the World Summit on Sustainable Development later in the same year.

Halting and reversing biodiversity loss will require a renewed effort to set aside areas of biological importance and/or manage them so as to maintain their biological values. In addition, we now better understand that areas in between and around protected areas contribute significantly to their success or failure. For effective conservation, the scale of intervention is vitally important. In the last decade WWF has been promoting ecoregions – biogeographic units containing an assemblage of ecosystems – as a suitable scale to plan conservation. Ecoregions are large enough to allow for effective planning of natural resources in such a way that the needs of people and biodiversity can be met.

In this context, WWF's Global Species Programme is proposing this report as a contribution to the implementation of the CBD's programme of work on protected areas. The aim of this analysis is to demonstrate, using seven large terrestrial mammal species, how priority species can help define protected areas and serve as indicators to measure progress on protected areas and protected area linkages. Species are an integral part of the ecosystem which they inhabit: protecting them necessitates protection of the ecosystem they depend upon.

This report provides a timely contribution to the programme of work on protected areas, as it presents governments with a tangible approach to meet a number of the targets set by the Parties. For example, establishing an effective global protected area network (target 1.1 with a deadline of 2010), integrating protected areas in wider landscapes (target 1.2 with a deadline of 2015) and monitoring the effectiveness of protected areas (targets 4.2 and 4.3 with a deadline of 2010).

1 Rodrigues, 2003

2 CBD, www.biodiv.org

1.1 The Convention on Biological Diversity and protected areas

The CBD final text on the programme of work on protected areas "Invites Parties to consider options, in the context of implementing the programme of work, such as ecological networks, ecological corridors, buffer zones and other related approaches in order to follow up the WSSD Plan of Implementation and the conclusions of Inter-Sessional Meeting on the Multi-Year Programme of Work of the Conference of the Parties up to 2010"[3]

Protected areas (PAs) are essential zones where nature can be set aside and managed in such a way as to maintain the vital ecological processes on which life depends. While protected areas as we know them today have been around for over a century, governments are now recognising the urgency to go beyond mere legislation and to actively protect biologically important areas and to manage them so as to maintain or restore their essential values. To date, while targets have been set globally (the 1992 World Parks Congress in Caracas, came up with the target of protecting 10% of the land area of each country)[4] and achieved, the quality and representation of PAs at a global scale remains unsatisfactory.

The CBD Secretariat has noted that "the current global systems of protected areas are not sufficiently large, sufficiently well-planned, nor sufficiently well-managed to maximize their contribution to biodiversity conservation. Therefore, there is an urgent need to take action to improve the coverage, representativeness and management of protected areas nationally, regionally and globally" (CBD, Programme of work on Protected Areas, 2004)

It is only at the end of the 20th century and at the turn of the 21st century that the need for effective protected areas has gained in importance. In 2000, the historical Millennium Summit highlighted the importance of PAs and the need for additional PAs to safeguard biodiversity essential to people and to poverty alleviation. The World Summit on Sustainable Development (WSSD) in 2002 endorsed the need to "assume a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development – economic development, social development and environmental protection – at local, national, regional and global levels", notably through a network of protected areas. A year later, in Durban (South Africa) 3000 protected areas' professionals were brought together for the Vth World Parks' Congress, entitled "Benefits beyond Boundaries", a clear recognition of the importance of what is around and beyond the strict boundaries of a PA.

Given this context, the CBD Programme of Work on PAs agreed in 2004 (see annex 3) represents an important milestone and a unique opportunity in nature conservation, with 187 governments plus the EU committing to a concerted effort to set aside areas of importance for biodiversity conservation and to critically evaluate and improve their current PA networks.

3 CBD, 2004

4 Rodrigues et al, 2004

Introduc

1.2 **Protected areas, people and biodiversity**

Protected areas as areas set aside for their beauty, their ecological importance, the unique species they harbour, their spiritual value or their role in protecting ecosystem services have been around for centuries. However, it is only in 1994 that the six IUCN categories (see box 1) were universally agreed as a means of defining management objectives for PAs and of comparing different areas[5]. The 1994 IUCN Guidelines[6] set out the definition for protected areas which represent the foundations for current work in conserving our environment.

Protected areas have significantly increased in number in the last 50 years. While in 1962 there were 10,000 protected areas around the world, by 2003 the number had reached 100,000[7]. With so many protected areas and close to 13% of the earth's surface protected, the question remains whether these are sufficient to truly protect biodiversity? WWF's Living Planet Index, a biennial statement of the world's biological health[8], shows that populations of terrestrial species declined by approximately 30% between 1970 and 2000. According to the Alliance for Zero Extinctions (AZE)[9], we are currently facing the imminent extinction of 794 species, three times the number recorded as having become extinct in the last 500 years. They found that the 794 species identified are situated in 595 sites of which only 1/3 is legally protected[10]. Another analysis done for the Durban Summit on PAs found that a total of 1423 species are not represented in the current global PA network, of which over 20% are threatened[11].

Box 1:

IUCN Categorisation of Protected areas

IUCN's protected areas' programme supports the work of the IUCN WCPA. In 1994, the IUCN General Assembly approved the system of categorisation of protected areas which is now widely used and is the only way to compare protected areas from country to country.
It subdivides protected areas into six categories:

Ia **Strict nature reserve/wilderness protection area**
Ib **Wilderness area**
II **National park**
III **Natural monument**
IV **Habitat/Species management area**
V **Protected landscape/seascape**
VI **Managed resource protected area**

In order to improve biodiversity conservation and to implement the CBD's ambitious programme of work on PAs, four approaches are available: 1. improve the quality of existing PAs, 2. expand the size of existing PAs, 3. increase the number of PAs, and 4. improve connections/linkages between PAs in a landscape. In reality, no single approach can be considered best, as it will depend on prevailing conditions. In most cases a mixture of approaches will apply. The current situation in many countries reflects the initial drive for creating PAs to meet quantitative targets with little concern over their exact purpose and therefore, most suitable location, size or objectives. Consequently, many PAs remain quite small in size because their borders were modelled around a patch of habitat, administrative unit or some other convenient boundary.

5 Bishop et al. 2004

6 Under the Commission on National Parks and Protected Areas of IUCN (CNPPA) which, since 1996, became the World Commission on Protected Areas (WCPA).

7 Mulongoy and Chape, 2004

8 WWF, 2004b

9 A coalition of 52 conservation entities concerned with the extinction of species. Their analysis highlights areas where highly threatened species are confined to a single site.

10 Ricketts et al, 2005

11 Rodrigues et al, 2004

Others remain isolated and are therefore, of limited value to biodiversity. While the ultimate aim of protected areas is to protect biodiversity, their location has often been in areas with limited biodiversity to protect, such as remote mountain areas or deserts. Equally, while legally establishing a protected area is one important step, ensuring the quality of its maintenance and management, is yet another which has often been neglected. The result is an over-representation of certain habitats within protected areas while on the other hand, few or badly degraded PAs unable to fulfil biodiversity conservation goals in areas that are very important to biodiversity. It is only in the last decade or so that there has been a healthy debate fuelling a better definition of the real purpose of PAs. Questions raised include effective sizes, management effectiveness, linkages and activities surrounding protected areas. Experience over the last forty years has shown that the scale of protected areas and, more importantly, the planning units for protected areas, are a critical factor in successfully meeting biodiversity protection objectives. Protected areas are no longer seen in isolation but rather as an integral part of landscapes.

One key step in the evolution of protected areas is that whereas they were once seen as areas devoted to protecting biodiversity for biodiversity's sake, they are now increasingly being seen as part of a large landscape or ecosystem which benefits not just wildlife but also people. Humankind depends on a healthy environment for food, shelter, water, medicines, genetic reservoir and a multitude of other goods and services. A recent analysis found that of the world's 100 largest cities a third depend on PAs for their drinking water[12]. It is estimated that 75% of the world's population obtains medicines from natural sources for its primary healthcare[13]. The value of protected areas, as areas harbouring high quality, unique and diverse biological resources is often greatly underestimated. In addition, in an over populated world, we are increasingly witnessing human-wildlife conflicts. Whether it is the stampeding of crops by elephants in Kenya or the dramatic attacks on villagers by tigers in India or the killing of livestock by wolves in France, such conflicts are always a regrettable consequence of a reduction in habitat for wildlife and an ever narrower division between human and wildlife territories. For this reason, it becomes even more important to carefully plan the location of protected areas, buffer zones and linkages within sufficiently vast areas to prevent and minimise human-wildlife conflict wherever possible.

1.3 The CBD Programme of Work on Protected areas and other relevant commitments

The purpose of the CBD's Programme of Work on protected areas is to "support the establishment and maintenance by 2010 for terrestrial and by 2012 for marine areas of comprehensive, effectively managed, and ecologically representative national and regional systems of protected areas that collectively, inter alia through a global network contribute to achieving the three objectives of the Convention and the 2010 target to significantly reduce the current rate of biodiversity loss at the global, regional, national and sub-national levels and contribute to poverty reduction and the pursuit of sustainable development, thereby supporting the objectives of the Strategic Plan of the Convention, the World Summit on Sustainable Development Plan of Implementation and the Millennium Development Goals[14]". The CBD Programme of Work on Protected areas reaffirms and strengthens a number of other commitments made by governments. A selection of these commitments, with a focus on Europe, is highlighted in table 1 and on page 15.

12 Dudley and Stolton, 2003

13 UNDP et al. 2000

14 CBD, 2004

Table 1: **Relevant agreements that impact on European PAs and linkages**

UNESCO Man and Biosphere (MAB) Programme	In 1971 the MAB programme was created, as a result of the 1968 "Biosphere Conference" organised by UNESCO, the first intergovernmental conference to seek to reconcile the conservation and use of natural resources. The MAB Programme encourages interdisciplinary research, demonstration and training in natural resource management. Biosphere reserves are set up as living laboratories for testing out and demonstrating integrated management of land, water and biodiversity. In order to clarify the overlap and complementarity between MAB and the IUCN PA categories a joint publication by IUCN and UNESCO was published in 1996. It concluded that core zones in biosphere reserves can be classified as categories I to IV while buffer zones could fall under categories IV, V or VI.
World Heritage Convention	In 1972 the World Heritage Convention was adopted to help protect both our cultural and natural heritage, promoting a balance between people and nature. 180 states are parties to this convention. The convention supports emergency assistance to safeguard properties in danger, long term conservation, management planning, technical assistance, professional training, public and youth education, and awareness-building. Areas of natural and/or cultural value are established as World Heritage Sites under this convention.[15]
Convention on the Conservation of Migratory Species (CMS or Bonn Convention)	The CMS aims to conserve terrestrial, marine and avian migratory species throughout their range. It acts as a framework Convention encouraging range states of threatened species to conclude specific agreements, for instance, such as the EUROBATS agreement ratified by 48 European range states that aims to protect bats. To date it has 95 members.
EU Birds Directive	Adopted by 9 EU member states in 1979, the EU Directive on the Conservation of Wild Birds was the first EU nature conservation agreement. It includes articles on the protection of the habitat of wild bird species falling under the Directive. The Birds Directive applies to all 25 EU countries since May 2004.
Council of Europe Biogenetic Reserves	Launched in 1976, this programme encourages cooperation between Member States in the conservation of representative examples of the natural habitats that are especially valuable for nature conservation in Europe. The Network provides a framework for international co-operation for establishing protected areas that complement and strengthen each other in safeguarding the biological diversity of Europe.
EU Habitats Directive	In 1992, in response to the significant ongoing deterioration of many habitat types and the growing number of threatened or rare species, EU member states adopted the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (CE/92/43), also known as the "Fauna-Flora-Habitat Directive". The directive aims to protect biodiversity by setting up a European network of protected areas in which to effectively conserve threatened species and habitats, the Natura 2000. Member states proposed potential sites, which were evaluated by the Commission and adopted as a final list of Sites of Community Importance (SCI) – the Natura 2000 network. The sites host a representative sample of each habitat type and species.
Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats)	The Bern convention was adopted in 1979 to ensure the conservation of European wildlife and natural habitats by means of cooperation between States. The Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1000 wild animal species. As of March 2005 there were 45 Contracting Parties to the Convention. The Emerald network, within the Bern Convention, is the equivalent of Natura 2000 in Non-EU European countries.
Alpine Convention	The „Convention on the Protection of the Alps" (also known as „The Alpine Convention") was signed in 1991 and became operative in 1995. The contracting parties (Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia, Switzerland and the European Union) commit themselves to the protection of the Alpine region and to its sustainable development. The Convention recognises the special natural and cultural diversity of the Alps and the need to address the tensions between economic and ecological issues.
Pan-European Biological and Landscape Diversity Strategy	The Pan-European Biological and Landscape Diversity Strategy, developed in 1994, promotes the integration of biological and landscape diversity considerations into social and economic sectors. An important implementation tool of this strategy is the Pan-European Ecological Network (PEEN) which aims to link European PAs in order to improve conservation in Europe.
Council of Europe – European Diploma of Protected Areas	The European Diploma of Protected areas was created in 1965 and is awarded to protected natural or semi-natural areas of exceptional European interest from the point of view of conservation of biological, geological or landscape diversity that have an appropriate protection status. The Diploma represents an important contribution to the PEEN.

15 whc.unesco.org

Pan-European Recommendations

The 4th Conference on Biodiversity in Europe (Pan European regional meeting in preparation for the 8th Meeting of the Conference of the Parties to the United Nations Convention on Biological Diversity), held in Plitvice National Park, Croatia, 22–24 Feb 2006 also considered the following CBD CoP 8 issues in the context of progress made in the implementation of the Kiev Resolution on Biodiversity:

Protected Areas and Ecological Networks

1. **Re-emphasize** the crucial importance of implementing the CBD Programme of Work on Protected Areas for the achievement of the 2010 target, for the well-being of the communities, and for the achievement of the Millennium Development Goals and in particular reinforce the agreed target of establishing – by 2010 for terrestrial and by 2012 for marine areas – a global network of comprehensive, ecologically representative and effectively managed national and regional protected area systems.
2. **Emphasize** the need to reinforce global efforts to meet the targets of the Programme of Work.
3. **Reiterate** the need to integrate protected areas systems into the wider land and seascape, and relevant sectors, by applying the ecosystem approach and taking into account ecological connectivity and the concept, where appropriate, of ecological networks.
4. **Welcome** the outcomes of the First Open-ended Working Group on Protected Areas (WGPA I) and recognize the importance of further discussions.
5. **Strongly support** further work of WGPA after CoP 8.
6. **Emphasize** the need for a clear and efficient review process in order to monitor implementation of the Programme of Work including the identification of obstacles, gaps and possible responses.
7. **Reiterate** the need for continuous improvement and the active dissemination of the tool-kit in cooperation with relevant partners (especially IUCN).
8. **Stress** the crucial relevance of the "ongoing dialogue" on financing initiated in Montecatini and offer its support to its progress.

Specifically for Marine Areas:

9. **Stress** the importance of addressing the under-representation of marine and coastal protected areas inter alia by developing scientific criteria for their selection and supporting scientific research, and fully implement the relevant institutional and legislative tools.
10. **Takes note** of the present discussions on the integrated governance of the high seas for the conservation and sustainable use of biodiversity in Areas Beyond National Jurisdiction.
11. **Reiterate** the important role and responsibility of the CBD in the elaboration of the basis and concepts aimed at the establishment and maintenance of marine protected areas through e.g. provision of scientific and other relevant information.
12. **Support** enhanced co-ordination and co-operation between CBD and different fora dealing with marine areas at the national regional and global level.

2. Scaling up our Conservation Efforts

2.1 Fragmentation, connectivity and species

Fragmentation is a major cause of species' loss throughout the globe. It results in population isolation, ie: small populations of species get disconnected from each other as happened with the Iberian lynx (see below in section 4). Isolated populations are either not viable or their limited genetic diversity weakens and eventually threatens the survival of the entire species through inter-breeding. In addition, some species, like the brown bear or the Amur tiger, require large areas to roam, to feed and to reproduce. Should these areas not be available, these carnivores often penetrate human territory thereby entering into conflict with human populations that they would normally avoid. Species that need to migrate for their survival, for dietary, climatic or reproductive reasons, may find that fragmented habitats make their migration dangerous, if not impossible. The changes we are witnessing in climate will also require species to adapt their ranges if they are to survive sudden weather fluctuations[16]. With limited and fragmented patches of habitat, this will not always be possible, leading possibly to further dramatic declines in populations of endangered species. Finally, by confining large species to a small isolated patch of habitat, they often end up using all the resources from the habitat, thus, eventually leading to the destruction of the very environment that supports them. This is a serious problem with elephants for instance that are confined to small protected areas in parts of Africa.

Connectivity is an attempt to minimise the impact of habitat fragmentation by providing links between different patches within a landscape. The idea of connectivity emerges from landscape ecology. It is only by viewing habitats and habitat requirements of different species within a large spatial unit like a landscape that connectivity becomes a prerequisite long term approach (see especially: CBD, IUCN, TNC & WWF 2004; CBD 2005; Dudley et al. 2005).

In the 1970s the idea of linking fragments of habitat through corridors of similar habitat became widespread in conservation circles. In many instances, however, the specific needs of the species these corridors were meant to help were not being carefully considered[17]. It was only in the 1990s that questions relating to design, location and management of linkages started to be raised. Clearly different species have different needs: some may be more tolerant of disturbance through human activity, while others much less so. Bennett[18] highlights three different types of connectivity (see box 2): 1) habitat mosaic (2d. below), where within a modified landscape, species can find a number of patches of habitat of varying quality, 2) stepping stones (2b. below), where individual patches of habitat are interspersed in a landscape in such a way as to enable some animal species to move along these patches in the landscape and 3) habitat corridors (2c. below), which unlike stepping stones provide a continuous link between habitat patches.

Actions to ensure landscape connectivity can result in a mosaic of land uses (see box 2 d) below) and a change in protected area categories. For example, zones in Biosphere reserves can include different categories of PAs with some areas classified as strictly protected with minimum human impact and other areas serving as buffer zones or linkages, classified under IUCN categories IV, V or VI, which are compatible with some human activity.

16 Biringer and Hansen, 2005

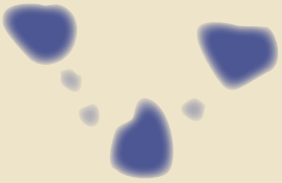
17 Bennett, 1998

18 Bennett, 1998

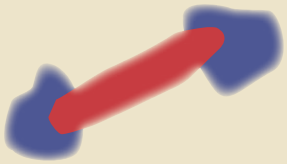
Box 2: **Different linkages in a landscape**
(Adapted from Bennett, 1998).

2a) Isolated patches of habitat

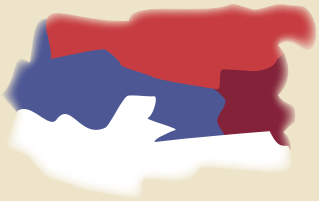
2b) Stepping stones linking habitat patches



2c) Corridor linking two protected areas



2d) Mosaic of landuse



2.2 Ecosystems and ecoregions

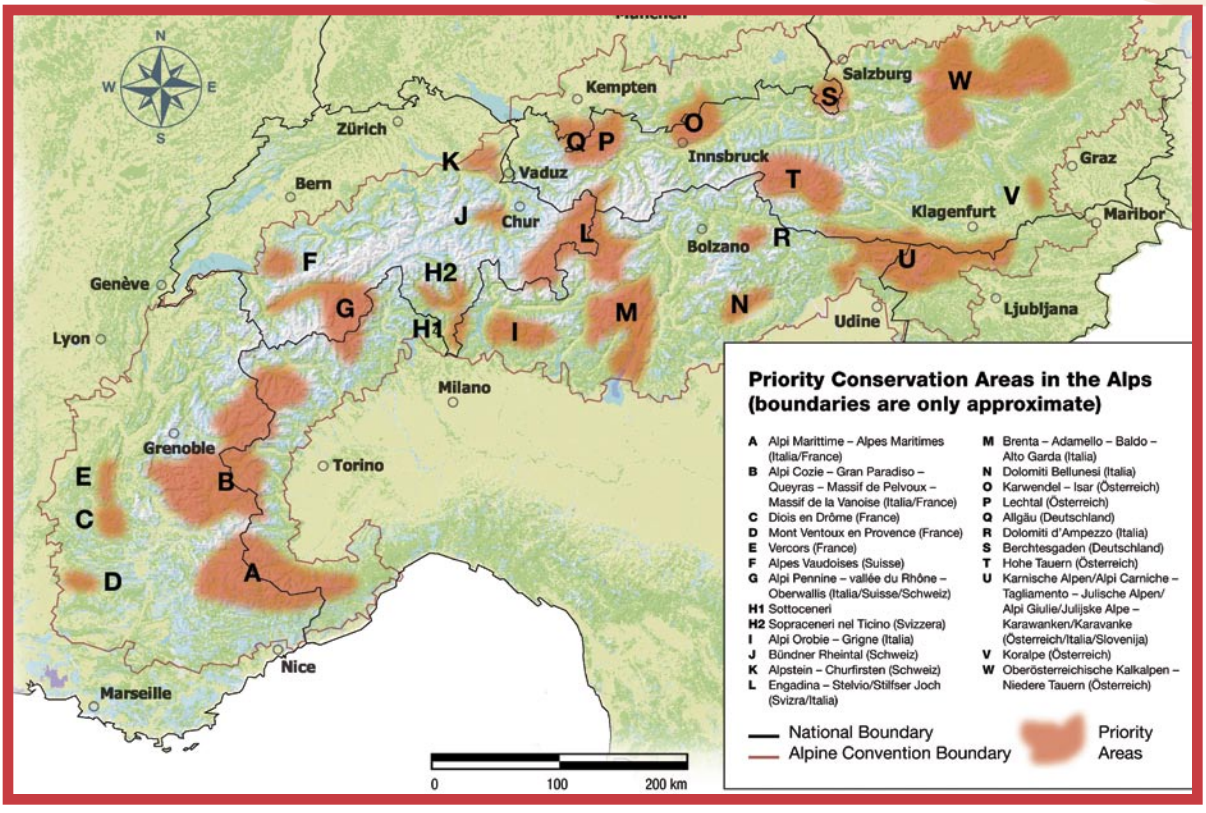
The ecosystem approach at the centre of the CBD is a comprehensive way of conserving biodiversity. It looks at an entire set of interrelated factors in our environment rather than just focussing on one species. An ecosystem is defined as "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.[19]" The ecosystem approach represents a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way[20]. In applying this approach, WWF and partners, have defined and used ecoregions as the preferred scale for conservation action. In this section we look at the two approaches in more detail and explore the implications of conservation in large scales for protected area networks.

In the last decade WWF has significantly scaled up its efforts to conserve biodiversity. Since biodiversity and ecological processes do not function in small, isolated patches of forests or rivers, WWF has decided to focus conservation efforts on ecoregions[21] instead of sites. Ecoregions are defined as large areas of land or water that contain a geographically distinct assemblage of natural communities that (a) share a large majority of their species and ecological dynamics, (b) share similar environmental conditions, and (c) interact ecologically in ways that are critical for their long-term persistence. Ecoregions are characterised by their biological distinctiveness – species' richness, high endemism, unusual ecological or evolutionary phenomena, and global rarity of major habitat types-, and by their conservation status, defined as the ecoregion's

19 CBD, www.biodiv.org

20 Shepherd, 2004

21 Out of the 867 identified ecoregions, 238 have been prioritised for action and are known as the « Global 200 »



Map of priority areas (landscapes) in the Alpine ecoregion

The map has been derived by overlaying biodiversity maps for separate taxa and identifying the areas with the greatest overlap.

ability to maintain viable species' populations, to sustain ecological processes, and to respond to natural environmental disturbances[22]. The shift of focus from sites to ecoregions by WWF, and many other conservation organisations, reflects the reality that the interplay of influences on natural systems extends far beyond the boundaries of that site. For example, in Borneo, the conversion of natural forests to oil palm plantations upstream is affecting water quality downstream because of siltation and extensive fertiliser use, while at the same time demand for palm oil in China and Europe is driving this forest conversion to oil palm plantations. Thus, a broader understanding of the inter-linkages helps to identify the points of intervention to achieve lasting conservation results.

A cornerstone of ecoregion conservation is the endorsement by all key stakeholders of a biodiversity vision or "road map" to the ecoregion. This vision identifies: 1. priority areas (or landscapes), species and ecological processes, 2. long term goals for conservation of the ecoregion's biodiversity, and 3. a statement or vision reflecting the aspirations for the future state of the ecoregion[23] (see box 3).

As a result of the ecoregion vision, priority areas or landscapes are identified which are essential either to protect or to restore so that the long term goals for the ecoregion can be achieved. These priority areas may be entire protected areas or a mosaic of land uses, including protected areas, buffer zones, corridors and well-managed but intensely used areas. The ultimate result of an ecoregional approach is to reach a balance of land uses that satisfy short term human imperatives and meet long term human and ecological

22 Dinerstein et al. 2000

23 WWF, no year (a)

Box 3: **A biodiversity vision for the Alps ecoregion**

For example the Alpine ecoregional vision developed by WWF in collaboration with the International Commission for the Protection of the Alps (CIPRA), the International Scientific Committee for Alpine Research (ISCAR), the Alpine Network of Protected Areas (ALPARC) and over 100 people representing 90 different organisations is:

"The mosaic landscape of the Alps offers living space for people and nature. The mountain forests shelter a wide range of wildlife throughout the Alps enabling migrating species to roam freely in the whole Alpine Arc between Nice and Vienna. Alpine rivers are open to wandering fish connecting the Alps with the seas of the North Sea, Black Sea and the Mediterranean. Sparkling and breathtaking glaciers continue to be a source of unspoiled freshwater as well as of enjoyment and enchantment of people. Children are playing in colourful flourishing meadows, happy to explore and discover the hidden miracles of nature. Alpine environment friendly behaviour of people has become a common living standard." (Source : WWF, 2005)

needs. This challenge is also at the core of the ecosystem approach which recognises that for effective biodiversity conservation it is the entire ecosystem, rather than disjointed individual elements (sites or species), which needs to be the focus of a conservation strategy. The overlap between the ecosystem approach and ecoregional conservation is substantial, particularly in terms of spatial and temporal scales. Both approaches extend their area of focus beyond a strict site to a comprehensive set of inter-related elements that combine to influence biodiversity and its conservation. They also extend in time, taking a longer term perspective to conservation, emphasising sustainability and therefore, durability of interventions. By necessity, both approaches seek to engage many more stakeholders than traditionally done by either the development or the conservation community. WWF's ecoregional approach to conservation provides a practical application of the ecosystem approach in implementing the programme of work on protected areas. Furthermore, it supports Decision VI/27 of the CBD which "encourages Parties to develop regional, sub-regional or bioregional mechanisms and networks to support implementation of the Convention including, as appropriate, through the development of regional or subregional biodiversity strategies and action plans".

As nature does not respect political borders, important conservation areas as identified notably through the ecoregion process, may extend beyond one country. These transboundary areas are more challenging to manage for biodiversity conservation and demand special attention. For example, the Altai Sayan ecoregion, which is important for snow leopards and the argali sheep, covers China, Kazakhstan, Mongolia and Russia. Partners in the Altai Sayan ecoregion programme have agreed a specific target to develop and begin implementation of transboundary conservation plans for the argali and snow leopard[24].

24 WWF, no year (b)

3. An Introduction to Priority Species and Ecoregions

With large scales identified as the most relevant units for conservation, we can now look at the role of species within large units. This section introduces the seven priority species used in this report and the five ecoregions that they inhabit.

3.1 WWF and priority species

For WWF and in the context of this work, a priority species is one identified through the ecoregion process as integral to the conservation of that ecoregion because of its economic or cultural value to the people of that ecoregion or because by protecting it, many other species and elements of the ecosystem will also benefit.

Table 2:

Species in this study and their classification in the IUCN Red List of threatened species

Species	Status IUCN Red List (year)
Argali sheep (Ovis ammon)	Vulnerable (1996)
Amur tiger (Panthera tigris altaica)	Critically endangered (1996)
Iberian lynx (Lynx pardinus)	Critically endangered (2002)
Brown bear (Ursus arctos)	Lower risk/least concern (1996)
Saiga antelope (Saiga tatarica)	Critically endangered (2003)
Amur Leopard (Panthera pardus ssp. orientalis)	Critically endangered (1996)
Persian Leopard (Panthera pardus ssp. saxicolor)	Endangered (1996)

Priority species may be one of the following:

- A "global flagship species"[25], with which WWF has a long history of conservation actions and field programmes. They include, for example, the tiger, the giant panda and African and Asian elephants.
- A species identified through the ecoregional programme planning and delivery process as integral to the conservation of the ecoregion. A priority species must:
  - Be reflective of a key threat across that ecoregion such that conservation of the species will contribute significantly to threat mitigation; and/or
  - Be a keystone species[26] in the ecology of that ecoregion; and/or
  - Be a strong communications symbol to explain the ecological importance of the ecoregion; and/or
  - Be a species crucial to the economic and/or spiritual wellbeing of peoples within that ecoregion such that conservation and management of the species will contribute to the success of the ecoregion programme; and/or
  - Be a species for which protection of the full range of life-cycle habitats of the species will contribute significantly to the conservation of the ecoregion.
- A species for which over-exploitation[27] for trade is a key threat.

25 A **flagship** species is a species selected to act as an ambassador, icon or symbol for a defined habitat, issue, campaign or environmental cause.

26 A **keystone** species is a species that plays an essential role in the structure, functioning or productivity of a habitat or ecosystem at a defined level (habitat, soil, seed dispersal, etc).

27 **Overexploitation** is defined here as the direct (legal or illegal) exploitation of the species (for utilisation of the whole organism or its parts or derivatives) at such levels that it is not sustainable, or poses a threat to its survival (or the survival or genetic integrity of one or more populations).)

iority Species and Ecoregions

3.2 Introduction to the seven priority species used in this study

The seven large mammal species used in this report have been chosen by the ecoregion programmes because they provide good examples to define PAs and PA linkages as they require wide areas and can be used as surrogates to identify habitat needs for much wider species' assemblages.

The seven priority species are: the Iberian lynx (Lynx pardinus), the Amur tiger (Panthera tigris altaica), the argali sheep (Ovis ammon), the brown bear (Ursus arctos), the saiga antelope (Saiga tatarica), the Amur leopard (Panthera pardus orientalis) and the Persian leopard (Panthera pardus saxicolor). All of these species are far ranging. Six of the seven are listed in the IUCN Red List of threatened species (see table 2). The choice of species for this study is particularly useful for broader conservation objectives since the areas and habitat types they all require should also serve the needs of many other species.

3.3 Ecoregions[28] home to the seven priority species

Altai Sayan Montane Forests:

The Altai Sayan complex is one of WWF's identified priority (or "Global 200") ecoregions. The Altai Sayan straddles the vast expanses of Russia, Mongolia, Kazakhstan and China, located between the great northern taiga forests of Siberia, the steppes of western Siberia, the Altai mountains and the Gobi desert of China and Mongolia. It spans an impressive territory of 86,200,000 hectares (about 1.5 times the size of France).

This ecoregion is characterised by a mosaic of coniferous forests, intermontane steppe, and alpine meadows. It is one of the world's centres of plant diversity with over 120 endemic species of vascular plants. It is also home to a majestic member of the cat species: the critically endangered snow leopard (Uncia uncia) and to the largest species of wild sheep, the **argali sheep** (Ovis ammon) which we highlight in this report.

Khovd river valley with Zambagaran Mountain (4149 m) in the background, Khar Us Nuur National Park, Mongolia.
© WWF-Canon / Hartmut JUNGIUS

28 www.nationalgeographic.com/wildworld

An Introduction to Priorit

Russian Far East ecoregion:

The Russian Far east ecoregion spans over 21,000,000 hectares, with two-thirds of its area being mountainous. It is in fact two ecoregions combining to display a spectacularly pristine temperate broadleaf and mixed forest. Inside these forests we can find the last **Amur (or Siberian) tigers** (Panthera tigris altaica) and **Amur leopards** (Panthera pardus orientalis). Only 30 or so individuals of the Amur leopards remain here in the wild.

In this vast area, different landscapes and micro-climates have contributed to the high degree of biological diversity. This ecoregion was a refuge for many species during the last Ice Age as it escaped glaciation. It is also a refuge today as it remains the sole pristine area of mixed forest in the region.

Mediterranean ecoregion:

The Mediterranean Forests, Woodlands, and Scrub ecoregion encompasses the entire region around the Mediterranean sea. It is a region boasting a unique flora, with 20% of the plant species on Earth (25,000 species), over half of which are endemic. It covers an area of 226,558,100 hectares.

The Mediterranean “maquis” is characterised by short evergreen shrubs and oak trees. They are the preferred habitat of the critically endangered **Iberian lynx** (Lynx pardinus). This region, the cradle of civilisation, has been heavily shaped by humans resulting in a severely modified landscape, a vast mosaic of land use that has evolved over millennia. Some of it remains as suitable habitat for the many critically important biological resources, while other areas have been severely degraded and can no longer support a healthy biological base without active management and restoration interventions.

Central Asian region (Central Asian desert and the Middle Asian Montane Steppe and Woodlands):

The Central Asia region, as referred to in this report, is in fact 2 groups of ecoregions, the Central Asian desert and the Middle Asian Montane Steppe and Woodlands spanning the countries of Afghanistan, China, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. This region includes richly coloured black and red deserts, enormous plains and towering mountains over an area of 219,650,000 hectares. The highest point, Victory Peak, is about 7,400 m high. Several big rivers run through the area, and glaciers are common. The Middle Asian Montane Steppe contains more than 60 species of grass many of which are endemic. These are important for the ungulates that roam the vast plains of central Asia such as the endangered Bukhara deer and the **saiga antelope** (Saiga tatarica). It is also the home of the **Persian leopard** (Panthera pardus saxicolor).

Species and Ecoregions

Alps (a subset of European-Mediterranean Montane Mixed Forests ecoregion):

The Alpine ecoregion extends from France in the west, to Slovenia in the East covering an area of 14,950,000 hectares. The Alps represent an important "transition area" between Central and Mediterranean Europe where plants and animals from both these regions converge. For this reason this mountain system is very important for Europe's biodiversity. About 4,500 species of vascular plants, 800 species of mosses, 300 liverwort species, 2,500 species of lichens, and more than 5,000 species of fungi are found here. What's more, there are about 21 species of amphibians, 15 species of reptiles, hundreds of bird species, and about 80 species of mammals in the Alps Conifer and Mixed Forests ecoregion[29]. This young mountain system characterised by its rugged peaks, is also an important migratory route for birds.

The Alps offer a varied mixture of habitats, from mountain forests of beech, fir, spruce, and pine; Alpine grasslands with rivers; to deep valleys of oak trees.

The **brown bear** (Ursus arctos) is a priority species of this region, which has suffered from the expanding presence of human populations in the mountains.

Alpine grassland consists of a thick carpet of plants on the gentle slopes of the mountains.
Vanoise National Park. French Alps in the Savoie, France.
© WWF-Canon / Michèle DÉPRAZ

29 WWF, 2004a

4. Analysis of WWF's priority species, protected areas and connectivity in the selected ecoregions

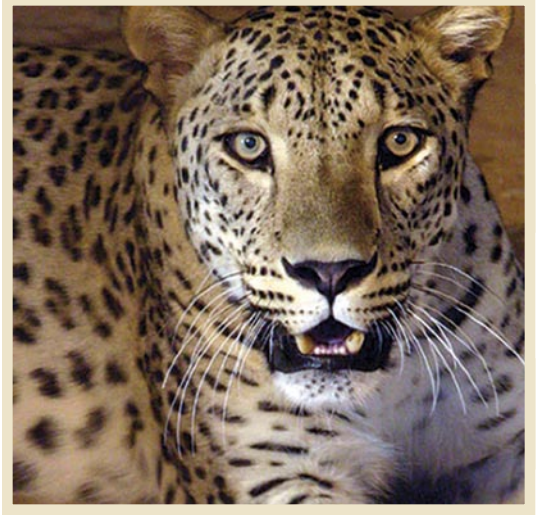
4.1. Introduction: From connectivity to gap analyses

Under the Programme of Work on Protected Areas, governments have agreed to a number of activities notably, gap analyses, setting national and regional PA targets, expanding their PA networks so as to protect threatened biodiversity which will all require action in the next **four** years. The approach we propose here is intended to demonstrate how focussing on priority species can contribute to meeting these important commitments. It relies on the use of data on priority species to set targets for protecting or linking areas in order to expand their habitat. For the purposes of this study WWF field offices were asked to gather specific information on each species (see annexes for completed tables). The examples described do not cover exhaustive species' data as that is beyond the scope of this report. They serve however, to illustrate the process that can be undertaken by governments and others to identify needs for protected area networks that support the requirements of priority species and ensure that commitments made under the CBD are met.

Relevant information on species that can help define PA networks and linkages includes:

- sensitivity to disruptions from human activity (eg: roads, agriculture, settlements etc.);
- sensitivity to edge effect, which will affect the shape and width of habitat linkages;
- degree of specialisation in food and its availability;
- requirements in terms of habitat quality (eg: primary or secondary forest etc.);
- current distribution and range (which will affect the size of PAs and linkages within a landscape);
- viability of populations;
- movements and migration routes;
- existence of protected areas within their range;
- quality of their current habitat (species will require more habitat if it is of poor quality);
- relationship to local communities.

Focussing more specifically on landscape linkages, Bennett[30] categorises data required as follows (see Table 3).



Persian leoprad.

© Ali Golshan

30 Bennett, 1998

Table 3: **Considerations in the design and management of linkages**

(Adapted from Bennett 1998)

Biological Issues	Typical questions to consider to enhance the value of linkages
Biological purpose of the linkage	Is the linkage to: • assist the movement of wide ranging or migratory species? • facilitate dispersal of individual animals? • promote effective continuity and gene flow between populations? • provide opportunity for populations to shift in response to threats (such as climate change) ?
Ecology and behaviour of species	• How large is the species' home range? • How far do animals tend to move? • Do they undertake seasonal movements?
Structural connectivity	• What are the number and length of gaps? • Are there alternative pathways between patches of habitat? • How do the target species respond to gaps ?
Quality of habitat	Does the linkage provide the priority species with: • Its preferred food source? • Shelter? • Refuge? • Breeding sites?
Edge effects	• How far do edge effects extend? • How wide is the edge? • How wide should the link be to minimise the impact of edge disturbance?
Width	• How wide should the link be to support the target species?
Location	• Where do the animals migrate? • What are important stopover points? • Where can we also enhance other resources conservation priorities such as protecting water sources or reducing soil erosion?
Monitoring	• How is the species responding to the linkage? • Are adjustments necessary?

Ultimately, the choice of intervention will depend on the reality on the ground. For example, issues such as land ownership, current land use practices, habitat quality etc. will all enter into account when defining whether to expand a protected area, link protected areas, or improve the quality of protected areas.

Bennett also identifies a number of socio political issues which should be considered when seeking to define new protected areas or linkages. For instance, he notes that all other factors being equal, an area with one single owner is easier to set aside as an important biological corridor than one shared by many different owners. He also highlights the importance of anticipating future land use changes when considering the viability of a new habitat linkage.

Table 4. **Sociopolitical Considerations**

(Adapted from Bennett 1998)

Socio-political Issues	Measures to enhance the conservation value of linkages
Land tenure	Where there are different options for linkages, land tenure is an important consideration and a determining factor for success.
Management responsibility	Management responsibility needs to be very clear and all responsible land managers should agree from the outset on management goals. Different skills may be required and adequate financial and human resources should be allocated. It will also be important to anticipate future changes in land use that could affect the link.
Support from local communities	It is essential to involve local communities in decisions, management and monitoring. This will help to encourage sympathetic management of adjacent lands. The process will need to be negotiated and concerns of local people will need to be taken into account.
Integration with other sustainable land management programmes	In order to be more effective, the linkage should be where possible, integrated with other relevant programmes.
Community education and awareness	Communications of the wider ecological and social benefits of linkages will be important. Transparency and openness will help promote trust and collaboration. The involvement of local people will help ensure long term adoption of the linkage.
Strategic approach to planning	As we have seen before, connectivity needs to be planned within large scales such as landscapes and with a long-term perspective. It is also important to identify future needs for connectivity before opportunities are foreclosed by changed land use.

4.2 Gap Analysis

Gap analyses are intended to compare desired targets against current situation in order to identify differences and define necessary actions. They have typically been used for habitat types to ensure full representation of biomes (see for example work by UNEP-WCMC). In this study we focus on species and their needs in ecosystems and landscapes to determine future PAs and linkages. We demonstrate how a combination of mapping tools and ecological data can help define areas for protection and connectivity within large areas to achieve durable species' conservation.

4.3 Data and assessment of protected area needs for priority species

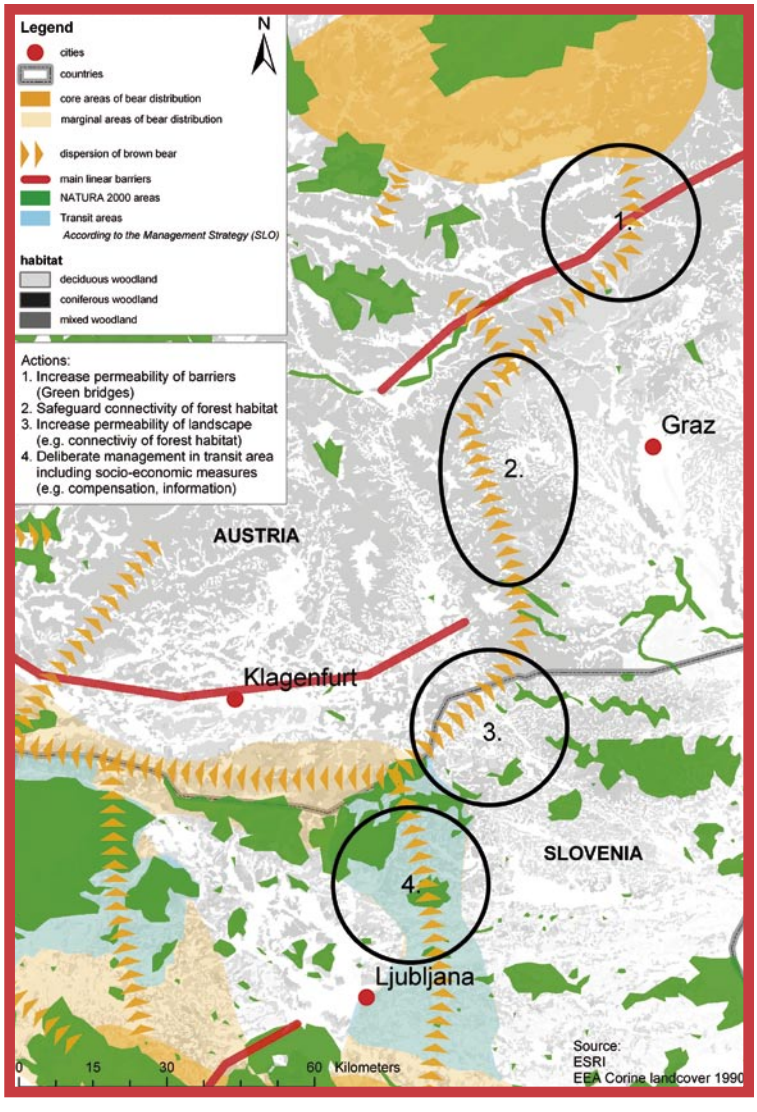
In this section we provide a brief overview of each species then look more closely at their needs and potential roles in improving protected area networks.

4.3.1

Brown Bear (Ursus arctos) and the Alpine ecoregion

Introduction

Brown bears are omnivorous and quite flexible in foraging. Animal food is an important source of protein and energy and is mostly taken from carrion and insects (ants) but also from weak game animals as well as livestock.



Map of Austria and Slovenia
showing 4 important intervention points for the protection of the brown bear. (WWF)

Bears spend the winter in a state of dormancy that lasts a couple of months. In this state the body temperature is lowered a few degrees, and the heart and breathing rates reduced. During hibernation which takes place in natural caves, bears do not feed or drink. Some adult male bears have been known to spend warm winters actively roaming. Bears are active from dusk till dawn while in areas undisturbed by humans they are also active during the day.

Bears reach sexual maturity at the age of three to four years and can have a lifespan of up to 30 years. The mating season is from May to July with the young being born in the winter while the mother is still in hibernation. Litter size ranges from one to four cubs and they remain with their mother for one year. Usually brown bears live alone, except for females accompanied by their cubs.

The main threats to the brown bears in the Alps are: habitat fragmentation, habitat loss, genetic viability, demographic viability, human-bear conflict (eg artificial food sources), poaching, legal killing of nuisance bears, livestock husbandry and farming and fragmentation of management authority.

Analysis of WWF's p

Population and distribution (in western and central Europe)

While the brown bear is not threatened globally, its population and distribution have declined significantly in the last few centuries largely as a result of increasing human populations and habitat loss. Bears in what is now Denmark disappeared about 3,700 years ago. They went extinct in Great Britain in the tenth century, in eastern Germany in 1770, in Bavaria in 1836, in Switzerland in 1904, and in the French Alps in 1937[31]. Today, in the area stretching from western ex-USSR and Turkey but including the Baltic countries and the Ukraine, a population of about 14,000 brown bears in an overall area of approximately 800,000 km² can be found. In some countries the bear population is considered viable whereas in other countries it is on the verge of extinction. In western Europe, only a few isolated and small populations remain. For instance, a population in the Pyrenees Mountains on the border between France and Spain numbers just six to eight animals, making it one of the most endangered wild mammal populations on Earth. The whole Alpine-Dinaric-Pindos population consists of about 2,800 individuals. Slovenia hosts a significant part (450–550 bears) of this population concentrated in the south of the country although only about 15–25 bears live in the Alpine part of Slovenia. Two migration corridors into the north are connecting the Dinarics with the Alps and therefore with the subpopulations. About 50 to 80 individuals presently inhabit the Alpine region: 23–35 in the Italian part of the Alps, 12–20 in the Austrian part and 15–25 in the Slovenian part of the Alps. These sub-populations are still too small to be considered viable. The core area of the population is located in the Dinaric mountains and has the potential to serve as a source for the dispersion of brown bears over the Alps.

Range, movement, migration

In areas with good habitat quality the home ranges cover 100 km² and can encompass up to 1000 km² and more in poor habitats. Male home ranges are often larger than females'. Population density averages 0.05 to 20 bears per 100 km². The brown bear is a migratory species.

Habitat requirements

Brown bears can adapt to a wide range of environments and habitat types. Their essential needs are food, escape cover and den sites.

Protected areas and the brown bear in the Alps

Because of its large home range and the habitat situation in the Alpine ecoregion, no single protected area was designated for the exclusive protection of the brown bear.

The main connections and corridors for brown bears are identified on a pan Alpine scale. The quality of the linkages between the populations is adequate for most parts of the Alps, although massive barriers (valley bottoms, linear infrastructure and built up areas) are affecting the efficiency of these linkages. The most serious barriers (valleys) are the Mur-, Mürztal, the Drautal and the Inntal in Austria as well as the Section between Lubljana and Trieste where the barrier is built by the motorway and the Valle dell Adige in Italy. In some areas, poor quality habitat may also create a barrier effect, for example in the border region between Slovenia and Austria.

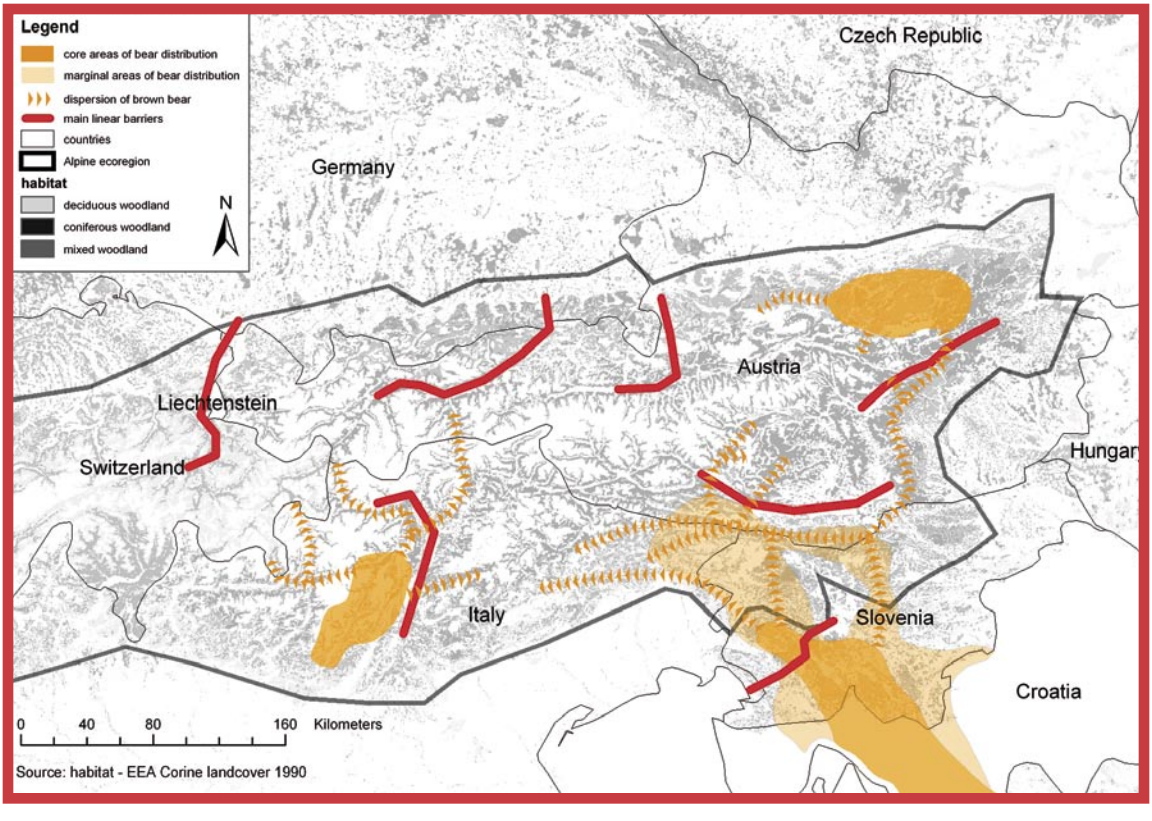
31 Zedrosser et al, 1999

Proposed actions for the protection of the brown bear in the Alps

The WWF Alpine Ecoregional programme has set a number of targets, some of which are of relevance to the brown bear, notably: "By 2010, at least 3 isolated large carnivore sub-populations are permanently linked by means of ecological corridors". Indeed, one of the major problems for the Alpine populations of brown bear seems to be fragmentation of their habitat through human disturbance. A Brown Bear Action Plan for Europe was drawn up in 1998. It is based on a pan-European approach since bear populations are shared and therefore, international co-operation is essential. The concept of managing at the population level was applied even though ultimately management responsibility rests with national political entities.

The three objectives of this Action plan are

1. To conserve the present viable brown bear populations in Europe and allow them to expand into suitable habitat, thereby increasing their population numbers and range to the limit that can be sustained given socio-economic realities.
2. To secure the viability of the presently small, isolated brown bear populations by increasing their population numbers and range.
3. To reduce the conflict between brown bears and humans and promote activities that secure a positive public attitude towards brown bears to realise objectives 1 and 2.[32]



Map of Eastern part of Alpine ecoregion with bear populations and man made linear barriers. (WWF)

32 Zedrosser et al, 1999

There is no fundamental need to increase protected areas for the brown bear in the Alps. Instead, what is important is improved connectivity between existing protected areas. These corridors for brown bears need to be included in regional and local spatial planning processes so as to be fully secured.

Areas with low human density could also be used to expand protected areas for the bear, thus securing additional breeding and hibernation sites.

Given the range of brown bears, the recommended minimal width of linkages for brown bear habitats is at least 1 km, with exceptional short stretches of 500 m also possible. Considering the scarcity of bears in the Alps, in order to increase chances of linkages between sub-populations, it is also recommended that at least two links be set up between each population. The map above identifies some of the major human barriers (mostly linear infrastructure and built up areas in the valley bottoms). Active management is required along the linkages between bear populations to reduce this disruption and to allow sub-populations to move and to inter-breed. In this respect, special standards have been identified to mitigate the barrier effect of linear traffic infrastructure at a European level ("COST 341"[33]). Green bridges (overpasses) have to have a minimal width of 80 m increasing with the length of the overpass. This standard has to be achieved especially in corridors of international importance like the brown bear corridors. Unsuitable habitat within linkage zones needs to be made more permeable. Integrating the knowledge about barrier effects and location of migration routes into the planning of further land use development and infrastructure is essential for the maintenance and reestablishment of interconnectivity of habitats on a pan-alpine scale. The financial implications of such linkages must be clearly incorporated in planning.

Financial needs for corridors

A study by Völk et al.[34] notes that in Austria in order to install adaptive measures like landscape bridges (80–100 m long) and green bridges (50–80 m long) on all motorways, a budget of about 100 million Euros is required. Extrapolating this amount over a proposed 20-year time frame, the average annual amount required is 5 million Euros.

Summary

A strategy to create a protected area network that would protect and ensure the viability of the brown bear population in the Alps could include: a) removing or mitigating critical barriers, particularly between Slovenia (the largest populations) and the existing nuclei in Austria and Northern Italy, b) considering management options compatible with the brown bear for establishing corridors of 500 m–1000 m in width between protected areas harbouring brown bears in the Alps, c) integrating the corridors, as well as their costs, in all future land development plans, and d) improving perceptions on the brown bear to minimise human-bear conflict.

33 The European cooperation in the field of scientific and technical research (COST) with its Action 341 was a scientific project to identify the problems of fragmentation of natural habitats by roads, railways and waterways in Europe and examines currently applied solutions. A handbook was produced from this project and it delivers clear recommendations on ecological standards for mitigation and compensatory measures as well as monitoring solutions

34 Völk et al. 2001

Box 4:

Special Recommendations for Austria and Slovenia for the protection of the brown bear:

- The Slovenian government and hunting authorities are already considering the existing corridors within the framework of the management of brown bears. Culling in the defined transit areas should remain exceptional. The measures taken should be coordinated with the Austrian (and for the western part, the Italian) authorities.
- Slovenia has to increase the structural connectivity of forested habitats along the two known transit areas in order to make this area permeable for bear migration. The region between the Kaminske Alpe and the Pohorje should be managed like a transit area for brown bears in the national strategy in order to increase the chance of brown bears migrating to Austria. Structural connectivity also has to be increased in this region. Spatial planning should support the existing corridor.
- Austria (Carinthia) has to increase the structural connectivity of forested habitats along the border with Slovenia, particularly in the area between Lavamünd and Slovenj Gradec (SLO), Bleiburg and Privalje (SLO). Spatial planning should support the corridor.
- Austria has to improve the permeability of its valley bottoms especially in the Mur-Mürz Tal and to safeguard the last existing options for crossing valleys. This could be achieved by green bridges over motorways and railways. Spatial planning should support corridors. In Styria for instance, spatial planning already supports the corridor within valley bottoms and this should be extended to other regions (e.g. Carinthia, Salzburg, Tirol).
- Austria has to safeguard the connectivity and the permeability of forest habitat along the Koralm Korridor to maintain its effectiveness. This should be taken into account especially in new infrastructure projects.

Specific WWF recommendations for the brown bear in the Alps

- Development of an overall Alpine bear management plan is necessary to solve problems that may arise from coexistence of man and bear.
- Mitigation measures (green bridges, landscape bridges) have to be set up where linear infrastructure (motorways, railways etc) and built up areas in the valley bottoms present serious barriers. Integration of the "COST 341" standards for new and existing transport infrastructure should be promoted.
- Areas of unsuitable habitat within a known migration route that create a barrier for brown bears should be improved by facilitating and funding landscape elements that increase structural connectivity.
- The existing migration corridors have to be considered in every stage of planning and land development.

4.3.2

Amur tiger (Panthera tigris altaica) in the Russian Far East

Introduction

The critically endangered Amur (or Siberian) tiger is the largest subspecies of tiger, with males weighing up to 300 kg. Its winter and summer fur differs sharply, with the hairs in winter growing dense and long and generally paler than in summer. Internationally, the Amur tiger subspecies is protected under Cites Appendix I (it was upgraded from Appendix II to Appendix I in 1987). Nationally, it is protected over most of its range. The Amur tigers are usually solitary except for females with cubs. A tiger eats 18–40 kg of meat at a time with large prey taken about once a week. Mating takes place all year round, but most frequently from the end of November to early April. In the wild tigers live between 8–10 years, while in captivity they may live up to 26 years. The main threats to the Amur tiger are habitat loss and degradation because of timber extraction, harvesting for traditional medicine and changes in prey species' dynamics.

Map of Amur tiger range,

courtesy of Save the Tiger Fund

Population and distribution

In the last decade, the Amur tiger population has stabilised at around 430–530 individuals virtually all confined to the Russian Far East, although a few may survive along China's north-east border area, and possibly also in North Korea[35]. Sightings of Amur tigers in Changbai Mountains (1,905 km^2) in north-eastern China were reported in Chinese newspapers in 1990[36]. Tigers may possibly survive in North Korea, and Mt Paekdu, a border area reserve which adjoins China's Changbai Mountains. Tigers need vast areas and currently only about 20% of Russia's tiger population is found in protected areas[37].

Habitat requirements: The tiger's preferred habitat can be summarised as: some form of dense vegetative cover, access to sufficient large ungulate prey and to water. Forests of Korean pine and Mongolian oak in different combinations represent the Amur tiger's favourite habitat. Tigers can opt for secondary forests if the thickness of cover and under-forest are dense enough. Their main requirements for habitat are prey availability and low levels of disturbance. Tigers use mostly valleys as migration routes. Open meadows and agriculture lands can constrain their movement although tigers have been seen to cross wide (up to 30–50 km), densely populated areas, including outskirts of villages and even suburbs of large cities.

Range, movement, migration

While females need ranges suitable for raising cubs, males have larger ranges. In the Russian Far East, where prey is unevenly distributed and moves seasonally, home ranges are as large as 300–500 km^2 for females and 800–1,000 km^2 for males.

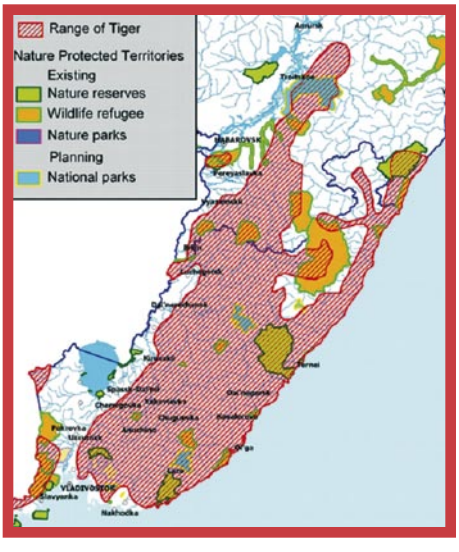
35 Cat Specialist group (www.catsg.org/)

36 Cat Specialist group (www.catsg.org/)

Existing protected areas and the Amur Tiger

Tigers occur, from north to south, in Russia's Sikhote Alin (4,014 km^2), Lazovskiy (1,210 km^2) Ussuriiskiy (404 km^2), Botchinskiy (2,674 km^2) and Bolshekhekhcirskiy (454 km^2) zapovedniks (strictly protected nature reserves) and 16 wildlife refuges (totalling 18,018 km^2 – see map).

The Sikhote Alin nature reserve (category Ia) is the largest protected area where they can currently be found. This area was declared a World Heritage site and serves as a reproduction zone for the Amur tiger's north eastern population. Creation of three national parks has been endorsed at the regional levels but final approval by the Russian Government is awaited. These national parks are Udegeiskaya Legenda (1,020 km^2), Zov Tigra (852 km^2), and Anuiskii (4,296 km^2). The recently established tiger ecological corridors (about 2000 km^2) uphold restrictions on commercial logging and hunting. There is also a small isolated population in the south-western part of Primorski Territory – in and around the Kedrovaya Pad nature reserve (179 km^2), Barsovy (1,069 km^2) and Borisovskoe Plato (634 km^2) wildlife refuges. About 80% of Russia's tiger population remain outside protected areas[38].



Amur tiger range and PAs (WWF)

Proposed actions for the protection of the Amur tiger in the Russian Far East

In 2002, WWF brought together experts to identify necessary actions to protect the tiger from extinction[39]. One essential conclusion from the meeting was the need to enlarge the geographic scale of tiger conservation from a site-specific to a landscape level. A more specific target, defined in the strategy of conservation of Amur tiger and approved by the Russian government is: "To create and maintain a genetically viable population of 300 breeding females (700 individuals) over an extended range" (www.wwf.ru/resources/publ/book/eng/40). Achieving this will require an extension of the PA network alongside with better game management to double the number of wild ungulates in hunting estates.

A landscape approach is essential to effectively increase numbers of this far ranging species. On the ground, a tiger conservation landscape will often equate to a series of well managed core protected areas (zapovedniks, nature reserves, wildlife sanctuaries, etc.), together with buffer zones linked together by dedicated corridors of suitable habitat or by land-use that is tiger-friendly in its status and management. The width of linkages should ideally be about 20–30 km for the tiger or about the diameter of a tiger's home range. Optimal location for corridors would be the forested stretches between the three sections of the tiger's current range. Creation of

a network of tiger reserves from north to south along the Sikhote Alin range would aim to guarantee protection of a third of the current population of breeding females. Existing zapovedniks would represent the core of such a system. Multiple use corridors and special management zones in collaboration with local communities would link up these reserves[40] For instance in table 5 below a concrete target is to connect the populations from Sikhote Alin and Primorsky reserves. Capacity of park staff would need to be strengthened to ensure effective anti poaching. The wide valley of the Dzhigitovka River to the south of the Sikhote Alin reserve should be included in the zapovednik in order to increase protection of territories of individual tigers[41]. Riverine areas, and the comfortable passes in the high mountains also represent potential land for corridors. Finally, the border areas are also suited as tiger corridors.

In summary, a strategy to protect the Amur tiger might include: a) increasing PAs, particularly along the Sikhote Alin range, b) increasing the size of PAs, possibly as World Heritage Sites or other multiple zone sites with a core area, built around existing zapovedniks, and buffer zones, c) creating a number of corridors of about 20–30 km in width between existing PAs, that would minimise human-tiger conflict and allow the tiger to move between the PAs, d) improving capacity of park staff to reduce poaching, and e) creating a system of wildlife reproductive zones in each hunting estate to serve as corridors or buffer zones for both the tiger and its prey.

Specific WWF Recommendations for the Amur tiger in the Russian Far East

- Put an end to poaching
- Establish a tiger ECONET (a protected area system encompassing at least 30% of tiger area)
- Incorporate tiger conservation into development of local communities
- Establish a positive tiger image to generate income for local people (eg. via tiger labelled products)

In addition, a number of specific actions identified by WWF and its partners in Russia can be found in table 5 below.

Amur or Siberian tiger (Panthera tigris altaica)

40 Darman and Williams, 2003.

41 Centre for Russian Nature Conservation, (www.wild-russia.org)

Table 5: **Targets and actions for the Amur tiger**

(Darman and Williams, 2003)

Medium-term targets by 2020	Short-term targets by 2012	Immediate Actions by 2007	Coordinators
Effectively managed tiger conservation landscapes consisting of protected areas and connecting corridors (Econet) are established by 2015	Set aside over 1 million hectares of new nature reserves, buffer zones, and corridors capable of supporting contiguous and viable tiger population by 2007 (see also Sikhote-Alin Econet in Forest Action Plan)	Create six nature parks (299,300 ha) by 2005	WWF, KWF
		Establish six natural monuments (13,000 ha) by 2005	KWF, WWF
		Create four corridors to connect tiger reserves (216,250 ha) by 2005	KWF, WWF
		Enlarge Ussurisky Zapovednik (24,500 ha) and create a buffer zone around it (225,000 ha) by 2005	
		Create buffer zone (23,600 ha) and grant federal status to Vasilkovsky Wildlife Refuge by 2005	WWF
		Create five new tiger refuges (298,000 ha) by 2007	WWF, KWF WCS
		Enlarge Losiny Wildlife Refuge (16,000 ha) by 2007	WWF
		Create local Econet in Samarga River Basin by 2007	
	Include at least 500,000 ha of specially protected forest areas in Econet by 2010	Carry out landscape management plans for Econets in model areas in tiger habitat (Khor River watershed, Oblachnaya Mountain, and southwestern Primorsky Province) by 2007	WWF, KWF WCS, PHOENIX
	Support creation of unified tiger population throughout its range in Russia by 2010	Assess feasibility of corridor connecting tiger populations in SW Primorsky Province and Pogranichny Range by 2005	WWF, WCS
		Elaborate and approve management plan for corridor to connect Sikhote-Alin and SW Primorsky tiger populations by 2007	WWF, WCS
	Establish two Russian-Chinese nature reserves by 2010	Instate strictly protected status in border patrol zone of Khasansky District as a part of UNESCO Transboundary Protected Area by 2005	WWF, WCS PHOENIX
		Create Barsovy National Park by 2006	WWF
		Create transboundary nature reserve in Cherny Gory Range-Changbangshan Mountains by 2007	WWF, WCS PHOENIX
		Create corridor in Strelnikov Range (9,300 ha in Khabarovsky and 12,000 ha in Primorsky provinces) by 2005	KWF, WCS, WWF
		Initiate talks for creating transboundary nature reserve in Strelnikov Range-Wadanshang Mountains by 2007	WWF, WCS KWF
Increase ungulate populations in the tiger's range by 2015	Implement wide-scale program to increase tiger prey base by 2007	Develop and adopt program for restoring ungulate populations in tiger habitat in Primorysky Province by 2003 and Khabarovsky Province by 2004	WWF, WCS KWF
	Raise tolerance of hunters to tigers and increase game numbers in 50% hunting estates by 2010	Test effectiveness of improving biotechnical methods, anti-poaching efforts, and economic solvency of hunting leases to increase ungulate numbers in model hunting estates by 2005	WWF,WCS
		Organize seminars and training for game managers and users to disseminate experience in model hunting estates by 2005	WCS,WWF

4.3.3

Iberian Lynx (Lynx pardinus) in the Mediterranean

Introduction

The Iberian lynx, once hunted for the fur from its spotted coat, is about half the size of the Eurasian lynx (Lynx lynx). Adult males weigh an average of about 12.8 kilos and females, 9.3 kg. The energy requirements of the Iberian lynx have been estimated at approximately one rabbit per day. Lynx live up to about 13 years[42].

Although the Iberian lynx is fully protected in Spain and Portugal and is on the Cites Appendix 1, its future remains very uncertain. The decline of the lynx population since the 1960s has been primarily caused by habitat loss and a decline of the lynx's main prey species, the European rabbit. The introduction of the poxvirus, myxomatosis, from South America in the early 1950s had a devastating impact on European rabbits, which had no natural immunity. The effects of a second disease (also introduced by man in the late 80s) the Rabbit Haemorrhagic Disease depleted the already scarce rabbit populations. At the same time, large-scale habitat conversion has taken place in Spain and particularly, in Portugal, where the pasture-scrub-woodland mosaic preferred by rabbits was replaced by wheat fields and industrial forest plantations of exotic species, contributing to the decline of rabbits and therefore, of the Iberian lynx. This trend was further exacerbated by fragmentation of habitat because of several major infrastructure projects (highways roads, dams, etc) resulting from rapid economic growth in both countries, supported by EU subsidies. Finally, additional threats to the species include snares set for rabbits, speeding vehicles on the expanding road network, and illegal shooting.

Population and distribution

The first national survey undertaken in 1990[43] showed that the Iberian lynx was confined to some 11,000 km^2 in the south western corner of the Iberian peninsula, where about 1,100 animals were left, with less than 350 breeding females. This survey identified the stable presence of the Iberian lynx in 48 areas in Spain, although only eight showed populations above 25 individuals. The estimated population of Portugal totalled about 50 individuals in the same period.

Although several regional studies were carried out in the 1990s showing an alarming population decline, it is only in 2002 that a second national survey was undertaken[44]. This census indicated that the Iberian lynx was only breeding in 2 of the 48 areas identified a decade earlier. These two areas were: Doñana and Sierra de Andújar (Eastern Sierra Morena), where the estimated population was of around 160 adults. Isolated individuals were also thought to survive in other areas like East Montes de Toledo, Western Sierra Morena and Western Sistema Central making the total population about 250 individuals. In Portugal a similar survey conducted in 2002 by the Instituto da Conservaçao da Natureza failed to detect a single lynx, although in 2003 new evidence of the Iberian lynx was found (confirmed by DNA analysis of scats).

42 Cat Specialist Group, IUCN Species Survival commission (www.catsg.org)

43 Rodriguez and Delibes, 1990

44 Guzman et al, 2002

Continuous monitoring of the population between 2002 and 2004 have confirmed worst fears, with population estimates dropping to 100 adult Iberian lynx in the world, with no more than 35 breeding females[45]. These lynx live in two areas: Sierra de Andujar y Cardeña (60–70 individuals) and Doñana (20–25 individuals). The two breeding populations are isolated due to the distance between both areas but also, due to separation by intensive agriculture and settlement. Isolated individuals have also been found in several places in Eastern Sierra Morena, Montes de Toledo and Sistema Central, although these do not represent stable populations.

Lynx distribution is centred on mountain ranges, where land use is mainly in the form of privately owned hunting reserves. They are mainly found between 400–900 m elevation, but will range up to 1,600 m.

Habitat requirements

The favourite habitat for the Iberian lynx is Mediterranean woodland and maquis thicket. It favours a mosaic of dense scrub for shelter and open pasture for hunting rabbits, its main prey. Lynx are generally absent from cropland and exotic tree plantations (eucalyptus and pine), where rabbits, are also scarce.

Range, movement, migration

Daily travel distances average seven kilometers, with males generally travelling further than females. In Doñana annual home ranges for resident males averaged 18 km^2 (with monthly ranges at 10 km^2) and 10 km^2 for females (with 8 km^2 monthly home ranges[46]).

Spanish or Iberian lynx (Lynx pardinus), Spain.

45 Guzman, In press

46 Rodriguez and Delibes, 1990

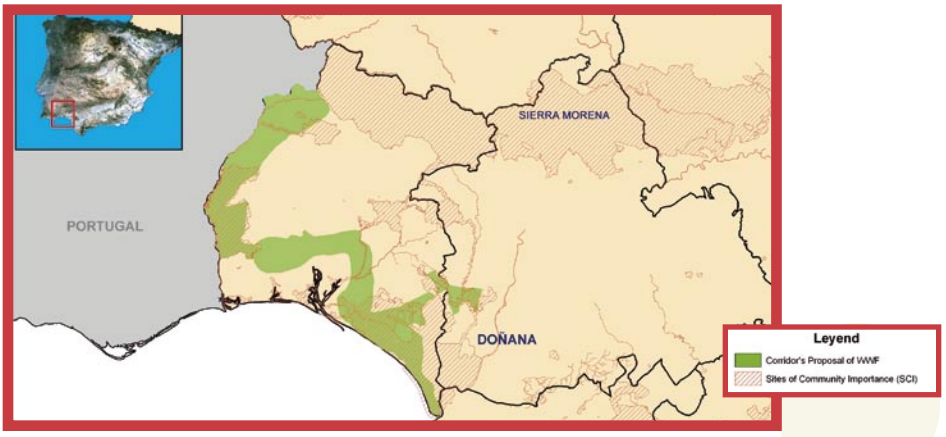
Analysis of WWF's p

Existing protected areas and the Iberian lynx

The last remnant populations of the lynx can be found in the Natural Parks of Sierra de Andújar and Sierras de Cardeña y Montoro (area of Sierra Morena Oriental) and in the South west in and around the Doñana National and Natural parks.

The connection of the Doñana population with the large mountain chain of Sierra Morena is weak and depends on a very narrow corridor upstream of the Guadiamar river. The opportunities for dispersal to more favourable areas are minimal given the presence of marshes to the east and intensive farming to the west of Doñana. The high number of roads crossing the area has further contributed to fragmenting habitat (as well as increasing the number of lynx killed on roads). Both factors are exacerbating the isolation of this population which is suffering strong inbreeding pressure.

The lack of a continuous corridor between the population of Andujar and the area of Montes de Toledo, where a large portion of favourable habitat is still available, is reducing the possibility of re-colonisation of old territories as well as the survival chances for dispersed individuals.



Natura 2000 Network and important corridors for Iberian lynx in Sierra Morena and Doñana

(WWF and ESRI)

Natura 2000 Network and important corridors for Iberian lynx in Sierra Morena and Montes de Toledo

(WWF and ESRI)

Proposed actions for the protection of the Iberian lynx in the Mediterranean:

The International Seminar for the Iberian Lynx (Andújar, October 2002), identified the need to guarantee the conservation of the lynx's 1990 distribution area as a critical factor for the future of the species. Currently this area is almost completely included in the official proposal for the Natura 2000 network which should guarantee long term conservation of the habitat and halt fragmentation. Unfortunately some basic connections between the two existing populations and between the best population and the largest portion of good habitat in central Spain have not been sufficiently considered which may reduce the effectiveness of having such a large portion of the territory under protection.

Urgent restoration of Mediterranean maquis is also necessary to minimise conflict between lynx and humans while restoring rabbit populations. The green areas on the maps above represent vital corridors that need to be created to ensure that isolated populations are able to interbreed. At the same time attempts need to be made to try to expand the lynx's territory westward back into Portugal. WWF's Green Belts programme is seeking to restore old eucalyptus plantations to Mediterranean maquis which should offer additional habitat for the Iberian lynx. Another project in Doñana called "One Europe More Nature" is focussing on re-defining land use (in particular targeting strawberry farming) in the area between Doñana and the Tinto River in order to create the basis for a green corridor between Doñana and Sierra Morena. Since 1999 WWF-Spain has been actively working on enhancing conservation in areas where the lynx was present in 1990 in order to guarantee the long-term recovery and conservation of the species.

47 Ward, 2005

In summary, a strategy to create a protected area network that would support the critically endangered Iberian lynx could include: a) urgently establishing links between existing populations in south west Spain, prioritising the populations known to be reproducing, b) creating new protected areas that could harbour new or re-introduced populations, c) restoring suitable habitat corridors and stepping stones on old eucalyptus plantations both in Spain and Portugal, to harbour future populations. Other actions that are necessary to prevent extinction of this species include captive breeding and re-introduction programmes (both of lynx, and of its favourite prey, the European rabbit)[47].

Specific WWF recommendations for the Iberian lynx in Spain

- The corridor between the last remaining breeding population of lynx in Doñana National Park and the population in Sierra Morena is of paramount importance if the remaining individuals are to have a chance of survival and reproduction. A Green Corridor plan should be developed in order to guarantee the effective connection between both areas. More natural corridors (using rivers) should be protected;
- A change in land use (from intensive farming to natural habitat) should be promoted, the recovery of stepping stones (for example eliminating eucalyptus plantations) should be supported and road construction should be reduced in Doñana.
- It is important to guarantee connectivity between Doñana and the Portuguese border where large portions of habitat are available.
- Finally the connectivity between Sierra Morena and Montes de Toledo must be improved, including the insertion of more areas in the Natura 2000 network.

4.3.4

Saiga antelope (Saiga tatarica) in Central Asia and Altai Sayan

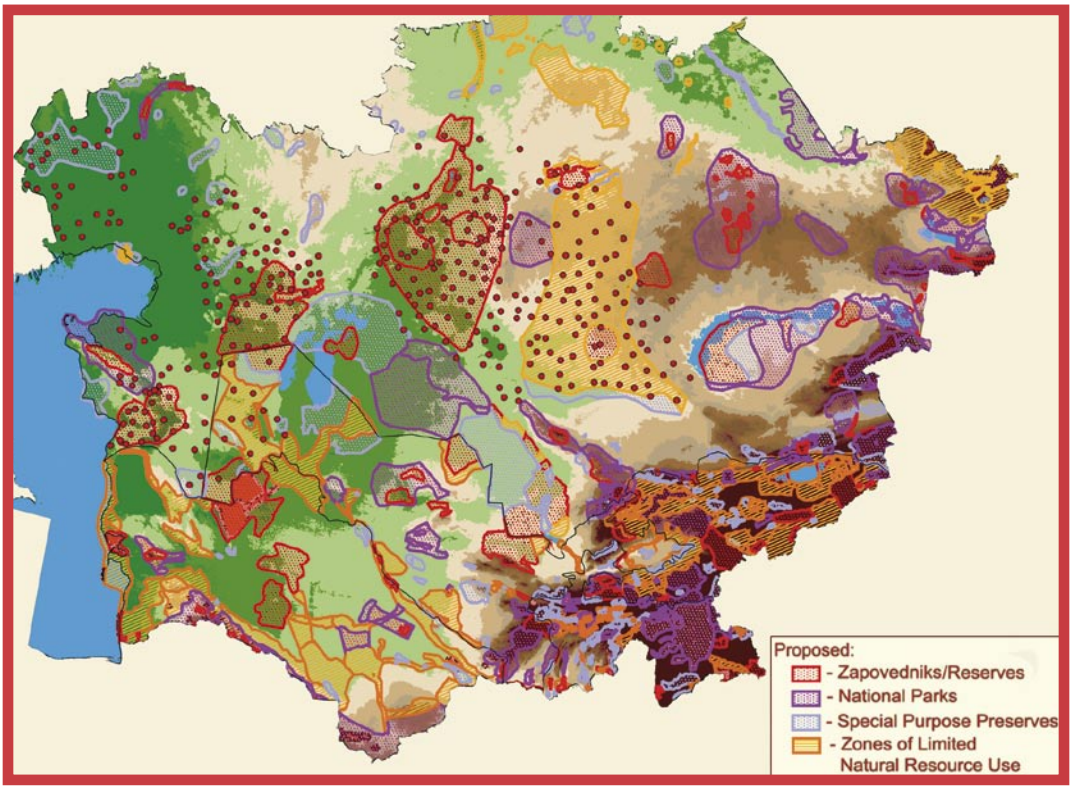
Introduction

The saiga is a medium-sized antelope ("saiga" means antelope in Russian) with a very distinctive nose. It weighs between 21–51 kilos and lives up to 10–12 years. It is a nomadic herding species that inhabits the open dry steppe grasslands and semi-arid deserts of Central Asia. Its population has shown an observed decline of over 80% over the last 10 years and the trend is continuing. Severely skewed sex ratios are leading to reproductive collapse.

Diet consists mostly of various grasses, herbs and shrubs. Adult males defend harems of females (a situation reversed in recent winters in Kalmykia). The dramatic decline in the now critically endangered saiga antelope can be largely attributed to poaching for meat and for export of horns that are used in traditional Chinese medicine. Subsequent distortion of the sex ratio has seriously affected reproduction with some populations having as little as 0.5% of males. Destruction of habitat in Russia is also a serious concern. Finally, severe winters can cause mass mortality. At present habitat reduction due to extensive occupation by livestock is the main pressure on grazing areas and water sources, causing saigas to be pushed into unsuitable habitats. Also extreme weather conditions such as long lasting summer droughts and prolonged cold winters are permanent threats to the saiga population.

Population and distribution

Today the saiga population numbers about 50,000, down from 1,250,000 in the mid-1970s. Most are found in Kazakhstan. In years with a favourable climate the population can increase by up to 60% in a single year. Very few animals in a population are more than 3.5 years old, indicating that the population is almost completely renewed after four years.



Map of saiga distribution and protected areas in Central Asia (WWF)

Mongolian saiga

The Mongolian Saiga antelope (Saiga tatarica mongolica) is endemic to Mongolia and is only found in the Shargiin Gobi and Khuisiin Gobi depressions. It used to be seen during its migration nearby the Great Lake Basin and the southern part of Uvs Lake. Unfortunately, the Mongolian saiga disappeared in Uvs lake depression in the 1920s, in the depression of Khyargas and Airag lakes in the 1960s and in the basins of Dorgon, Khar Nuur lakes and lower parts of the Zavkhan river in the 1960s[48]. By 1998 its distribution range was down to 30% of its 1930s' range. The distribution area of the Mongolian saiga varies between 1100–13,300 km^2. According to surveys, saiga numbered 300 in 1978[49], 1400 by 1993[50], 5300 in December 2000[51] and 1500 saigas in 2004[52]. Main threats are habitat reduction, severe environmental and weather conditions and illegal hunting. Due to massive decrease in range, the species is facing an extinction crisis[53]. In Mongolia two protected areas, Sharga NR (286,900 ha) and Mankhan NR (30,000 ha), were designated in 1993 to protect most of the remaining areas of occurrence for the subspecies Saiga tatarica mongolica.

Central Asian saiga

The other sub-species Saiga tatarica tatarica was formerly found across steppes and semi-deserts of southeastern Europe and Central Asia from Ukraine to Mongolia but is currently found only at one location in Russia (steppes of Kalmykia) and three areas in Kazakhstan. According to data from an aerial census in spring 2004, estimates of the number of saiga in Kazakhstan's Betpakdala (30,000 km^2) totalled 6900 animals, while in 2005 the estimated number was 9900. It is extinct in China and also in southwestern Mongolia (although the separate subspecies, Saiga tatarica mongolica, still occurs in western Mongolia). It migrates seasonally to Uzbekistan (Karakalpakstan) and Turkmenistan.

Habitat requirements

Typical habitat for the saiga is flat open areas covered with low-growing vegetation, allowing animals to run quickly. Areas of broken terrain or dense cover are generally avoided, but animals may stray into these out of necessity.

© Pavel Sorokin (CITES website)

48 Dulamtseren and Amgalan, 1995

49 Sokolov et al., 1978

50 Dulamtseren & Tulgat, 1993

51 Amgalan & Nyambayar, 2000

52 Amgalan, 2004

53 Amgalan & Nyambayar, 2000; Amgalan, 2003

Range, movement, migration

The saiga is a migratory species with widely separated summer and winter ranges covering thousands of kilometres.

Protected areas and the saiga in Central Asia and the Altai Sayan

Some protected areas exist within saiga range but the distance between summer and winter ranges of the various populations hinders full protected area coverage. The infrastructure for saiga protection and management is still in place throughout its range, but under-funding has rendered it ineffectual.

In an effort to halt the dramatic decline in this species, there has been a moratorium on commercial hunting of the saiga in Betpak-dala (Central Kazakhstan) since 1998, throughout the rest of Kazakhstan since 1999 and in Kalmykia (Russia) since 1991 (although hunting was allowed in Kalmykia in 1996)[54].

The International Altyn Dala Conservation Programme (ADCP) is a new large-scale initiative from the Government of Kazakhstan in partnership with the Association for Conservation of Biodiversity in Kazakhstan (ACBK), the Frankfurt Zoological Society (FZS), the Royal Society for Protection of Birds (RSPB) and WWF to conserve nationally and internationally important flagship species, biodiversity and steppe and semi desert habitats in a network of large protected areas in Central Kazakhstan. The project was initiated after meetings between WWF and the Ministry of Environmental Protection and Forestry & Hunting Committee Ministry of Agriculture (MA RK) in 2005. The ADCP is building upon the results from saiga antelope research, (UNEP/GEF/WWF ECONET-Central Asia project), and the ACBK/RSPB/BirdLife International Important Bird Areas project and is enabling the Government of Kazakhstan to contribute significantly to meeting its obligations under the Programme of Work on Protected Areas of the Convention on Biological Diversity, Convention on Migratory Species and Ramsar Convention.

Proposed actions for the protection of the saiga in Central Asia:

A Memorandum of Understanding for the conservation and management of the saiga antelope was concluded between the saiga range states in November 2005 at the 8th meeting of the Conference of the Parties to the Convention on Migratory Species (CMS). The MOU commits signatories to: a) Provide effective protection for saigas and conserve its habitats; b) implement the action plan to restore saiga populations and habitats, c) enhance transboundary and international cooperation through a regional conservation strategy; d) facilitate information exchange; e) set up a competent body to implement the MOU and monitor its activities; and f) report progress to the CMS. The agreement and action plan were formally agreed to by Kazakhstan, Turkmenistan and Uzbekistan and signed by Turkmenistan's Minister of Nature Protection, as well as by the Mongolian Minister of Environment, IUCN, the CMS Secretariat and WWF. The action plan now commits the governments and cooperating organisations to the recovery of the species' populations throughout Central Asia[55].

54 Milner-Gulland, et al. 2001

55 Milner-Gulland, 2005

riority species, protected areas and connectivity

With poaching for meat for the domestic market representing the major threat to the saiga, increasing and strengthening a well managed protected areas network is essential. In addition, because this species migrates over vast areas, "stepping stones" of habitat can offer sanctuaries on the migration route (as a corridor would be too big to protect properly). Securing these stepping stones will require working with pastoralists to ensure that patches of habitat remain to provide sufficient food for the saiga. In addition, to reduce poaching along the saiga's migration route, longer term efforts will need to centre on awareness raising and alternative economic incentives that would help ensure that those stepping stones would indeed remain viable and would support the saiga. Because of the species' sensitivity to sudden climatic extremes, it is all the more important to expand its range at the landscape scale in order to increase its chances of survival under likely future climate scenarios.

In summary, a strategy to create a protected area network that would protect the saiga antelope in Central Asia includes: a) gathering more data on this species and its ecology, b) improved collaboration between the countries covering saiga range to identify and create joint transboundary protected areas, c) identifying stepping stones to support the migration of the saiga, and managing them accordingly, d) supporting antipoaching activities, e) working with local communities for awareness raising and improved natural resource management.

Specific WWF recommendations for the protection of the saiga in Central Asia

- In Kazakhstan – creation of an important system of PAs (not less then 6 million ha) – to insure natural migrations of the Betpackdala population, as well as conservation in winter and spring (lambing) sites. The timing is right as Kazakhstan is starting the process of land privatisation.
- Land-use planning and reservation of lands for future creation of PAs in Kazakhstan needs to include considerations for the saiga which could be threatened by fencing off newly privatised lands.
- In Uzbekistan, where the saiga regularly migrates in winter, new PAs need to be created
- Connectivity between Kazakhstan, Uzbekistan and Turkmenistan (ecological corridors) needs to be secured and special passes for saiga in the newly established system of fences should be built along the border.
- For the Volga- Ural population, similar ecological corridors need to be established at the Russian-Kazakhstan border (ensuring connectivity).

4.3.5

Argali (Ovis ammon) in the Altai Sayan

Introduction

The argali sheep is the largest mountain sheep with males displaying extraordinary horns. While the argali is categorised as Vulnerable in the IUCN Red List, of the two subspecies found in Mongolia, Altai argali (O.a. ammon) and Gobi argali (O.a. darwini), the latter is classified as endangered. It is also listed in Appendix II of CITES. The major threats to the argali are poorly regulated trophy hunting, habitat loss, poaching and competition with domestic livestock for water and forage[56]. Livestock numbers have increased dramatically over the past few years following privatization of herds with the result that herders are expanding grazing into more marginal pastures[57]. Over-grazing and displacement by livestock has substantially reduced and degraded argali habitat, leading to increased competition between livestock and wild ungulates[58, 59].

© Richard Reading and Henry Mix

(courtesy: IUCN Caprinae group)

Population and distribution

The argali can be found in Afghanistan, Armenia, Azerbaijan, China, Georgia, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russian Federation, Tajikistan, Turkmenistan, Uzbekistan and is now extinct in Bhutan. The estimated area inhabited by argali declined from about 264,000 km^2 in 1985 to about 47,815 km^2 in 2001. The situation with the argali is particularly alarming in western Mongolia. Surveys and interviews with local people in 2001 have recorded that argali have been locally extirpated from 35 of 79 soums (or counties) in the 8 western aimags (provinces). According to these assessments, there were 50,000 argali in 1975, 60,000 in 1985, but only 13–15,000 in 2001 and their population very fragmented (Institute of Biology, 2001). About 1060–1140 Altai argali inhabit the trans-boundary areas of Russia and Mongolia. The whole area of the argali Mongolian – Russian trans-boundary range is about 10,950 km^2. About 5570 km^2 (51%) belongs to Mongolia and 5380 km^2 (49%) to Russia.

Habitat requirements

Gobi argali occur in the hills, rocky outcrops, and mountains across the Transaltai Gobi and Gobi Altai Mountains and also in several isolated mountains in the steppe and semi desert zones of Central and South-Eastern Mongolia.

56 Gruzdev and Sukhbat 1982, Zhirnov and Ilyinsky 1986, Shagdarsuren et al. 1987, Luschekina 1994

57 Honhold, 1995

58 Mallon et al. 1997

59 Gruzdev and Sukhbat 1982, Zhirnov and Ilyinsky 1986, Shagdarsuren et al. 1987, Luschekina 1994

Range, movement, migration

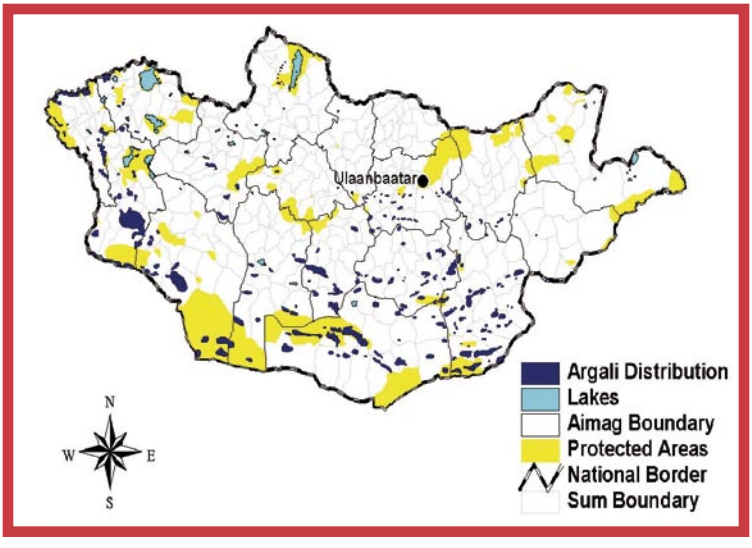
The argali sheep is not a typical migratory species, although it will move large distances in search of food and suitable habitat. Migrating herds of argali sheep may temporarily be seen in some mountains in the southern and south-western side of the Khentii range. In summer, argali in the Altai and Khangai Mountains migrate up to glacier meadows, moving down in the winter.

Existing protected areas and the argali

The argali's 120,926.11 km^2 distribution is included within 7 Strictly Protected Areas, 7 National Parks, 6 Nature Reserves. At present, there are 7 protected areas (4800 km^2) within argali habitat in the transboundary areas of Mongolia and Russia alone, but all of them are either poorly protected or not protected at all. Only an estimated 23.2% of the total argali range is contained within protected areas[60].

Proposed actions for the protection of the argali in the Altai Sayan

WWF's Altai Sayan ecoregion has a number of targets related to the argali, one of which is "by 2009, critical habitat of the argali in the border areas of Russia and Mongolia is covered by a PA network". Indeed this border zone is where a number of fragmented populations of argali remain and where competition with livestock can be minimised. Opportunities within existing legislation can support this target. In 1992 the Mongolian Parliament set a goal of 30 per cent of the nation to be placed under protected status by 2030. Conservation of threatened species such as the argali can be integrated with this target so that new protected areas are established in the most appropriate locations in order to have a real positive impact on biodiversity. Along similar lines, in 2002 WWF introduced a plan to create a network of protected areas, also known as "Econet", for the Altai-Sayan Ecoregion. Currently in the Altai-Sayan Ecoregion there are more than 300 protected areas, totalling 11.3 million hectares. Creation of the Econet will double this figure and the specially protected areas (SPAs) will make up 23% of the Ecoregion[61].



Map showing argali distribution in Mongolia (WWF)

60 WWF Mongolia office (www.panda.org)

61 Maroney, 2003

Analysis of WWF's p

A number of strategies are already being taken to address the critical situation of the argali: these go from economic measure to work with local communities, to addressing trophy hunting as well as to minimising competition with livestock. Nonetheless, in addition to these approaches, a strategic focus on the current PA network (ie: to improve its management capacity) as well as its expansion in areas most suitable for the argali should be emphasised. As we have seen, the argali is forced to move over large areas because of a lack of suitable habitat, thus increasing the species' vulnerability. Improving management in existing protected areas could help to minimise this by securing better habitat.

Currently, the larger populations of argali can be seen in the southwest of Mongolia near the two Great Gobi strict protected areas where human and livestock activity is minimised. Initial efforts should be focussed on these significant populations as well as on areas at the border between Mongolia and Russia. With livestock competition being a key issue, community based natural resource management is an important option to consider if PAs are to have a real impact on the argali and other threatened species in Mongolia.

In summary, a proposed strategy to protect the argali and improve the protected area network of the Altai Sayan would therefore be: a) further research on the needs of the species, b) expand PAs where possible around larger argali populations, c) increase PAs on the transborder area between Russia and Mongolia, d) improve management in existing PAs, and e) work with local communities to reduce poaching and to identify mutually beneficial options around community based natural resource management[62].

Specific WWF recommendations for the argali in the Altai Sayan

- Undertake a full gap analysis of argali habitat and identify optimal areas for connectivity.
- Establish sustainable and well monitored trophy hunting programmes to provide return to local people.
- Establish community based wildlife management programmes in the argali habitat to ensure support for protecting the argali in the Altai Sayan ecoregion.
- Impose seasonal grazing limitations in birthing areas to help promote grazing practices that reduce impacts on wildlife.

Argali habitat in Ikh Nat Reserve, Mongolia.

© Gerald Dick

62 Bedunah and Schmitt, 2004

4.3.6

Amur leopard (Panthera pardus orientalis) in the Russian Far East

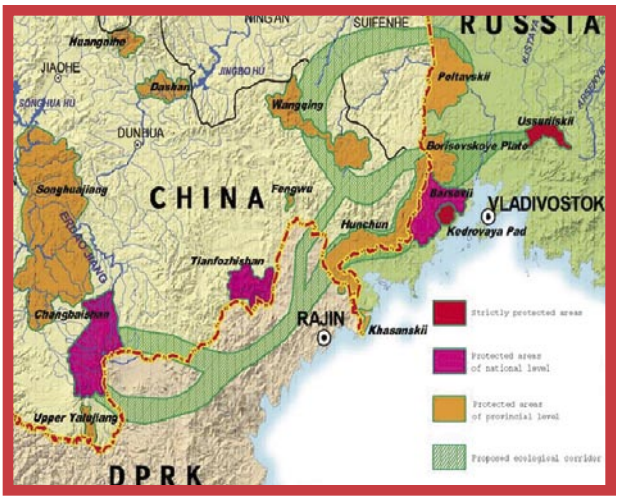
Introduction

The Amur leopard has a typically pale-cream coat which exhibits widely spaced rosettes with thick, unbroken rings and darkened centres. The length of the coat varies between 2.5 cm in summer and 7.5 cm in winter. Male Amur leopards weigh between 32–48 kg, with exceptionally large males reaching 60–75 kg while females weigh between 25–43 kg. The main prey species of the Amur leopard are roe and sika deer along with hares and badgers[63].

The habitat of the Amur leopard is being devastated by human induced forest fires, and logging. In addition, the reconstruction of highways and railways, as well as plans to build pipelines, threaten to fragment the population. The re-establishment of agriculture in river valleys has led to the creation of developed zones, crossing the last range of the leopard. In the wild, leopards live for between 10–15 years but may live up to 20 years in captivity. Father-daughter and sibling matings have been observed and it is possible that this may lead to genetic problems, particularly in such a small population where there is no possibility of subsequent outbreeding[64].

Population and distribution

Only about 30–45 Amur leopards remain in the Russian Far East. The Amur leopard's former habitat in China has been greatly reduced, leaving just a few individuals at the border with Russia.



Map of proposed ecological corridor for the Amur leopard (WWF)

63 www.wwf.ru/resources/publ/book/eng/35

64 www.wwf.ru/resources/publ/book/eng/35

Analysis of WWF's p

Range, movement, migration

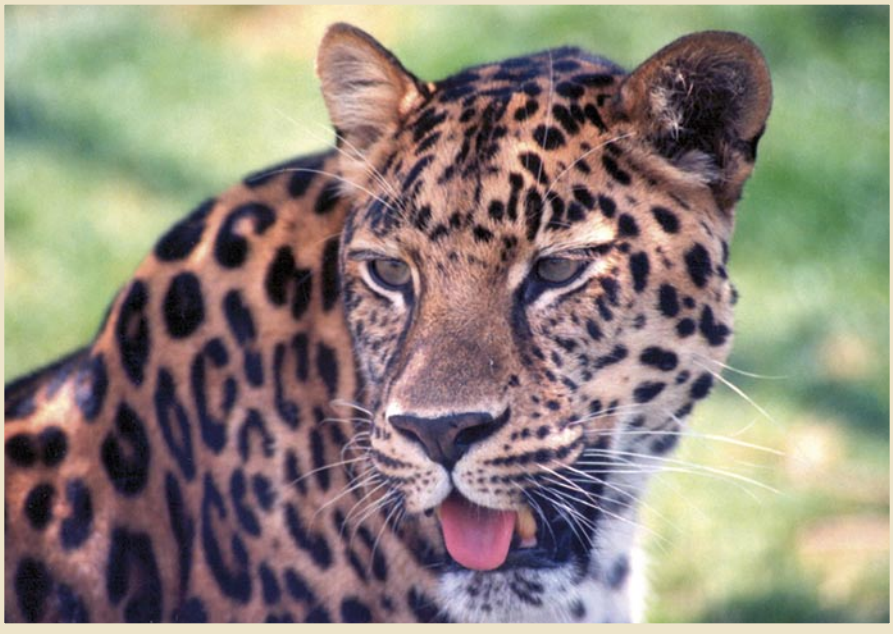
Leopards have a large home range extending up to 200 km^2. They follow the seasonal movements of the wild ungulates on which they prey.

Habitat requirements

Leopards can be found in forested areas in mid-range elevations. The areas that the leopards avoid are the flat fertile agricultural lands of valley bottoms and higher elevations (above 500 m).[65] The presence of cliffs and rocks is essential for breeding.

Protected areas and the Amur leopard

At least 50% of remaining leopard habitat is included in different protected areas. It includes the Kedrovaya pad' zapovednik (strictly protected nature reserve – 179 km^2), Federal Barsoviy Refuge (1069 km^2) and provincial Borisovskoe Plato Refuge (639 km^2) in Russia. Just along the border with China, the Forest Bureau has created Hunchun nature reserve in Jilin province, and connected it to Erduan Nature reserve in Heilongjiang province. Together they cover about 1000 km^2 of leopard habitat.



Amur leopard.

(courtesy: Rolling Hills Wildlife Adventure)

65 www.wwf.ru/resources/publ/book/eng/35

Proposed actions for the protection of the Amur leopard in the Russian Far East

Because of the very small and ever narrowing range along the Russia-China border, edge effect is very important. The disturbance zone is about 5 km along the roads and settlements, thereby shrinking the possible habitat.

Forests right along the border between China and Russia are in relatively good condition and the border fences would not stop the movement of the leopard. This isolated breeding ground is connected with the former range in Sikhote-Aline mountain and Pogranichnyi ridge (see the Amur tiger). The area connects with Northern Hamgen province of People's Democratic Republic of Korea, where leopard's tracks were registered in 2005. Creation of a transboundary habitat linkage, including protected areas in Russia, China and North Korea, offers long term conservation of the single stable population, and creates conditions for natural appearance of new groups and reintroduction. Ideal corridor size is about the diameter of the leopard's home range (approximately 10–15 km).

In summary, a strategy to create a protected area network to protect the Amur leopard includes: a) integrating existing PAs in Russia into one large joint national park with effective management, b) launching the Russia-China-North Korea transboundary nature reserve with creation of a corridor about 10–15 km in width connecting current protected areas along the Russia-China-Korea border, c) ensuring appropriate land use regime in the main defined corridors between Pogranichnyi ridge and Sikhote-Aline mountain d) captive breeding and re-introduction in well protected areas.

Specific WWF recommendations for the Amur leopard in the Russian Far East

- Upgrade the Borisovskoe Plato refuge to the federal level and join it with Barsovyi refuge. Both of them should be managed by the Ministry of Natural Resources.
- Integrate existing PAs in Russia into one large joint national park (with different zones and linkages) and with strong management.
- Establish a Russia-China-North Korea transboundary nature reserve.
- Create a system of reproductive zones through the use of ecological corridors and buffer zones.
- Ensure an appropriate land use regime in the main corridors to Pogranichnyi ridge, Sikhote-Aline mountain and Northern Hamgen province.
- Establish a special protection regime along the Russia-China-North Korea border.
- Incorporate leopard support measures into state forest inventories and undertake EIAs in each logging or development plan located within leopard habitat.
- Ensure sustainable forest management practices in commercial forests according to FSC principles to help support better forest management in leopard habitat.
- Elaborate land use plans in the entire leopard habitat that should be approved at the provincial and district levels.

4.3.7

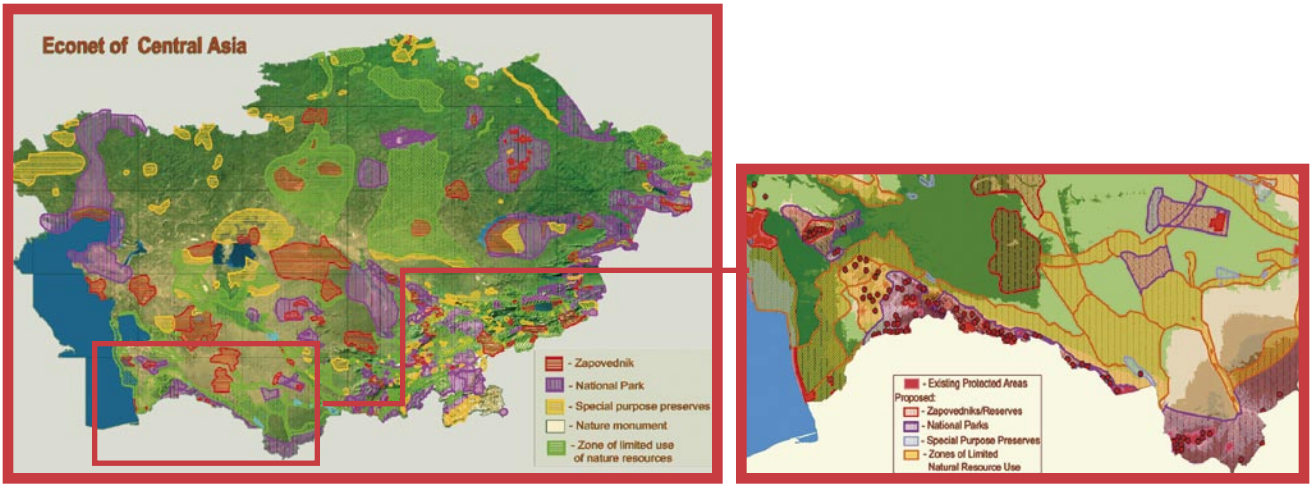
Persian leopard (Panthera pardus saxicolor) in Central Asia

Introduction

The Persian leopard is one of the largest subspecies of leopard. Since 2004 the Persian and the Caucasus leopard which used to be considered as two separate sub-species (ssp. saxicolor and ciscaucasia respectively), have been re-classified as one sub-species: Panthera pardus saxicolor. It is one of the 20 sub species of leopard recorded. This sub-species is classified as endangered as it is severely fragmented (i.e. no subpopulation estimated to contain more than 250 mature individuals). Leopards have no breeding season but tend to mate in January and February. The gestation period is between 90 and 105 days and an average litter consists in 2 cubs. The average life expectancy for a leopard in the wild is 15 to 20 years with captive individuals often exceeding 25 years. Leopards catch and feed on everything from insects and rodents up to large ungulates which may weigh over 100 kilos. They are very flexible in adapting to changing food situation (ie: loss of traditional food sources). Because of a loss of prey, and encroachment by humans on traditional leopard territory, Persian leopards are increasingly feeding on livestock thus entering into conflict with farmers and often being killed by them.

Population and distribution

As recently as the last century, the Persian leopard was found throughout all of the mountains of Turkmenistan, southern Uzbekistan, and southwestern Tajikistan, as well as Iran, Turkey and parts of the Caucasus. Although the former range of the leopard in these regions stretched for several million hectares, today such habitats are confined to less than 600,000–800,000 ha. Throughout the region they can be found mainly in the more remote montainous regions and rugged foothills, ranging up to 1,800 m in Turkmenistan, and 3,200 m in Iran. In the southern Caucasus the situation is more critical with the number of leopards estimated at 18–23 individuals.



Map of Persian leopard distribution and protected areas (WWF)

Habitat requirements

The Persian leopard can be found in sparse juniper forests, arid and mountain grasslands, and subalpine habitats. The determining factor for the leopard's choice of habitat is availability of prey. For example in Khosrov Reserve (Armenia) there is an abundance of bezoar goats which make up 90% of the leopard's diet.[66]

Protected areas and the Persian leopard in Turkmenistan

There are 3 strictly protected areas in Turkmenistan where the leopard can be found (Badkhyz, Kopetdag and Sunt-Khasardag).

Specific WWF recommendations for the Persian leopard in Central Asia

- The three protected areas inhabited by the Persian Leopard in Turkmenistan (Badkhyz, Kopetdag and Sunt-Khasardag) need to be connected into a network (connectivity between core-sites, establishment of ecological corridors, sanctuaries combining sustainable grazing and nature conservation).
- A strict protected area needs to be established in the Bolshoi Balkhan mountains
- Special conservation/species restoration measures are needed in the Russian part of the Caucasus, Azerbaijan, Armenia and Georgia through reintroduction. In order for this effort to be viable, and to have a sustainable population of leopard throughout the area, a network of protected areas needs to be established throughout the whole region connecting Turkmenistan via Iran, south of the Caspian sea and into the Caucasus.

A typical landscape of Persian leopard. Kopetdag, Turkmenistan.

66 Malkhasyan and Asmaryan; S. 2005.

4.4 WWF's priority species linked to the goals, targets and activities of the CBD Programme of Work on Protected Areas

Analysis of

Protection of the seven priority species can only be guaranteed through actions identified in the CBD programme of work on protected areas. As we have seen, however, to achieve this will require significant improvements in protected area networks and connectivity in the relevant ecoregions. Below we relate a selection of targets and activities of the programme of work on protected areas to large terrestrial mammals and specifically to the priority species highlighted in this report.

TARGET and ACTIVITIES (in abridged form)	RELEVANCE TO LARGE TERRESTRIAL MAMMAL SPECIES
1.1 By 2010, terrestrially and 2012 in the marine area, a **global network** of comprehensive, representative and effectively managed national and regional protected area system is established **1.1.1** By 2006, establish national protected area targets and indicators. **1.1.2** By 2006, establish and expand protected areas in high priority areas including large, unfragmented, intact, irreplaceable or highly threatened areas taking into consideration the conservation needs of migratory species. **1.1.5** By 2006, conduct national and regional gap analyses	Large mammal species, especially migratory ones, tend to have ranges extending beyond what can reasonably be set aside as a PA, often covering hundreds of square kilometres. For this reason, setting up one protected area is rarely sufficient to protect a designated species. On the other hand, a network of PAs is able to provide a series of safehavens within which animals can move freely. This is important for different populations to interbreed as well as for food availability. Gap analyses for PA networks can be complemented by data on priority species' requirements.

EXAMPLES FROM WWF's PRIORITY SPECIES:

- The **Amur tiger** with ranges extending to 1000 km^2, can only be effectively protected through a network of PAs.
- The migratory **saiga** antelope will require connected protected areas providing a series of havens within which the animals can move freely, this will include new protected areas in Uzbekistan and a network spanning the countries of Kazakhstan, Uzbekistan and Turkmenistan.
- The **Persian leopard** in Turkmenistan requires the vast range of three connected protected areas (Badkhyz, Kopetdag and Sunt-Khasardag) to maintain its population.

TARGET and ACTIVITIES (in abridged form)	RELEVANCE TO LARGE MAMMAL SPECIES
1.2 By 2015, all protected areas and protected area systems are **integrated into the wider land- and seascape,** and relevant sectors, by applying the ecosystem approach and taking into account ecological connectivity and the concept, where appropriate, of ecological networks. **1.2.1** By 2006, identify lessons learned in integrating protected areas into broader landscape-scale strategies **1.2.2** By 2008, identify and implement practical steps to integrate protected areas into broader land/seascapes	For large mammal species it is important to consider the distance between PAs and the sorts of habitat or disturbance within these gaps. In this respect the concept of landscape is important. Landscapes are units within which one can more effectively and realistically plan biodiversity conservation. It is also at such a scale that larger species as well as ecological functions tend to operate and at which multiple-uses by local people can be envisaged.

EXAMPLES FROM WWF's PRIORITY SPECIES:

- The **brown bear** in the Alps does not necessarily require new PAs, but barriers between PAs impeding its movement need to be removed to make for a coherent network of PAs within the landscape that can effectively protect the bear.
- To return the **Iberian lynx** from the brink of extinction, it is essential to take a landscape level approach, linking up protected areas with a specific focus on lynx conservation. These should be incorporated clearly within the EU Habitats Directive.
- Protecting the **argali** will require working with local people within the landscape to reach an acceptable balance between the needs of people and those of the argali.
- To secure the **Amur leopard**, landscape plans will need to ensure appropriate land use regimes in the main corridors between Pogranichnyi ridge, Sikhote-Aline mountain and Northern Hamgen province.

TARGET and ACTIVITIES (in abridged form)	RELEVANCE TO LARGE MAMMAL SPECIES
1.3 Establish and strengthen by 2010–12 **transboundary protected areas**, other forms of collaboration between neighbouring protected areas across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the **ecosystem approach**, and improving international cooperation. **1.3.3** Establish where appropriate new transboundary protected areas	Conditions are such that it is often necessary to consider collaboration across borders in order to effectively protect a species' habitat. While political realities often mean that transborder PAs are more challenging, ecological reality means that they can represent more effective ways of conserving species given existing habitat, its condition and species' requirements.

EXAMPLES FROM WWF's PRIORITY SPECIES:

- Four countries signed an MoU to protect the **saiga** across their common borders.
- All of the large mammal species described in this report move beyond one country and therefore, require some form of trans-border protected area or habitat linkage.

TARGET and ACTIVITIES (in abridged form)	RELEVANCE TO LARGE MAMMAL SPECIES
1.4 All protected areas to have effective management in existence by 2012, **using participatory and science- based site planning** processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a long-term management plan with active stakeholder involvement. **1.4.4** As appropriate, but no later than 2010, develop or update management plans for protected areas, to better achieve the three objectives of the Convention. **1.4.5** Integrate climate change adaptation measures in protected area planning, management strategies, and in the design of protected area systems.	Protected areas should have clear management plans, with biodiversity objectives that include species' protection. These should be reached in consultation with stakeholders in order to ensure their full implementation. Focussing on large mammal species has the benefit of ensuring the protection of related assemblages' of species. Large mammal species require particular attention in the face of threats like climate change, as their far-ranging needs will need to be ensured through adaptation strategies that include corridors and buffer zones.

EXAMPLES FROM WWF's PRIORITY SPECIES:

- For effective protection of species such as the **Amur leopard**, stakeholders need to be engaged in the process and to benefit from the conservation effort.
- Already highly threatened species such as the **Iberian lynx** will not be sufficiently resilient to withstand extreme weather patterns. For this reason an appropriate conservation strategy will consist in PAs and corridors that can provide necessary safehavens for the species.

TARGET and ACTIVITIES (in abridged form)	RELEVANCE TO LARGE MAMMAL SPECIES
4.2 By 2010, frameworks for **monitoring**, evaluating and reporting protected areas management **effectiveness** at sites, national and regional systems, and transboundary protected area levels adopted and implemented by Parties. **4.2.1** By 2006, develop and adopt appropriate methods, standards, criteria and indicators for evaluating the effectiveness of protected area management and governance	The presence, increase or decline of large mammal species can be used as effective indicators of success for the implementation of the management plan and wider national biodiversity objectives.

EXAMPLES FROM WWF's PRIORITY SPECIES:

- With the protection of the **Amur tiger** at stake, a number of specific protected areas need to be created and others more effectively managed. Changes in the Amur tiger population can serve as an effective indicator of progress on the PA system.
- Regular monitoring of the **saiga** in Kazakhstan allows anti poaching patrols to be deployed more effectively along the saiga migratory routes.

TARGET and ACTIVITIES (in abridged form)	RELEVANCE TO LARGE MAMMAL SPECIES
4.4 Scientific knowledge relevant to protected areas is further developed as a contribution to their establishment, effectiveness, and management. **4.4.2** Promote interdisciplinary research, to improve understanding of the ecological social and economic aspects of protected areas, including methods and techniques for valuation of goods and services from protected areas **4.4.3** Encourage studies to improve the knowledge of the distribution, status and trends of biological diversity.	There is much to be learnt about the specific needs of many species. Yet in order to effectively protect them more research is essential. Undertaking scientific research on the needs and behaviour of large mammal species within and around protected areas will help to protect them in the long run but also to protect the many species that require similar conditions to them.

EXAMPLES FROM WWF's PRIORITY SPECIES:

- A thorough understanding of the ecology of species such as the **saiga,** including seasonal variations as they migrate, can help determine much more accurately their needs in terms of protected areas and linkages across the millions of hectares that they cover during their migration.

While only a selection of targets and activities from the CBD programme of work on PAs have been highlighted above, many more relate directly to species. Focussing on the conservation of species can provide an effective and efficient means of achieving these targets. A number of recommendations are made in the next section on the role of species in the implementation of the CBD programme of work on protected areas.

5. Recommendations to the contracting Parties of the CBD

5.1 Support research to improve knowledge about species and protected area gaps

Priority species represent an important reason and target for the establishment of a PA network. However, it is important to have a clear understanding of their ecology, their habitat requirements, their sensitivities to current and future threats etc., in order to effectively plan a viable network of PAs. Without that information, efforts and resources can be channelled in setting up PAs without effectively achieving lasting conservation of important biological resources. The sort of information that needs to be collected includes habitat requirements of priority species, their migration/movement patterns, their sensitivity to disturbance and their food requirements.

- **relevant to CBD Programme of Work on PAs targets: 1.1, 1.2, 1.3, 1.4, 3.3, 4.1, 4.4**

5.2 Establish an effective protected area network that ensures species' conservation and contributes to mitigating threats to species

Scenarios for future climate change do not bode well for threatened species. A change in temperatures could cause pest outbreaks, increase fires, forcing species to move beyond their current range. Species that are already only present in a few fragmented patches of habitat, in small numbers, or at the limits of their range will be unable to adapt to such changes unless a well planned protected areas network provides them with alternatives. For this reason, adaptation strategies should be devised to increase species' resilience through the optimal design of protected area networks, including linkages and buffers that anticipate future climate change.

- **relevant to CBD Programme of Work on PAs targets 1.1, 1.3, 1.5, 4.1, 4.2**

Recomme

5.3

Use the conservation of priority species as an objective to integrate protected areas within relevant national strategies by using the ecosystem approach or bioregional mechanisms (such as ecoregions)

A strategic approach is needed to guarantee the functionality of habitat linkages, corridors and ultimately protected areas. A focus on species will help to integrate their conservation through effective protected area networks into coherent broader national strategies. Protected areas do not stand in isolation from other land management options. Instead, they should be integrated within other land use programmes in order to ensure that they fit within a mosaic of land uses that cater for different needs. Protected areas should also be integrated with a number of other relevant policy instruments. For instance, the EU Habitats Directive and its Natura 2000 sites, which represents the only legal attempt to protect biodiversity at a continental scale, should be much more closely integrated with the protection of highly endangered species, such as the Iberian lynx. The rural development funds and the structural funds of the EU, could also support measures such as forest restoration that are contributing to the enhancement of ecological connectivity.

- **relevant to CBD Programme of Work on PAs targets 2.2, 3.1, 3.2**

5.4

Focus on migrating and wide ranging species to establish corridors via trans-border collaboration where necessary

Migrating and wide-ranging species can help define the parameters of a biologically important cross-border area that will require international collaboration. These trans-border areas may require harmonised management practices within a landscape, as is necessary in the Alps for the brown bear. They may also be set aside as trans-border protected areas and managed jointly, as is necessary in the Altai Sayan ecoregion. The legal obligation derived from article 10 of the EU-Habitats Directive, which is about connectivity, should be effectively applied in all EU member states as soon as possible, so as to ensure an adequate coherence of the European Natura 2000 network of protected areas. Using migratory and wide ranging species to define PA networks and corridors is also in line with decison VI/27 of the CBD which supports the development of regional, sub-regional or bioregional networks or bioregional mechanisms.

- **relevant to CBD Programme of Work on PAs targets 1.3, 3.1**

5.5

Engage and involve local communities in species' protection and protected area management

Without local engagement, the long term viability of many species and protected areas remains at risk. In the Alps for instance, the survival of the brown bear will require active local awareness, understanding and engagement. If the public is better informed about species' conservation, is supported to deal effectively with large mammals and is able to benefit from protecting them, then acceptance and sustainable conservation of the species can follow. In the Altai Sayan for example, pastoralists need to be engaged in natural resource management in order to reduce competition over grazing lands between their livestock and the argali.

- **relevant to CBD Programme of Work on PAs targets 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3, 3.5**

5.6

Improve information collection and monitoring of species

Monitoring systems are essential to identify trends and to adapt management measures. Data on priority species can be used to help monitor the effectiveness of protected area networks. Regular data analysis is necessary to identify corrective measures. For instance, a corridor may need to be widened to reduce edge effect if that appears to be a problem for the priority species, or on the other hand more work may be necessary with a local community to increase their engagement in the process. For effective monitoring, clear time-bound targets need to be put in place. Priority species can also act as a useful surrogate for a range of biodiversity indicators (ie: they are proxy indicators of for example, habitat quality, ecosystem functions etc.).

- **relevant to CBD Programme of Work on PAs targets 3.3, 4.1, 4.2, 4.3**

endations

5.7

Use species' data to improve effectiveness and planning of protected areas within a landscape

The effectiveness of many existing protected areas is still limited, particularly when dealing with the protection of priority species. For instance, poaching is still a big problem with many of the priority species. Equally, many protected areas are unable to fulfil their function of conserving species because they are either too small or isolated or surrounded by an intensely degraded landscape. Working at the landscape scale allows biodiversity conservation to take into account other land uses and stakeholders. A renewed focus on species can help identify trade offs with different land uses and promote sympathetic practices as well as identify optimal PA sizes, locations and linkages to benefit both biodiversity and stakeholders within the landscape.

- **relevant to CBD Programme of Work on PAs targets 1.2, 3.1, 3.2, 4.1, 4.2**

5.8

Ensure adequate financial resources are available for protected areas and corridor establishment to meet their biodiversity targets

Sufficient funding needs to be secured if an effective network of PAs is to be established as agreed by the Parties to the CBD. The cost of corridors and linkages should be calculated and included as part of the national assessments of protected area financial needs and the development of sustainable financing plans as required under the programme of work. Increased funding through innovative schemes such as Trust Funds or Payment for Environmental Services (PES), as well as traditional ones like the GEF, is essential for urgent action to be implemented if the programme of work's targets are to be met.

- **relevant to CBD Programme of Work on PAs target 3.4**

6. Conclusions

There is a clear role for priority species in identifying gaps in protected areas' networks. This report has used available information to demonstrate a process which could serve to define, plan and manage effective protected areas and linkages. Such an approach can help governments make tangible progress towards their commitments under the CBD programme of work on Protected Areas. We conclude that:

Priority species function as a useful tool to define protected areas' networks

A thorough knowledge of priority species' habits and needs can help define a harmonious network of well connected protected areas that can combine to achieve the twin goals of protecting the species in question and the ecosystem it is a part of. It is all the more important to plan current and future protected areas around species that are threatened. For example, given that Mongolia has a set target to expand its protected areas by 2030, it is reasonable to plan this expansion around the conservation of priority species such as the saiga and the argali. Using species as a defining factor to optimise protected areas at a national or regional level helps governments meet goals under the CBD programme of work but also under other legal commitments and instruments (as outlined in Table 1, section 1).

Priority species help to frame conservation landscapes

Large mammal species' ranges provide a useful basis for defining conservation landscapes. The ecosystem approach emphasises the need to look at an interconnected natural system as a single unit. Focussing on species as a central part of that unit can help frame the ecosystem in question and therefore, determine the area within which to plan protected areas and linkages in a coherent fashion. For instance both the brown bear and the Amur tiger's home ranges can extend up to 1000 km^2. A well-designed protected area network within a landscape that accommodates these ranges can include a series of core areas, buffer zones and linkages that are coherent and that meet broader biodiversity conservation goals. Issues of conflict with human populations and future land use plans can also best be addressed at the scale of landscapes.

clusions

Priority species serve to define linkages in a landscape

While linking up two protected areas can generally be seen to provide an added value for biodiversity, in some cases these linkages may not make much of a difference. If the linkage is too narrow to provide adequate cover to the priority species and other biodiversity or if it is made up of unsuitable habitat, then its value will be extremely limited. On the other hand, by identifying the key areas that are important for a given priority species (in terms of potential size needed, habitat requirement, risk of disruption etc) one can ensure that the linkage is more carefully designed and does provide a much needed added value to biodiversity. This linkage may be protected or not, it may consist in a solid block of habitat or smaller “stepping stones”. Nonetheless, defining this required link in the landscape will depend upon the needs of the species to be conserved.

Priority species serve to monitor the effectiveness of protected areas’ networks

If protected areas’ networks can be effectively planned around the conservation of priority species, these same species can then be an effective indicator for the effectiveness of the PA network and measures to enhance this same network.

Annex 1:

Data on issues related to improving protected areas' coverage and connectivity

(Adapted from Bennett 1998)

Template used by offices

Measures to Enhance Protected Areas Connectivity	
Issue	**Measures to Enhance Conservation Value of Linkages**
Purpose of the linkage	• Clearly define the purpose of the link as a basis for management actions and goals
Ecology and behaviour of species	• Match linkage design with the ecology and movement patterns of the target species • Plan landscape links to provide habitat and resources for entire faunal assemblages, with particular attention to species having specialized requirements
Structural connectivity	• Manage habitats to minimize gaps in linkages • Monitor external disturbances that potentially may damage sections of links • Develop networks of links to provide alternatives in case of unforeseen disaster • Incorporate nodes along linkages to provide additional habitat
Quality of habitat	• Manage habitats to ensure appropriate resources (food, shelter, refuge, breeding sites) are present for all species using the link • Establish new linkages based on existing areas of natural or semi-natural vegetation rather than disturbed land • Recognize the need to manage linkages and their habitat resources over time
Edge effects	• Evaluate likely edge effects and their potential impacts on wildlife • Maximize the width of linkages to minimize edge effects • Seek ways to reduce disturbance close to or within linkages, or move the sources of disturbance • Incorporate buffer zones along edges to limit impacts of external disturbance sources
Width	• Match the width of the linkage to its biological purpose • Assess the area requirements of key species using the link • Maximize width wherever possible to increase the total size and diversity of habitats for fauna • Ensure that width is sufficient to counter severe edge disturbances
Location	• Use knowledge of animal pathways to locate linkages • Avoid establishing linkages across natural ecological barriers • Locate linkages along environmental contours to maximize continuity of homogeneous habitat (unless the goal is to deliberately link across contours) • Locate linkages to complement other resource conservation strategies
Monitoring	• Include monitoring as an integral part of the management of linkages • Design monitoring procedures to assess the effectiveness of linkages for fauna • Use the results of monitoring to improve ongoing management

Annexes

Issue	Measures to Enhance Conservation Value of Linkages
Land tenure	• Ensure security of land status and tenure to avoid future detrimental changes in land use • Ensure that the location and extent of the linkage are clearly marked on maps, planning documents and land-use strategies
Management responsibility	• Specify responsibility for management • Ensure agreement on management goals among all responsible land managers • Ensure adequate financial and human resources, and land management skills are available • Anticipate likely changes in land use that could affect the link
Support from local communities	• Involve local communities in decisions, management and monitoring • Encourage sympathetic management of adjacent lands • Be aware of the wider concerns of local people
Integration with other sustainable land management programmes	• Investigate ways to integrate linkages with other programmes in natural resource management • Identify and communicate the wider ecological and social benefits of linkages
Community education and awareness	• Ensure that communication and sharing of information is an integral part of management • Determine the most effective means for providing information to all groups involved • Encourage the involvement of local people and community group
Strategic approach to planning	• Plan for connectivity at broad spatial scales (landscape, region) and with a long-term perspective • Identify future needs for connectivity before opportunities are foreclosed by changed land use

Source: Bennett, 1998

Measures to Enhance Protected Areas Connectivity for the argali sheep (Ovis ammon**) in the Altai Sayan Ecoregion**

Issue	Measures to Enhance Conservation Value of Linkages
Purpose of the linkage	The population of argali sheep in Mongolia appears to have been declining in the last 10–15 years. Official government figures from Mongolia's Scientific Authority estimated a total population of 50,000 argali in 1975, 60,000 argali in 1985, but only 13–15,000 in 2001. The estimated area inhabited by argali declined from about 264,000 km^2 in 1985 to about 47,815 km^2 in 2001. Approximately 23.2% of the total argali range is contained within Protected Areas. The situation is particularly alarming in Altai Sayan. Surveys and interviews with local people in 2001 suggest that argali have been locally extirpated from 35 of 79 Soums (or counties) they formerly inhabited (a 44% decline) in the western-most 8 Aimags (Provinces). The whole transboundary Mongolian – Russian area of the argali range is about 10.950 km^2. About 5570 km^2 (51%) belongs to Mongolia and 5380 km^2 (49%) to Russia. At present, there are 7 protected areas (4800 km^2) in argali habitat in the transboundary areas of Mongolia and Russia, with about 1060–1140 Altai argali, but all of these protected areas are either poorly protected or not protected at all. The main reason for argali declining in Mongolia is hunting and competition with domestic livestock (sheep and goats), which have increased over the past decade. The western provinces of Mongolia have been particularly affected and even many protected areas now suffer from drastic over-grazing.
Ecology and behaviour of species	The argali is not a migratory species. Many scientists and researchers believed that the mountain sheep moved seasonally following grass and open water, snow, and pastures. In fact the mountain sheep change their locations according to weather conditions, and human disturbance, so they permanently settle where there is less human disturbance and where living conditions are optimal. Migrating herds of argali sheep can be temporarily seen in some mountains in the Southern and southwestern side of Khentii range. Unfortunately, frequent, long-term monitoring using standardised methods has been lacking, which means that we are unsure about exact population size. In addition, as the number of livestock increases, herders move their animals into more marginal lands that were traditionally little grazed, often displacing argali in the process.

Issue	Measures to Enhance Conservation Value of Linkages
Structural connectivity	Since April 2005 the WWF Mongolia Office has been conducting a radio collar programme to follow the migration movement of the argali in the trans-boundary area of the Altai-Sayan. As a result of this survey, it was found that some herds of female regularly disperse in the area while rams move along the hills and valleys in the breeding season.
Quality of habitat	Imposing seasonal grazing limitations in wildlife birthing areas can help promote grazing practices that reduce impacts on wildlife.
Edge effects	NA
Width	NA
Location	NA
Monitoring	NA
Land tenure	NA
Management responsibility	A necessary incentive to protect the argali would be to establish sustainable and well monitored hunting programmes to provide return to local people as an incentive to protect the argali.
Support from local communities	NA
Integration with other sustainable land management programmes	NA
Community education and awareness	Community based wildlife management programmes in the argali habitat would help ensure support for protecting the argali in the Altai Sayan ecoregion.
Strategic approach to planning	A full gap analysis of argali habitat and optimal areas for connectivity is necessary.

Source: WWF Russia and WWF Mongolia programme office

Annexes

Measures to Enhance Protected Areas Connectivity for the Amur tiger (*Panthera tigris altaica*) in the Russian Far East and North East China

Issue	Measures to Enhance Conservation Value of Linkages
Purpose of the linkage	Create a system of protected areas, linked with ecological corridors and buffer zones to ensure long-term persistence of large un-fragmented populations of a minimum of 500 tigers.
Ecology and behaviour of species	The Amur tiger has a large home-range (up to 1000 km^2 for males and 400 km^2 for females) because of low density of prey in the ecosystem. Tigers use mostly valleys as migration routes, crossing ridges and passes. Open meadows and agricultural land can limit their movement but sometimes tigers have been known to cross wide (up to 30–50 km), densely populated areas or to visit the outskirts of a village and even the suburbs of large cities. The high level of territorialism leads to the expulsion of young males (up to a 700 km distance): this can create an opportunity to recover the species' former range. Tigers can opt for secondary forests if the thickness of cover and under-forest are enough for them to hide in. The main requirements are prey availability and low levels of disturbance.
Structural connectivity	The Amur tiger inhabits the foothills of Sikhote-Alin mountain (200–800 m above sea level), which is divided into 2 belts by the high peaks of the main ridge (1300–2000 m above sea level). This region presents harsh conditions with spruce and fir tree forests and significant amounts of snow in winter. The northern part of the Western belt is threatened by fragmentation. This area has the only forested corridor to Vadanshan mountain in Heilongjiang province of China, where tigers still survive in spite of high pressures from logging and poaching. The Ussury River flows here in a narrow gorge and boundary fences (2 metres high) restrict but do not completely bar the tiger's movements. A separate group of tigers inhabits the South Western Primorskii province and Laoyeling mountain in Jilin province of China. The Russia-China border here is still well forested and protected from poachers on both sides. This area is connected with Northern Hamgen province in the People's Democratic Republic of Korea. The sub-population is separated from the main range of Sikhote-Alin mountain by a densely populated wide belt with a number of roads and the Trans-Siberian railway. The only corridor is at Banevurovo army polygon, where construction is forbidden. The third portion of former tiger range covers the Pogranichny ridge on the border with Heilongjiang province of China south from Khanka Lake. This block has a narrow forested corridor just along Russia-China border. A main threat for connectivity is the possible further development of lands along the Trans-Siberian railway (including a new pipeline for oil and gas). The Russia-China border lands and army polygons could be fast developed if the current special regime of land use were to be changed.
Quality of habitat	Increasing pressure from commercial logging has changed the carrying capacity of tiger habitat. The harvest of Korean pines and Mongolia oaks has reduced the amount of nuts and acorns for wild boar. At the same time, the opening up of the forest canopy has led to an increase in seedlings and therefore an increase in the number of red deer. In general, logging practices do not lead to loss of tiger habitat, if the temporary forest opening is closed and levels of disturbance and poaching remain under control. Vegetation in existing corridors allows tiger movement between parts of the range. Land use regime in crucial areas should prevent human settlement and the development of new arable lands. The existing forest belt along the Russia-China border should be established as a special protected zone to keep current low levels of human activities on both sides.
Edge effects	The main range of the tiger in Sikhote-Alin mountains does not suffer much from edge effect. Zones of low density are formed along the thoroughfare and settlements (up to 10–15 km). Special buffer zones should be established around protected areas (at least 1 km by Russian law). The 2 isolated ranges are small and tigers hug the boundary fences, which are only 20–30 km from densely populated areas. Increasing development of the belt along the Trans-Siberian railroad could eventually lead to fragmentation of parts of the tiger range. The fast growth of human settlements in North East China along the Russia border could lead to the extinction of isolated groups in Laoyeling and Vadanshan.
Width	The best size of corridors for tigers should be about the diameter of their home range (approximately 20–30 km). In fact, we can and should protect riverine habitats and some important passes in the mountains, where corridors should be at least 2–5 km width.
Location	The best location for corridors is the forested stretches between 3 parts of the tiger range. Riverine areas, and the comfortable passes in the high mountains also represent potential land for corridors. Finally, the border areas behind the fences are also suited as tiger corridors.
Monitoring	Monitoring of tiger population is on-going in the framework of WCS' project with WWF participation in 16 permanent plots. Once every 10 years, a full census has been conducted on the whole tiger range.

Issue	Measures to Enhance Conservation Value of Linkages
Land tenure Management responsibility	The ecological network (Econet) scheme has been developed for the Russian Far East Ecoregion. The tiger habitats are under strict protection in 5 existing nature reserves (about 9000 km^2). Zapovedniks (as organisations) are the landowners under supervision of the Ministry of Natural Resources and the Russian Academy of Science. The regime in the 3 federal level refuges (3000 km^2) prohibits commercial logging, road construction and new developments. They officially belong to the Ministry of Agriculture, but in fact have no budget, or staff. The provincial refuges (about 15,000 km^2) do not offer the long-term persistence of habitats, and their protection should be enforced. The recently established tiger ecological corridors (about 2000 km^2) support restrictions on commercial logging and hunting. These refuges and corridors belong to the recently created Directorate of PAs of the Provincial Government. In total, the existing system of protected areas covers about 30,000 km^2 or 20% of Amur tiger habitat in the Russian part of the range. The lands outside of nature reserves mostly belong to the State Forest Agency of the Ministry of Natural Resources. They have a state forest bureau in each district which is responsible to manage the forests, keep them from fires and protect them from illegal logging, and sell concessions to logging companies on short-term (1–2 years) or long-term (10–25 years) leases. In the same areas, hunting rights belong to the State Control Agency of the Ministry of Agriculture, which defines the quotas for game animals and gives out leases to hunting societies. This last ministry should also protect wildlife, and increase the forage base for ungulates. As a rule, about 15% of each lease should be kept as a wildlife reproductive zone, and they can serve as a kind of buffer zone or corridor for linking tiger protected areas.
Support from local communities	Poaching is one of the major reasons for the population decline of tiger prey. Insurance programmes do not apply to damage from Amur tigers. The Conflict Tiger Programme is not supported by the state. Under such conditions, it is very difficult to gain support from local people. Nevertheless, a poll demonstrated that 98% support the Amur tiger protection programme. The Ungulate Recovery Programme is a new approach, which aims to find a balance between the interest of local hunters, ungulates and tigers.
Integration with other sustainable land management programmes	WWF tried to incorporate tiger conservation principles with regional criteria for FSC (Forest Stewardship Council) certification. The WWF forest programme works to conduct Environmental Impact Assessments (EIAs) of logging plans in tiger habitat to delineate high conservation value forest (HCVF) and Specially Protected Forest Stands. The programme for eco-tourism development includes the linkage between national parks (under process of establishment) and surrounding hunting estates to develop ecological trails and lodges.
Community education and awareness	WWF with partner NGOs has educational projects and annually conducts mass campaigns in model areas and big cities. For example, Tiger Day in Vladivostok attracted 10,000 people on September 24, 2005.
Strategic approach to planning	A strategic approach to planning a PA network to protect the Amur tiger includes: • Finalising the implementation of the system of PAs to cover up to 30% of the Amur tiger's habitat. • Establishing Russia-China transboundary nature reserves in Laoyeling and Vadanshan area. • Creating the system of reproductive zones as ecological corridors and buffer zones. • Improving land use in the defined corridors between the 3 fragmented populations. • Launching special protection measures along the Russia-China border. • Incorporating tiger support measures into state forest inventory and ensuring EIA of each logging or development plan in tiger habitats. • Supporting sustainable forest management practices in commercial forests according to FSC principles. • Promote and implement "Local Tiger Econets", approved by municipal governments as long-term land use plans, including corridors compatible with tiger conservation.

Source: WWF Russia

Annexes

Measures to Enhance Protected Areas Connectivity for the brown bear (Ursus arctos) in the Alpine Ecoregion	
Issue	**Measures to Enhance Conservation Value of Linkages**
Purpose of the linkage	The brown bear is an impressive large carnivore species. Because of its migratory behaviour and ecology it is an ideal indicator for the identification of existing and potential ecological linkages between populations. In order to reach a viable population within the Alpine Ecoregion establishing ecological corridors and increasing the permeability of barriers should be the principle targets.
Ecology and behaviour of species	Brown bears are omnivorous and quite flexible in foraging. Animal food is an important source of protein and energy which is mostly taken from carrion and insects (ants) but of course also from weak game animals as well as livestock. Bears spend the winter in a state of dormancy that lasts a couple of months. In this state the body temperature is lowered a few degrees, heart and breathing rate also drop. During hibernation bears do not feed or drink. They spend the winter in natural caves. Adult male bears can spend warm winters also actively roaming. Bears are active from dusk till dawn. In areas undisturbed by humans they are also active during the day. Bears reach sexual maturity at the age of three or four and can have a lifespan of up to 30 years. Mating season is from May to July. Implantation of the ovule does not occur until October or November. The young are born end of January to the beginning of February while the mother is still in hibernation. Litter size ranges from one to four cubs. Cubs remain with their mother for one year. Usually brown bears live solitarily, except for females accompanied by their cubs. Bears have large overlapping home ranges. In areas with good habitat quality home ranges cover 100 km² and can encompass up to 1000 km² or more in poor habitats. Male home ranges are often larger than females'. Population density averages 0.05 to 20 bears per 100 km². Young females usually settle close to their maternal home range, young males disperse further. Within a growing population even young females are dispersing.
Structural connectivity	The Alpine mountains host a small part of the so called Alpine-Dinaric-Pindos population and some sub-populations that are not regularly in contact with the main population. The whole Alpine-Dinaric-Pindos population consists of about 2,800 individuals. About 50 to 80 individuals presently inhabit the Alpine region. The core area of the population is located in the Dinaric mountains. This population has the potential to serve as a source for the dispersion of brown bears across the Alps. Slovenia hosts a part (450–550 bears) of the Alpine-Dinaric-Pindos population that is concentrated to the south of the country although only about 15–25 bears live in the Alpine part of Slovenia. Two migration corridors into the north connect the Dinarics with the Alps and therefore with the sub-populations. There have been two reintroduction programmes in the Alps since the extinction of brown bears in most regions in the 19th century. One of these programmes was carried out by WWF Austria in the border region between the Austrian Provinces of Lower Austria and Styria in the early 1990s. Three bears were released in order to form a new (sub)population together with one male individual that already migrated from the source population in Slovenia in the 1970s. The other re-introduction programme was carried out by Parco Adamello Brenta in the Italian Region of Trentino from 1999–2002. Ten bears were released to revitalise the vanishing relict population of two old males – the last two real Alpine brown bears. In both programmes bears that originated from Slovenia and Croatia were used to increase the population. At the moment the number of brown bears in the Alpine ecoregion is estimated at about 50–80 individuals (23–35 in the Italian part of the Alps, 12–20 in the Austrian part and 15–25 in the Slovenian part of the Alps). The sub-populations are still far too small to be rated as viable. The recolonisation of the Alps by brown bears through a population surplus in southern (not Alpine) Slovenia strongly depends on management measures taken by the Slovenian hunting and nature protection authorities. The main connections and corridors for brown bears are identified on a pan Alpine scale. The quality of the linkages between the populations is good for most parts of the Alps, although massive barriers (valley bottoms: linear infrastructure and built up areas) are affecting the efficiency of these linkages. The most important barriers (valleys) are the Mur-, Mürztal, the Drautal and the Inntal in Austria as well as the section between Lubljana and Trieste where the barrier is built by the motorway and the Valle dell Adige in Italy. Poor habitat quality (areas that are not built up but also not forested) also has a barrier effect, but actually there are only some regions where this has a serious impact on the quality of the linkages. Some of these regions can be found in the border region between Slovenia and Austria.

Issue	Measures to Enhance Conservation Value of Linkages
Quality of habitat	Brown bears are adaptive and have no great demands on habitat quality. The original distribution of the brown bear in Europe shows its adaptability to different environmental conditions. Within central and eastern Europe bears are mostly pushed back into the mountainous regions by humans. Today they are found in forested areas with generally low human density. Bear habitat consists mainly of three components, food, escape cover and den sites. Of course bear movements (and also its home range) and habitat use, as well as reproduction and survival are strongly influenced by food availability. Furthermore, population density is positively related to food availability. But food is not the only factor that influences the survival of brown bears. The availability of refuge sites, especially of forested areas, is essential. In areas where bears are subject to hunting and poaching, protective shrub or forest cover will likely be an indispensable part of the bear's home area and crucial for its survival. (The culling of brown bears in the Alpine region is forbidden under the regime of the Habitat Directive of the European Union. Exceptions can be made for bears that are endangering humans. It seems reasonable to assume that poaching is still a problem although there is no clear evidence.) Den areas are often associated with remote areas and with low human disturbance. Brown bears have large home ranges. This stresses the need for large areas of suitable habitat and for interconnected habitats to support a viable population. Within the Alpine region there is sufficient adequate habitat to host a viable population of brown bears. The forest habitats are well connected throughout the whole Alps although they are disconnected by natural barriers such as high mountainous areas and by human barriers – mostly densely populated and built up valley bottoms and linear traffic infrastructure. The effect of these barriers needs to be minimised to make the overall habitat more permeable. In some parts of the Alps (especially the northern Alps) where tourism is an important economical factor human population density is much higher the 150 years ago. Nevertheless it is significantly lower in the vast part of the Alpine region. According to changes in land use there is even an increase in forested areas each year in the Alpine countries. So the quantity of brown bear habitat is increasing. The coexistence of bear and humans in the Alpine region and therefore the management of the population are also essential for its survival. The Alps are a landscape that is mainly cultivated by man which is why there are no undisturbed areas large enough to support a brown bear population and no protected areas exclusively designated for the protection of brown bears. The most important management measures for protection of the brown bear are monitoring, damage prevention, damage compensation, information to local people, maintenance of the natural shyness of the animals and a quick reaction on nuisance bears to avoid escalation of conflicts.
Edge effects	There has not been much research work on edge effects for brown bears within linkages. Nevertheless it can be said that some parts of existing linkage zones are covered by unsuitable habitat. Within these unsuitable habitats bears can be easily disturbed by man and vice versa. These areas require special management measures and the culling of supposed nuisance bears should be avoided as far as possible. Especially in densely populated valley bottoms migration corridors should allow for minimal human disturbance (hunting, tourism, recreation) as this reduces the effectiveness of linkage zones.
Width	Minimal requirements for the width of a linkage have been identified for large mammals in general but not explicitly for the brown bears. The width of a linkage should have at least 1 km of undisturbed land. In some exceptional cases (densely populated areas, good structural cover for linkage) it is reasonable to reduce it to at least 500 m for short distances. In order to reduce the likelihood of absolute fragmentation and the risk of extinction of sub-populations, more than one functional connection between two (sub-)populations should be guaranteed. These recommendations are especially true for areas with unsuitable habitat and massive barriers. Special standards have been identified for mitigation measures on the barrier effect of linear traffic infrastructure on a European level (COST 341). Green bridges (overpasses) have to have a minimal width of 80 m increasing with the length of the overpass. This standard has to be achieved especially within corridors of international importance like the brown bear corridors.
Location	We already have a relatively good knowledge of the location of brown bear migration routes. Due to the fact that the brown bear is an impressive animal it can be identified easily by local people and because of its rarity, the appearance of brown bears is well documented. There has also been a lot of research work on telemetry and other monitoring methods. The main results of this work is that linear infrastructure (highways,...) and built up areas represent as much of a barrier as unsuitable habitat. It is therefore important to improve permeability of unsuitable habitat within linkage zones. Integrating the knowledge about barrier effects and location of migration routes into the planning of further land use development and infrastructure is essential for the maintenance and reestablishment of interconnectivity of habitats on a pan-Alpine scale.

Annexes

Issue	Measures to Enhance Conservation Value of Linkages
Monitoring	Monitoring systems on brown bears are already in place in the Alps. The quality of these monitoring systems differs greatly in the national states. The systems are set up for monitoring of the population in general and not especially for identification and monitoring of corridors although this data can be extracted. Current monitoring methods include collecting track data, analysis of damages, collecting observation data and genetic analysis of DNA samples. In Austria the data are collected and accumulated by WWF. In Slovenia the Wildlife and Hunting Department of the Slovenian Forest Service is collecting it and in Italy the data is gathered by Forestry and Wildlife Department of the province of Trento and the Parco Adamello Brenta and by the University of Udine together with the Forest Department of the Province of Friuli Venezia Giulia. Regarding mitigation measures such as green bridges (overpasses) monitoring of these buildings can be easily obtained (infrared cameras, track data...). (Example: Monitoring at the new green bridge over the A 2 in Carinthia. There was already one proof of a bear crossing the bridge. Croatia: Dedin green bridge: monitoring provides evidence of acceptance – more than 1000 crossings during a period of 3 years). The data gathered can reveal important information about the efficiency of the measure and, together with other data, of the functionality of a corridor.
Land tenure and Management responsibility	The Natura 2000 Network set up by the Habitats and Birds directive of the EU and the Emerald Network based on the Bern Convention have two main targets: The establishment of a coherent network of protected areas and the maintenance or restoration of a favourable conservation status of certain species and habitats. The designation of protected areas for the Natura 2000 is almost finished. Because of its large home ranges and the habitat situation in the Alpine ecoregion no single protected area was designated for the exclusive protection of the brown bear. It is therefore, all the more important to integrate the idea of connectivity of habitats as well as corridors for brown bears into regional and local spatial plans and to secure these corridors through spatial planning processes. The creation of a network of protected areas is furthermore supported by the nature protection protocol of the Alpine Convention. The management responsibility for the brown bear is at the level of national or provincial authorities. The Slovenian Government has agreed on a brown bear management strategy. In Austria a management plan exists (developed together with WWF). In Italy it is a provincial responsibility to carry out brown bear management. A vast number of measures in management plans are directly relevant to bears such as rules for exceptional culling and procedures for nuisance bears. But measures addressing the socio-economic component of bear management such as compensation rules and information to local communities are also important components of management plans. It is also important to harmonise bear management throughout the whole Alpine ecoregion.
Support from local communities/ Community education and awareness	The involvement of the local community is another essential factor for the survival of brown bears in the Alps and an important part of bear management. If the public is better informed about the situation of bear management and if it knows how to deal appropriately with bears, acceptance towards bears will increase. Communication creates a relationship of trust among local people, authorities, NGOs and other stakeholders. The active involvement of local communities also creates a sense of responsibility. The establishment of efficient linkages at a regional and local level has to be a participatory process strongly taking into account scientific knowledge and ecological needs. With regard to densely populated valley bottoms, the argument for the need of free spaces as ecological linkages might possibly be quite welcome by some local communities (the pressure to the local authorities is extremely high, although in some cases they would prefer to keep the landscape free).
Integration with other sustainable land management programmes	In the framework of the rural development funds and the structural funds of the EU, measures that are contributing to the enhancement of ecological connectivity could be supported. Useful measures that could be funded would be reforestation programmes in corridor areas or measures that improve the structural connectivity within intensely used areas and therefore unsuitable habitats for brown bears (measures for land set-aside or extensification programmes).
Strategic approach to planning	To improve the connectivity of populations of brown bears there is no fundamental need to enlarge protected areas (according to the criteria of IUCN) in the Alpine ecoregion. Nevertheless protected areas in remote area (areas with low human population density, low tourism and low fragmentation) might safeguard some functions for the bear population. These functions could be: breeding sites (remote areas with good cover); winter sites (inaccessible areas with a sufficient number of dens); corridor function (primarily unsuitable habitat connecting forest habitats especially in landscapes that are under pressure by human activity e.g. swamps). These functions can and should be guaranteed by the establishment of protected areas. More importantly, the efficiency and effectiveness of linkages has to be increased by different means. On the one hand overall Alpine bear management is necessary to solve problems that may arise through coexistence of man and bear. This is based on the premise that the number of bears can increase significantly and put some population pressure on the individuals in order to begin recolonising suitable habitat. On the other hand a strategic planning approach is necessary to guarantee the functionality of linkages and corridors. This could be reached by legally binding means of spatial planning, by agreements and contracts, or by introduction of ecological standards (like the COST 341 standards) into infrastructural planning.

Source: WWF Austria

Measures to Enhance Protected Areas Connectivity for the Saiga antelope (Saiga tatarica**) (Kazakhstan, Uzbekistan, Turkmenistan, Russia)**	
Issue	**Measures to Enhance Conservation Value of Linkages**
Purpose of the linkage	The saiga antelope as a flagship species can help to define gaps in the system of protected areas – in order to expand it. Recently saiga is one of the most threatened species in the context of national priorities (particularly for Kazakhstan).
Ecology and behaviour of species	Saiga is a true migratory species, covering thousands of kilometres twice a year. Migrating in spring from its winter grounds to the north, to the lambing areas, saiga concentrate in huge herds, thus presenting an easy prey both for natural predators and for people. This brought them to the edge of extermination already once in the species' history. The last decades were maybe the most tragic for the saiga, leading to a decrease of species' numbers from millions to some thousands in separate populations, and to a sex ratio characterized by very low percentage of males (about 0.5% in some populations!) which makes natural reproduction and restoration highly problematic. After lambing the saiga widely disperse in suitable habitats, and migrate to the south in autumn in small groups. Thus the habitats of the species cover huge areas of millions of hectares, which cannot be covered by protected areas. But different parts of the area have different seasonal importance, while saiga migrations provide a unifying link for the whole area. Both vegetation and variable fauna representatives depend on saiga populations: lack of saiga grazing leads to degradation of natural steppe ecosystems (sheep-breeding can replace it to some extent, quantitatively, but not qualitatively). In the absence of saiga such very rare species as sociable lapwing nest only in the overgrazed surroundings of the villages – thus being much more vulnerable to nest destruction, etc.
Structural connectivity	With a low population density, the saiga has seriously changed its areas of winter and spring concentrations, as well as its preferred migratory routes. Moreover, both areas of concentration and migratory routes can vary depending on climate characteristics of the particular year. At the beginning of the 1990s livestock practically decreased 10 fold, and simultaneously cultivated areas were seriously reduced, leaving plenty of free habitat for the saiga, particularly in the steppes of Kazakhstan and Kalmykia (Russia). But the situation is starting to change, with new laws on land use being adopted. These could lead to parts of the steppe areas falling under private ownership (for sheep-breeding, agriculture, game management). For this reason it is all the more important to identify the areas that guarantee connectivity for the whole ecoregion – and to identify the regime of protection and sustainable use, which could ensure this connectivity. Regular monitoring of saiga migrations, its variations under different conditions (dry and wet years, cold and mild winters, etc.) is a key point for identification of such ecosystem links.
Quality of habitat	Recently the quality of habitats is more than satisfactory for the species. The carrying capacity of the area exceeds the recent population pressure and livestock grazing.
Location	Free migrations of saiga herds can be easily broken by building fences across migratory routes (in case of private land ownership), building pipe-lines without special passages, by ploughing up some key habitats (lambing sites), etc. So, it is very important to plan long-term land-use of these huge areas in accordance with the needs of saiga populations, leaving free the major migratory routes as linkages inside homogeneous seasonal saiga habitats and between different types of ecosystems – to ensure seasonal habitat changes. The same linkages would ensure sustainable development of the ecosystems as a whole including its most threatened key elements.
Monitoring	As it is well documented that saiga populations are highly threatened, the countries of the region – and Kazakhstan in particular – are paying serious attention to population monitoring and conservation measures. The government of Kazakhstan is allocating important funding for aerial censuses of the species. In addition, monitoring of seasonal distribution, migrations etc. is conducted by different methods – funded from variable complimentary sources (Government of Kazakhstan, international projects, such as the Darwin Initiative, INTAS, FZS-WWF, etc.) The results of monitoring allow to adapt the system of anti-poaching patrols to the variations of the species' seasonal distribution.

Annexes

Issue	Measures to Enhance Conservation Value of Linkages
Land tenure/ Management responsibility	Recently Kazakhstan is changing its legislation on land use – and huge areas of government property will be privatised. But simultaneously a system of land reservation for future establishment of protected areas is taking place in the country. The ecological network (Econet) scheme, which is developed for the region in the framework of a GEF-UNEP-WWF project, includes all the species' habitats as core zones, and migratory routes as ecological corridors and buffer zones. In accordance with the decision of the Interregional Sustainable Development Commission (ISDC) and relevant ministries of the countries of the region, Econet is integrated in Regional Environmental Action Plan (REAP) and national sustainable development plans as a major component, which ensures biodiversity conservation. This means, that the Econet scheme would be an officially approved basis for a future protected area system in the country. Thus any changes in the land use in the areas, included in the Econet plan, would take into consideration the demands of species and habitat conservation, while proper management would be ensured and funded by relevant governmental authorities. The MOU and Action plan for saiga conservation was developed in the frame of CMS with participation of different stakeholders of all range states – and in November 2005 the first parties signed it. This means that all range states undertake responsibilities for saiga conservation/habitat management on the highest governmental level – including all necessary transboundary measures.
Support from local communities Community education and awareness	Poaching for horns, an important source of income for the local population, was the major factor of catastrophic saiga population decline. Besides that, poaching for meat as a source of food for local population in the difficult years of the period of transition economy was also an important factor. Thus interaction with local communities is crucial in the process of species' restoration. It includes community involvement in the process, development of alternative ways of economic development as sources for sustainable livelihood support, etc. Poverty reduction and improvement of the livelihood levels of local populations (especially visible in Kazakhstan and Turkmenistan during the last years) make ecological education and awareness very important components (as there is already no real need for poaching for people's survival – but "tradition" needs to be broken). Ecological education and awareness are included in all projects devoted to saiga and its habitats conservation and restoration in the region is one of the most important components. The special project under the Darwin Initiative and the GEF project, developed by UNDP Kazakhstan and Uzbekistan are especially aimed at socio-economic development and local communities' involvement.
Integration with other sustainable land management programmes	Saiga habitats cover huge plain areas of the region – which are severely threatened with desertification – both in the northern (spring-summer) and especially in southern (wintering) parts of the habitats. An important part of the winter habitat includes the area of the Aral sea disaster. Therefore, any activities on saiga habitat conservation are linked to combating desertification activities and programmes on saving the ecosystems of the Aral sea basin.
Strategic approach to planning	As noted above, saiga habitat connectivity is a component of the regional Econet – which strategically plan long-term development of the system of protected areas and sustainable land-use in the scale of the whole region, covering the territory of all 5 countries of Central Asia – the Republic of Kazakhstan, Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, the Republic of Uzbekistan.

Source: WWF Central Asia programme

Measures to Enhance Protected Areas Connectivity for the Amur Leopard (Panthera pardus altaica) in the Russian Far East and North East China	
Issue	**Measures to Enhance Conservation Value of Linkages**
Purpose of the linkage	The Amur or Far Eastern leopard can help to define gaps in the protected areas system. Present populations total 30–45 individuals. Creating transboundary linkages, including protected areas in Russia, China and North Korea, will support long term conservation of the single stable population, and create conditions for natural appearance of new groups and reintroduction.
Ecology and behaviour of species	Because the Far Eastern leopard has large home ranges (up to 200 km^2), and also because of competition with the Amur tiger, large areas are necessary for long term persistence of the population of 50 or more leopards. The species follows the seasonal movements of wild ungulates, and this should be taken into account in the delineation of protected areas and corridors. At the same time, high prey concentration, for example, sika deer herds in deer farms, can help limit the leopard's migration, providing conditions for their successful breeding and decreasing risks.
Structural connectivity	At least 50% of remaining leopard habitat is included in different protected areas. It includes the Kedrovaya pad' zapovednik (strictly protected area – 179 km^2), Federal Barsoviy Refuge (1069 km^2) and provincial Borisovskoe Plato Refuge (639 km^2) in Russia. Just along the border with China, the Forest Bureau has created Hunchun nature reserve in Jilin province, and connected it with Erduan Nature reserve in Heilongjiang province. Together they cover about 1000 km^2 of leopard habitat. The bordering forests are in good conditions, and border fences would not stop leopard movement. This isolated breeding ground is connected with the former range in Sikhote-Aline mountain and Pogranichnyi ridge (see the Amur tiger). The area connects with Northern Hamgen province of People's Democratic Republic of Korea, where leopard tracks were registered in 2005. One main obstacle to connectivity is possible further development of lands along the Trans-Siberian railway (including a new pipeline for oil and gas). A further threat would be the possible change in land use regime at the Russia-China border to expand development.
Quality of habitat	Habitat in the remaining parts of the leopard range has a high carrying capacity both in terms of forest quality and prey base. Nonetheless, annual fires have been slowly leading to deforestation of marginal areas, shrinking the core zone of the population. An increase in the harvest of Mongolian oak, Korean pine and Manjurian fir tree has also worsened habitat quality. The reconstruction of highways and railways and plans to build pipelines threaten to fragment the population. The re-instating of agriculture in river valleys has led to the creation of developed zones crossing the last range of the leopard. WWF-Russia has obtained that management plans for hunting estates in leopard habitat be elaborated. These documents foresee the creation of rest sites and measures for increasing ungulate numbers during hunting. Improvements have been suggested to forest exploitation plans to consider the leopard in important areas for the species. One of the central challenges for habitat and leopard protection is to halt the construction of an oil terminal in Perevoznaya Bay. Another important threat that is coming up is the recreation development along Amursky Bay.
Edge effects	Because of the very small and ever narrowing range along the Russia-China border, edge effect is very important. The disturbance zone is about 5 km along the roads and settlements, thereby shrinking possible habitats.
Width	Width and location of the Econet protected areas for conservation of the Far Eastern leopard was elaborated taking into account all the peculiarities of the subspecies' biology, requirements for representation and quality of habitats. The best size of corridors should be about the diameter of the leopard's home range (approximately 10–15 km).
Location	The best location for a leopard corridor is the forest belt along the Russia-China border, and the Banevourovo army polygon.
Monitoring	WWF-Russia participates in a longstanding monitoring programme for leopard population, elaborated and implemented in collaboration with WCS, the Russian Academy of Science and ISUNR. In particular, seven leopard surveys were conducted beginning in 1997. Research using tracking cameras is ongoing.

Annexes

Issue	Measures to Enhance Conservation Value of Linkages
Land tenure Management responsibility	Leopard habitat is under strict protection in the single nature reserve (IUCN category Ia) managed by the Russian Academy of Science. The federal refuge (IUCN category III) officially belongs to the Ministry of Agriculture, but in fact has no budget, or staff. Its regime prohibits commercial logging, road construction and new developments. The provincial refuge (IUCN category IV) cannot offer long-term persistence of habitats, and its regime should be enforced. This refuge belongs to the recently created Directorate of PAs of the Provincial Government. The 30% of lands outside of nature reserves mostly belongs to the State Forest Agency of Ministry of Natural Resources. It has 3 state forest bureaus in each district with the rights to manage forests, protect them from fires and illegal logging, and sell forests as concessions to logging companies on the basis of short-term (1-2 years) leases. There are 2 forest bureaus, which belong to the Ministry of Defence, where, in addition to logging, army manoeuvres are conducted. In the same areas, the hunting rights belong to the State Control Agency of the Ministry of Agriculture, which defines the quotas for game animals and gives leases to hunting societies. The latter should protect wildlife and increase forage for ungulates. As a rule, about 15% of each lease should be kept as a wildlife reproductive zone, and they can serve as a buffer zone or corridor for linkage of leopard protected areas.
Support from local communities	Poaching is one of the major reasons for the decline of leopard prey. An insurance programme for livestock is supported by the Phoenix Foundation. There are no registered cases of leopard attacks on people. The Ungulate Recovery Programme is a new approach, which aims to find a balance between the interests of local hunters, ungulates and leopards.
Integration with other sustainable land management programmes	The ecotourism development programme of the Khasan district includes a Leopard visitor centre “Land of Leopard”. A Forest Restoration Programme was designed to restore secondary forest with native broadleaf coniferous forest. One of its components includes forest surveys with delineation of key biotopes for the leopard and its prey. Sustainable forest management and sustainable use of non-timber forest production by local people is also an important element. A GEF/World Bank full size project is devoted to fire fighting in leopard habitat. The TumenNET GEF/UNDP project aims to integrate nature conservation with economic development on the border between Russia-China and North Korea.
Community education and awareness	Community education work is being conducted with local leaders and school children. University student groups participate in anti-poaching activity with support from WWF and the Phoenix Foundation.
Strategic approach to planning	Necessary actions include: • Up-grading Borisovskoe Plato refuge to the federal level and joining it with Barsovyi refuge, shifting their management to the Ministry of Natural Resources. • Integrating existing PAs in Russia into one large joint national park with strong management. • Launching the Russia-China-North Korea transboundary nature reserve. • Creating the system of Reproductive zones as ecological corridors and buffer zones. • Ensuring appropriate land use regime in the main defined corridors to Pogranichnyi ridge, Sikhote-Aline mountain and Northen Hamgen province. • Launching a special protection regime along Russia-China-North Korea border. • Incorporating measures of leopard support into state forest inventory and ensuring EIAs of each logging or development plans in leopard habitats. • Supporting sustainable forest management practices in commercial forest according to FSC principles. • Elaborating land use plan in the entire leopard habitat and approving them at provincial and district levels.

Source: WWF Russia

Measures to Enhance Protected Areas Connectivity for the Persian Leopard (Panthera pardus saxicolor**) (Turkmenistan)**	
Issue	**Measures to Enhance Conservation Value of Linkages**
Purpose of the linkage	The Persian leopard is a species with large individual home-ranges and a comparatively low natural population density. It therefore needs vast areas to ensure the development of a self-sustainable population. The existing system of protected areas cannot ensure the species' sustainability. At the same time an important expansion of the protected areas system could cause conflict with socio-economic development plans of the region.
Ecology and behaviour of species	The Persian leopard home range consists of several hunting grounds. Each one is approximately several thousand hectares in size, equalling the entire individual range of leopards in Africa. The range of the mature male overlaps, as a rule, partly or completely with the ranges of two or three adult females sharing the same hunting areas. The size of the home range depends on the population density of wild ungulates (which had seriously dropped at the beginning of the 1990s) the natural prey of the species. In case of low population density of prey species, home ranges of leopards seriously increase. Thus, the existing strictly protected areas can include the home ranges of just a few animals. Sustainable development of a reproductive population could be ensured only by a system of ecological corridors and buffer zones, which combine wildlife conservation and sustainable economic development of local communities. The more or less safe Turkmenian population of Persian leopard consists of about 90 animals; while populations in Iran and the Caucasus are smaller. The sustainable development of the species' population can only be ensured with a population of about 500 reproductive animals with free genetic exchange. Therefore, only a transboundary system of protected areas of different status, which ensures genetic exchange between Caucasus-Iran and Turkmenistan, can guarantee the conservation of the species.
Structural connectivity	Major habitats of the Persian leopard include mountain ranges of the above-named countries. On the northern border of the species' habitat in the low and middle mountain lands of the Iran-Afghanistan Plateau, the leopard habitats are represented by rocky ravines, which are actually fully depleted of forest vegetation, by mountain tablelands with steppe-type vegetation, and some sparse juniper, and by upper reaches of large ravines covered by closed forest and with stony placers and precipices along the cliffs. In the past the total area of the leopard habitat occupied several million hectares, covering all mountain systems from Kugitang – Badhyz – Kopetdag – Balkhan mountains in the north-east of the area, connected by mountain systems of Iran- south of the Caspian sea – with the Caucasus (north-western part of the area) and Turkey and the Arabian peninsula to the south.
Quality of habitat	In general leopard habitat is defined mainly not by the relief or vegetation characteristics, but by the condition of its food resources. Practically all habitats of the leopard all over its area are becoming rapidly degraded under the pressure of overgrazing by livestock, logging, forest fires, hunting, and partly recreation activities, as well as the result of development of new territories for agricultural cultivation. There are no grounds to suppose that in the near future the anthropogenic pressure will decrease if current trends of social and economic development remain the same. Therefore, some special additional measures need to be undertaken in order to prevent overgrazing by livestock and to increase the population of the natural prey species.
Edge effects	As the population density of the Persian leopard is naturally rather low, its further decline causes problems in species' reproduction in the edge areas (home ranges are so large, and competition for prey is so high, that animals hardly ever meet – thus reproductive success is very low). This is one of the most probable reasons why the Persian leopard is already extinct in the most eastern part of its historical area (Kugitang mountains), in the southern part of the area, is near to extinction in the north-western part of the area (Russian part of Caucasus). Therefore, these areas need to be included in the network and connected with core areas by a system of linkages.
Width/Location	Practically all of the main mountain ranges in the leopard's natural area should be included in the network, establishing linkages between protected areas – the major refuges of leopard and its prey species. They need to ensure development of populations of wild ungulates (natural prey species of leopard) and possibilities of individual movements – genetic exchange in population, which is really critical for species' sustainable development. Such planning of linkages would simultaneously ensure conservation of the most threatened mountain ecosystems – grasslands and forests of high conservation value, which in turn serve as water-saving and land-slide protection for all ecosystems and agricultural areas in the foothills and surrounding valleys.

Annexes

Issue	Measures to Enhance Conservation Value of Linkages
Monitoring	Monitoring of the Turkmenian part of the leopard population is regularly on-going in the framework of WWF projects. A survey had been conducted lately in the Caucasus, part of Turkey and part of Iran. A regular monitoring system needs to be established, providing us with background information on the effectiveness of linkages for the population development.
Land tenure Management responsibility	An ecological network (Econet) scheme, which is developed for the region of Central Asia in the framework of a GEF-UNEP-WWF project, includes all the critical species' habitats as core zones, and migratory routes as ecological corridors and buffer zones. In accordance to the decision of the Interregional Sustainable Development Commission (ISDC) and relevant ministries of the countries of the region, Econet is integrated in Regional Environmental Action Plan (REAP) and national plans of sustainable development as a major component, which ensures biodiversity conservation. This means, that the Econet scheme would be an officially approved basis for future protected areas' system development in the country. Thus, any changes in the land use in the areas, included in Econet plan, would take into consideration the demands of species and its habitat conservation, while proper management would be ensured and funded by relevant governmental authorities. This ensures governmental management responsibility for the core areas and linkages in the Turkmenian part of the area. Similar activities are planned in the Caucasus (in the process of development). Necessary mechanisms should be established in transboundary areas of Iran- which connect Turkmenian and Caucasian parts of the species' populations.
Support from local communities Community education and awareness	Poaching is one of the major reasons for the leopard's population decline. Moreover, since at the beginning of the 1990s poaching on wild ungulates provided a real livelihood option for local people to survive, leopards lost their prey base and began preying on livestock. In the situation when a leopard kills a cow, a family treasure, it is not enough just to control poaching or to develop education and awareness campaigns. WWF has developed community-based compensation for leopard damage, combined with wide education programmes and awareness campaigns. Meanwhile, special measures are undertaken to restore the natural prey base, thus decreasing the species' pressure on livestock. Such involvement of local communities allowed to stabilise the leopard population in Kopetdag, to save numerous animals and to change the attitudes of local people towards the species.
Integration with other sustainable land management programmes	Persian leopard habitats cover mountain ranges of the region which are severely threatened with degradation under pressure from overgrazing by livestock, logging, forest fires, hunting, and partly recreation activities, as well as by development of new territories for agricultural cultivation. Climate change also plays an important role as it causes sharpening of extreme arid conditions of these ecosystems. Thus, any activities related to leopard habitat conservation, requires activities to Combat Desertification, one of the 5 priorities of the Regional Environmental Action Plan.
Strategic approach to planning	As noted above, Persian leopard habitat connectivity is a component of the regional Econet – which strategically plan long-term development of the system of protected areas and sustainable land-use at the scale of the whole region, covering the territory of all 5 countries of Central Asia – the Republic of Kazakhstan, Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan. This means that leopard conservation is being integrated into strategic plans in Turkmenistan. A similar process is ongoing in the Caucasus. Special measures are undertaken locally for the species' conservation in Iran and Turkey. In order to ensure a strategic approach to the species' conservation and restoration, a transboundary system of protection needs to be planned and implemented for the whole range of the Persian leopard – Turkmenistan, Iran, Turkey, as well as countries of the Caucasus.

Source: WWF Central Asia Programme

Annex 2: **Specific recommendations for each species**

Specific WWF recommendations for the argali in the Altai Sayan ecoregion (Mongolia, Russian Federation, Kazakhstan):

- Undertake a full gap analysis of argali habitat and optimal areas for connectivity.
- Establish sustainable and well monitored trophy hunting programmes to provide return to local people.
- Establish community based wildlife management programmes in the argali habitat to ensure support for protecting the argali in the Altai Sayan ecoregion.
- Impose seasonal grazing limitations in wildlife birthing areas to help promote grazing practices that reduce impacts on wildlife.

Specific WWF recommendations for the Iberian lynx (Spain):

- The corridor between the last remaining breeding population of lynx in Doñana national park with the other population in Sierra Morena is of paramount importance if the remaining individuals are to have a chance of survival and re-population. A Green Corridor plan should be developed in order to guarantee the effective connection between both areas. More natural corridors (using rivers) should be protected;
- A change in land use (from intensive farming to natural habitat) should be promoted, the recovery of stepping stones (for example eliminating eucalyptus plantations) should be supported and the permeability of Doñana's territory (reducing number of roads) must be increased.
- It is also important to guarantee connectivity between Doñana and the Portuguese border where large portions of habitat are available.
- Finally the connectivity between Sierra Morena and Montes de Toledo must be improved including insertion of more areas in the Natura 2000 network.

Specific WWF Recommendations for the brown bear in the Alps (Italy, Austria, Slovenia, Switzerland, France):

- Development of an overall Alpine bear management plan is necessary to solve problems that may arise from coexistence of man and bear.
- Mitigation measures (green bridges, landscape bridges) have to be set up where linear infrastructure (motorways, railways etc) and built up areas in the valley bottoms present serious barriers. Integration of the "COST 341" standards for new and existing transport infrastructure should be promoted.
- Areas of unsuitable habitat within a known migration route that create a barrier for brown bears should be improved by facilitating and funding landscape elements that increase structural connectivity.
- The existing migration corridors have to be considered in every stage of planning and land development.

Annexes

Special recommendations for Austria and Slovenia for the protection of the brown bear:

- The Slovenian government and hunting authorities are already considering the existing corridors within the framework of the management of brown bears. Culling in the defined transit areas should remain exceptional. The measures taken should be coordinated with the Austrian (and for the western part, the Italian) authorities.
- Slovenia has to increase the structural connectivity of forested habitats along the two known transit areas in order to make this area permeable for bear migration. The region between the Kaminske Alpe and the Pohorje should be managed like a transit area for brown bears in the national strategy in order to increase the chance of brown bears migrating to Austria. Structural connectivity also has to be increased in this region. Spatial planning should support the existing corridor.
- Austria (Carinthia) has to increase the structural connectivity of forested habitats along the border with Slovenia, particularly in the area between Lavamünd and Slovenj Gradec (SLO), Bleiburg and Privalje (SLO). Spatial planning should support the corridor.
- Austria has to improve the permeability of its valley bottoms especially in the Mur-Mürz Tal and to safeguard the last existing options for crossing valleys. This could be achieved by green bridges over motorways and railways. Spatial planning should support corridors. In Styria for instance, spatial planning already supports the corridor within valley bottoms and this should be extended to other regions (e.g. Carinthia, Salzburg, Tirol).
- Austria has to safeguard the connectivity and the permeability of forest habitat along the Koralm Korridor to maintain its effectiveness. This should be taken into account especially in new infrastructure projects.

Specific WWF recommendations for the protection of the saiga in Central Asia (Kazakhstan, Uzbekistan, Turkmenistan, Russian Federation):

- In Kazakhstan – creation of an important system of PAs (not less then 6 million ha) – to ensure natural migrations of the Betpackdala population, as well as conservation in winter and spring (lambing) sites. The timing is right as Kazakhstan is starting the process of land privatisation.
- Land-use planning and reservation of lands for future creation of PAs in Kazakhstan needs to include considerations for the saiga which could be threatened by fencing off newly privatised lands.
- In Uzbekistan, where the saiga regularly migrates in winter, new PAs need to be created
- Connectivity between Kazakhstan, Uzbekistan and Turkmenistan (ecological corridors) needs to be secured and special passes for saiga in the newly established system of fences should be built along the border.
- For the Volga- Ural population, similar ecological corridors need to be established at the Russian-Kazakhstan border (ensuring connectivity).

3

Specific WWF recommendations for the Amur leopard (Russian Federation, China, North Korea):

- Upgrade the Borisovskoe Plato refuge to the federal level and join it with Barsovyi refuge. Both of them should be managed by the Ministry of Natural Resources.
- Integrate existing PAs in Russia into one large joint national park (with different zones and linkages) and with strong management.
- Establish a Russia-China-North Korea transboundary nature reserve.
- Create a system of Reproductive zones as ecological corridors and buffer zones.
- Ensure an appropriate land use regime in the main corridors to Pogranichnyi ridge, Sikhote-Aline mountain and Northern Hamgen province.
- Establish a special protection regime along the Russia-China-North Korea border.
- Incorporate leopard support measures into state forest inventories and undertake EIAs in each logging or development plan located within leopard habitat.
- Ensure sustainable forest management practices in commercial forests according to FSC principles to help support better management in forest habitat for the leopard.
- Elaborate land use plans in the entire leopard habitat that should be approved at the provincial and district levels.

Specific WWF recommendations for the Persian leopard (Turkmenistan, Iran, Azerbaijan, Armenia, Georgia, Russian Federation):

- The three protected areas inhabited by the Persian Leopard in Turkmenistan (Badkhyz, Kopetdag and Sunt-Khasardag) need to be connected into a network (connectivity between core-sites, establishment of ecological corridors, sanctuaries combining sustainable grazing and nature conservation).
- A strict protected area needs to be established in the Bolshoi Balkhan mountains
- Special conservation/species restoration measures are needed, in the Russian part of the Caucasus, Azerbaijan, Armenia and Georgia through reintroduction. In order for this effort to be viable, and to have a sustainable population of leopard throughout the area, a network of protected areas needs to be established throughout the whole region – connecting Turkmenistan via Iran, south of the Caspian sea and into the Caucasus.

Specific WWF Recommendations for the Amur tiger (China, Russian Federation):

- Put an end to poaching
- Establish a tiger ECONET (a protected area system encompassing at least 30% of tiger area)
- Incorporate tiger conservation into development of local communities
- Establish a positive tiger image to generate income for local people (eg. via tiger labelled products)

Annex 3 Goals, targets and activities of the CBD Programme of Work on Protected Areas

PROGRAMME ELEMENT 1: Direct actions for planning, selecting, establishing, strengthening, and managing, protected area systems and sites

Goal 1.1 – To establish and strengthen national and regional systems of protected areas integrated into a global network as a contribution to globally agreed goals

Target

By 2010, terrestrially/ and 2012 in the marine area, a global network of comprehensive, representative and effectively managed national and regional protected area system is established as a contribution to (i) the goal of the Strategic Plan of the Convention and the World Summit on Sustainable Development of achieving a significant reduction in the rate of biodiversity loss by 2010; (ii) the Millennium Development Goals – particularly goal 7 on ensuring environmental sustainability; and (iii) the Global Strategy for Plant Conservation.

Suggested activities of the Parties

1.1.1 By 2006, establish suitable time-bound and measurable national and regional level protected area targets and indicators.

1.1.2 As a matter of urgency, by 2006, take action to establish or expand protected areas in any large, intact or relatively unfragmented or highly irreplaceable natural areas, or areas under high threat, as well as areas securing the most threatened species in the context of national priorities, and taking into consideration the conservation needs of migratory species.

1.1.3 As a matter of urgency, by 2006 terrestrially and by 2008 in the marine environment, take action to address the under-representation of marine and inland water ecosystems in existing national and regional systems of protected areas, taking into account marine ecosystems beyond areas of national jurisdiction in accordance with applicable international law, and transboundary inland water ecosystems.

1.1.4 By 2006, conduct, with the full and effective participation of indigenous and local communities and relevant stakeholders, national-level reviews of existing and potential forms of conservation, and their suitability for achieving biodiversity conservation goals, including innovative types of governance for protected areas that need to be recognized and promoted through legal, policy, financial institutional and community mechanisms, such as protected areas run by Government agencies at various levels, co-managed protected areas, private protected areas, indigenous and local community conserved areas.

1.1.5 By 2006 complete protected area system gap analyses at national and regional levels based on the requirements for representative systems of protected areas that adequately conserve terrestrial, marine and inland water biodiversity and ecosystems. National plans should also be developed to provide interim measures to protect highly threatened or highly valued areas wherever this is necessary. Gap analyses should take into account Annex I of the Convention on Biological Diversity and other relevant criteria such as irreplaceability of target biodiversity components, minimum effective size and viability requirements, species migration requirements, integrity, ecological processes and ecosystem services.

1.1.6 By 2009, designate the protected areas as identified through the national or regional gap analysis (including precise maps) and complete by 2010 terrestrially and 2012 in the marine environments the establishment of comprehensive and ecologically representative national and regional systems of protected areas.

1.1.7. Encourage the establishment of protected areas that benefit indigenous and local communities, including by respecting, preserving, and maintaining their traditional knowledge in accordance with article 8(j) and related provisions.

Suggested supporting activities of the Executive Secretary

1.1.8 Identify options for quantitative and qualitative protected areas targets and indicators that should be used at the global level that could contribute to the 2010 target and the Millennium Development Goals.

1.1.9 Invite relevant international and regional organizations to offer their assistance to the Parties in conducting national-level gap analyses.

1.1.10 Compile and disseminate through the clearing-house mechanism and other relevant media relevant approaches, frameworks and tools for system planning and promote and facilitate the exchange of experiences and lessons learned in applying and adapting them to different ecological and social settings.

Goal 1.2 – To integrate protected areas into broader land- and seascapes and sectors so as to maintain ecological structure and function

Target

By 2015, all protected areas and protected area systems are integrated into the wider land- and seascape, and relevant sectors, by applying the ecosystem approach and taking into account ecological connectivity and the concept, where appropriate, of ecological networks.

Suggested activities of the Parties

1.2.1 Evaluate by 2006 national and sub-national experiences and lessons learned on specific efforts to integrate protected areas into broader land- and seascapes and sectoral plans and strategies such as poverty reduction strategies.

1.2.2 Identify and implement, by 2008, practical steps for improving the integration of protected areas into broader land- and seascapes, including policy, legal, planning and other measures.

1.2.3 Integrate regional, national and sub-national systems of protected areas into broader land- and seascape, inter alia by establishing and managing ecological networks, ecological corridors and/or buffer zones, where appropriate, to maintain ecological processes and also taking into account the needs of migratory species.

1.2.4 Develop tools of ecological connectivity, such as ecological corridors, linking together protected areas where necessary or beneficial as determined by national priorities for the conservation of biodiversity.

1.2.5 Rehabilitate and restore habitats and degraded ecosystems, as appropriate, as a contribution to building ecological networks, ecological corridors and/or buffer zones.

Suggested supporting activities of the Executive Secretary

1.2.6 Encourage the organization of regional and sub-regional workshops for the exchange of experiences on integration of biodiversity and protected areas into relevant sectoral and spatial plans.

1.2.7 Compile and disseminate, using the CHM and other media, case-studies of best practices and other reports regarding the application of the ecosystem approach in relation to protected areas at the international, regional, national and sub-national levels.

Annexes

Goal 1.3 – To establish and strengthen regional networks, transboundary protected areas (TBPAs) and collaboration between neighbouring protected areas across national boundaries

Target

Establish and strengthen by 2010–2012 transboundary protected areas, other forms of collaboration between neighbouring protected areas across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the ecosystem approach, and improving international cooperation.

Suggested activities of the Parties

1.3.1 Collaborate with other parties and relevant partners to establish effective regional networks of protected areas, particularly in areas identified as common conservation priorities (e.g. barrier reef systems, large scale river basins, mountain systems, large remaining forest areas and critical habitat for endangered species), and establish multi-country coordination mechanisms as appropriate to support the establishment and effective long term management of such networks.

1.3.2 Collaborate with other Parties and relevant partners through the United Nations Informal Consultative Process on the Law of the Sea (UNICPOLOS) to establish and manage protected areas in marine areas beyond the limits of national jurisdiction, in accordance with international law, including the UN Convention on the Law of the Sea, and based on scientific information.

1.3.3 Establish, where appropriate, new TBPAs with adjacent Parties and countries and strengthen effective collaborative management of existing TBPAs.

1.3.4 Promote collaboration between protected areas across national boundaries.

Suggested supporting activities of the Executive Secretary

1.3.5 Collaborate and consult with relevant organizations and bodies for developing guidelines for establishing transboundary protected areas and collaborative management approaches, as appropriate, for dissemination to Parties.

1.3.6 Compile and disseminate information on regional networks of protected areas and transboundary protected areas, including, as far as possible, their geographical distribution, their historical background, their role and the partners involved.

1.3.7 Review the potential for regional cooperation under the Convention on Migratory Species with a view to linking of protected area networks across international boundaries and potentially beyond national jurisdiction through the establishment of migratory corridors for key species.

Goal 1.4 – To substantially improve site-based protected area planning and management

Target

All protected areas to have effective management in existence by 2012, using participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a long-term management plan with active stakeholder involvement.

Suggested activities of the Parties

1.4.1 Create a highly participatory process, involving indigenous and local communities and relevant stakeholders, as part of site-based planning in accordance with the ecosystem approach, and use relevant ecological and socio-economic data required to develop effective planning processes.

1.4.2 Identify appropriate measurable biodiversity conservation targets for sites, drawing on criteria laid out in Annex I to the Convention on Biological Diversity and other relevant criteria.

1.4.3 Include in the site-planning process an analysis of opportunities for the protected area to contribute to conservation and sustainable use of biodiversity at local and regional scales as well as an analysis of threats and means of addressing them.

1.4.4 As appropriate, but no later than 2010, develop or update management plans for protected areas, built on the above process, to better achieve the three objectives of the Convention.

1.4.5 Integrate climate change adaptation measures in protected area planning, management strategies, and in the design of protected area systems.

1.4.6 Ensure that protected areas are effectively managed or supervised through staff that are well-trained and skilled, properly and appropriately equipped, and supported, to carry out their fundamental role in the management and conservation of protected areas.

Suggested supporting activities of the Executive Secretary

1.4.7 Compile and disseminate through the clearing-house mechanism current relevant approaches, frameworks and tools for site planning and promote and facilitate the exchange of experiences and lessons learned in applying and adapting them in different ecological and social settings.

1.4.8 Disseminate information on successful management models of protected areas which serve to further the three objective of the Convention and may also contribute to poverty reduction and the pursuit of sustainable development.

Goal 1.5 – To prevent and mitigate the negative impacts of key threats to protected areas

Target

By 2008, effective mechanisms for identifying and preventing, and/or mitigating the negative impacts of key threats to protected areas are in place.

Suggested activities of the Parties

1.5.1 Apply, as appropriate, timely environmental impact assessments to any plan or project with the potential to have effects on protected areas, and ensure timely information flow among all concerned parties to that end, taking into account decision VI/7 A of the Conference of the Parties on guidelines for incorporating biodiversity related issues into environmental impact assessment legislation and/or processes and in strategic environmental assessments.

1.5.2 Develop by 2010 national approaches to liability and redress measures, incorporating the polluter pays principle or other appropriate mechanisms in relation to damages to protected areas.

1.5.3 Establish and implement measures for the rehabilitation and restoration of the ecological integrity of protected areas.

1.5.4 Take measures to control risks associated with invasive alien species in protected areas.

1.5.5 Assess key threats to protected areas and develop and implement strategies to prevent and/or mitigate such threats.

1.5.6 Develop policies, improve governance, and ensure enforcement of urgent measures that can halt the illegal exploitation of resources from protected areas, and strengthen international and regional cooperation to eliminate illegal trade in such resources taking into account sustainable customary resource use of indigenous and local communities in accordance with article 10(c) of the Convention.

Annexes

Suggested supporting activities of the Executive Secretary

1.5.7 Address issues specific to protected areas, in the guidelines for incorporating biodiversity considerations in environmental impact assessment and strategic environmental assessment, procedures and regulations.

1.5.8 Collaborate with the International Association for Impact Assessment and other relevant organizations on further development and refinement of the impact assessment guidelines particularly to incorporate all stages of environmental impact assessment processes in protected areas taking into account the ecosystem approach.

1.5.9 Compile and disseminate through the clearing-house mechanism and other means case studies, best practices and lessons learned in mitigating the negative impacts of key threats and facilitate the exchange of experiences.

PROGRAMME ELEMENT 2: Governance, participation, equity and benefit sharing

Goal 2.1 – To promote equity and benefit-sharing

Target

Establish by 2008 mechanisms for the equitable sharing of both costs and benefits arising from the establishment and management of protected areas.

Suggested activities of the Parties

2.1 Assess the economic and socio-cultural costs, benefits and impacts arising from the establishment and maintenance of protected areas, particularly for indigenous and local communities, and adjust policies to avoid and mitigate negative impacts, and where appropriate compensate costs and equitably share benefits in accordance with the national legislation.

2.1.2 Recognize and promote a broad set of protected area governance types related to their potential for achieving biodiversity conservation goals in accordance with the Convention, which may include areas conserved by indigenous and local communities and private nature reserves. The promotion of these areas should be by legal and/or policy, financial and community mechanisms.

2.1.3 Establish policies and institutional mechanisms with full participation of indigenous and local communities, to facilitate the legal recognition and effective management of indigenous and local community conserved areas in a manner consistent with the goals of conserving both biodiversity and the knowledge, innovations and practices of indigenous and local communities.

2.1.4 Use social and economic benefits generated by protected areas for poverty reduction, consistent with protected-area management objectives.

2.1.5 Engage indigenous and local communities and relevant stakeholders in participatory planning and governance, recalling the principles of the ecosystem approach.
2.1.6 Establish or strengthen national policies to deal with access to genetic resources within protected areas and fair and equitable sharing of benefits arising from their utilization, drawing upon the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization as appropriate,.

Goal 2.2 – To enhance and secure involvement of indigenous and local communities and relevant stakeholders

Target

Full and effective participation by 2008, of indigenous and local communities, in full respect of their rights and recognition of their responsibilities, consistent with national law and applicable international obligations, and the participation of relevant stakeholders, in the management of existing, and the establishment and management of new, protected areas

Suggested activities of the Parties

2.2.1 Carry out participatory national reviews of the status, needs and context-specific mechanisms for involving stakeholders, ensuring gender and social equity, in protected areas policy and management, at the level of national policy, protected area systems and individual sites.
2.2.2 Implement specific plans and initiatives to effectively involve indigenous and local communities, with respect for their rights consistent with national legislation and applicable international obligations, and stakeholders at all levels of protected areas planning, establishment, governance and management, with particular emphasis on identifying and removing barriers preventing adequate participation.
2.2.3 Support participatory assessment exercises among stakeholders to identify and harness the wealth of knowledge, skills, resources and institutions of importance for conservation that are available in society.
2.2.4 Promote an enabling environment (legislation, policies, capacities, and resources) for the involvement of indigenous and local communities and relevant stakeholders / in decision making, and the development of their capacities and opportunities to establish and manage protected areas, including community-conserved and private protected areas.
2.2.5 Ensure that any resettlement of indigenous communities as a consequence of the establishment or management of protected areas will only take place with their prior informed consent that may be given according to national legislation and applicable international obligations.

Suggested supporting activities of the Executive Secretary

2.2.6 Make available to Parties case-studies, advice on best practices and other sources of information on stakeholder participation in protected areas
2.2.7 Promote, through the CHM, technical publications and other means, the international sharing of experience on effective mechanisms for stakeholder involvement and governance types in conservation in particular with regard to co-managed protected areas, indigenous and local community conserved areas and private protected areas.

Annexes

PROGRAMME ELEMENT 3: Enabling activities

Goal 3.1 – To provide an enabling policy, institutional and socio-economic environment for protected areas

Target

By 2008 review and revise policies as appropriate, including use of social and economic valuation and incentives, to provide a supportive enabling environment for more effective establishment and management of protected areas and protected areas systems.

Suggested activities of the Parties

3.1.1 By 2006, identify legislative and institutional gaps and barriers that impede the effective establishment and management of protected areas, and by 2009, effectively address these gaps and barriers.

3.1.2 Conduct national-level assessments of the contributions of protected areas, considering as appropriate environmental services, to the country's economy and culture, and to the achievement of the Millennium Development Goals at the national level; and integrate the use of economic valuation and natural resource accounting tools into national planning processes in order to identify the hidden and non-hidden economic benefits provided by protected areas and who appropriates these benefits.

3.1.3 Harmonize sectoral policies and laws to ensure that they support the conservation and effective management of the protected area system.

3.1.4 Consider governance principles, such as the rule of law, decentralization, participatory decision-making mechanisms for accountability and equitable dispute resolution institutions and procedures.

3.1.5 Identify and remove perverse incentives and inconsistencies in sectoral policies that increase pressure on protected areas, or take action to mitigate their perverse effects. Whenever feasible, redirect these to positive incentives for conservation.

3.1.6 Identify and establish positive incentives that support the integrity and maintenance of protected areas and the involvement of indigenous and local communities and stakeholders in conservation.

3.1.7 Adopt legal frameworks to national, regional and sub-national protected areas systems of countries where appropriate.

3.1.8 Develop national incentive mechanisms and institutions and legislative frameworks to support the establishment of the full range of protected areas that achieve biodiversity conservation objectives including on private lands and private reserves where appropriate.

3.1.9 Identify and foster economic opportunities and markets at local, national and international levels for goods and services produced by protected areas and/or reliant on the ecosystem services that protected areas provide, consistent with protected area objectives and promote the equitable sharing of the benefits.

3.1.10 Develop necessary mechanisms for institutions with responsibilities for conservation of biological diversity at the regional, national and local level to achieve institutional and financial sustainability.

3.1.11 Cooperate with neighbouring countries to establish an enabling environment for transboundary protected areas and for neighbouring protected areas across national boundaries and other similar approaches including regional networks.

Suggested supporting activities of the Executive Secretary

3.1.12 In collaboration with key partners such as OECD, IUCN, WWF and the secretariats of other conventions compile information on relevant guidance, resource kits and other information on incentive measures including those relating to the development of incentive options.

3.1.13 Compile and disseminate, through the CHM and other media, case-studies on best practices on the use of incentive measures for the management of protected areas.

3.1.14 Compile and disseminate through the CHM and other media best practices on ways and means to integrate the use of incentive measures into protected area management plans, programmes and policies including opportunities for the removal or mitigation of perverse incentives.

Goal 3.2 – To build capacity for the planning, establishment and management of protected areas

Target

By 2010, comprehensive capacity building programmes and initiatives are implemented to develop knowledge and skills at individual, community and institutional levels, and raise professional standards.

Suggested activities of the Parties

3.2.1 By 2006 complete national protected-area capacity needs assessments, and establish capacity building programmes on the basis of these assessments including the creation of curricula, resources and programs for the sustained delivery of protected areas management training.

3.2.2 Establish effective mechanisms to document existing knowledge and experiences on protected area management, including traditional knowledge in accordance with Article 8 (j) and Related Provisions, and identify knowledge and skills gaps.

3.2.3 Exchange lessons learnt, information and capacity-building experiences among countries and relevant organizations, through the Clearing-house Mechanisms and other means.

3.2.4 Strengthen the capacities of institutions to establish cross-sectoral collaboration for protected area management at the regional, national and local levels.

3.2.5 Improve the capacity of protected areas institutions to develop sustainable financing through fiscal incentives, environmental services, and other instruments.

Suggested supporting activities of the Executive Secretary

3.2.6 Cooperate with IUCN and other relevant organizations to compile and disseminate available information.

3.2.7 Cooperate with initiatives such as the Protected Areas Learning Network (PALNet-IUCN) and explore lessons learned from those experiences, in collaboration with relevant organizations.

Goal 3.3 To develop, apply and transfer appropriate technologies for protected areas

Target

By 2010 the development, validation, and transfer of appropriate technologies and innovative approaches for the effective management of protected areas is substantially improved, taking into account decisions of the Conference of the Parties on technology transfer and cooperation.

Annexes

Suggested activities of the Parties

3.3.1 Document and make available to the Executive Secretary appropriate technologies for conservation and sustainable use of biological diversity of protected areas and management of protected areas.

3.3.2 Assess needs for relevant technologies for protected area management involving indigenous and local communities and stakeholders such as the, research institutions, non-Governmental organizations and the private sector.

3.3.3 Encourage development and use of appropriate technology, including technologies of indigenous and local communities with their participation, approval and involvement in accordance with Article 8(j) and Related Provisions, for habitat rehabilitation and restoration, resource mapping, biological inventory, and rapid assessment of biodiversity, monitoring, in situ and ex situ conservation, sustainable use, etc.

3.3.4 Promote an enabling environment for the transfer of technology in accordance with decision VII/29 of the Conference of Parties on technology transfer and cooperation to improve protected area management.

3.3.5 Increase technology transfer and cooperation to improve protected area management.

Suggested supporting activities of the Executive Secretary

3.3.6 Compile and disseminate information provided by Parties and relevant international organizations on appropriate technologies and approaches for efficient management of protected areas and conservation and sustainable use of biological diversity of protected areas.

Goal 3.4 – To ensure financial sustainability of protected areas and national and regional systems of protected areas

Target

By 2008, sufficient financial, technical and other resources to meet the costs to effectively implement and manage national and regional systems of protected areas are secured, including both from national and international sources, particularly to support the needs of developing countries and countries with economies in transition and small island developing States.

Suggested activities of the Parties

3.4.1 Conduct a national-level study by 2005 of the effectiveness in using existing financial resources and of financial needs related to the national system of protected areas and identify options for meeting these needs through a mixture of national and international resources and taking into account the whole range of possible funding instruments, such as public funding, debt for nature swaps, elimination of perverse incentives and subsidies, private funding, taxes and fees for ecological services.

3.4.2 By 2008, establish and begin to implement country-level sustainable financing plans that support national systems of protected areas, including necessary regulatory, legislative, policy, institutional and other measures.

3.4.3 Support and further develop international funding programmes to support implementation of national and regional systems of protected areas in developing countries and countries with economies in transition and small island developing States.

3.4.4 Collaborate with other countries to develop and implement sustainable financing programmes for national and regional systems of protected areas.

3.4.5 Provide regular information on protected areas financing to relevant institutions and mechanisms, including through future national reports under the Convention on Biological Diversity, and to the World Database on Protected Areas.
3.4.6 Encourage integration of protected areas needs into national and, where applicable, regional development and financing strategies and development cooperation programmes.

Suggested supporting activities of the Executive Secretary

3.4.7 Convene as soon as possible, but not later than 2005, a meeting of the donor agencies and other relevant organizations to discuss options for mobilizing new and additional funding to developing countries and countries with economies in transition and small island developing States for implementation of the programme of work.
3.4.8 Compile and disseminate case-studies and best practices concerning protected area financing through the clearing-house mechanism and other media.
3.4.9 Review and disseminate by 2006 studies on the value of ecosystem services provided by protected areas.

Goal 3.5 – To strengthen communication, education and public awareness

Target

By 2008 public awareness, understanding and appreciation of the importance and benefits of protected areas is significantly increased.

Suggested activities of the Parties

3.5.1 Establish or strengthen strategies and programmes of education and public awareness on the importance of protected areas in terms of their role in biodiversity conservation and sustainable socio-economic development, in close collaboration with the Communication, Education and Public Awareness Initiative (CEPA) under the Convention on Biological Diversity and targeted towards all stakeholders.
3.5.2 Identify core themes for education, awareness and communication programmes relevant to protected areas, including inter alia their contribution to economy and culture to achieve specific end results such as compliance by resource users and other stakeholders or an increased understanding of science-based knowledge by indigenous and local communities and policy makers and an increased understanding of the needs, priorities and value of indigenous and local communities' knowledge, innovations and practices by Governments, non-Governmental organizations and other relevant stakeholders.
3.5.3 Strengthen, and where necessary, establish information mechanisms directed at target groups such as the private sector, policy makers, development institutions, community-based organizations, the youth, the media, and the general public.

3.5.4 Develop mechanisms for constructive dialogue and exchange of information and experiences among protected-area managers, and between protected area managers and indigenous and local communities and their organizations and other environment educators and actors.
3.5.5 Incorporate the subject of protected areas as an integral component of the school curricula as well as in informal education.
3.5.6 Establish mechanism and evaluate the impacts of communication, education and public awareness programmes on biodiversity conservation to ensure that they improve public awareness, change behaviour and support the achievement of protected area objectives.

Suggested supporting activities of the Executive Secretary

3.5.7 Collaborate with IUCN and other relevant organizations to collect and disseminate educational tools and materials for adaptation and use in the promotion of protected areas as an important means of achieving the conservation and sustainable use of biodiversity.
3.5.8 Establish, in collaboration with the IUCN and other relevant partners, an initiative to engage the global news and entertainment industry (television, film, popular music, internet, etc.) in a global campaign to raise awareness of the consequences of biological diversity loss and the important role of protected areas in biodiversity conservation.

PROGRAMME ELEMENT 4: Standards, assessment, and monitoring

Goal 4.1 – To develop and adopt minimum standards and best practices for national and regional protected area systems

Target

By 2008, standards, criteria, and best practices for planning, selecting, establishing, managing and governance of national and regional systems of protected areas are developed and adopted.

Suggested activities of the Parties

4.1.1 Collaborate with other Parties and relevant organizations, particularly IUCN, on the development, testing, review and promotion of voluntary protected areas standards and best practices on planning and management, governance and participation.
4.1.2 Develop and implement an efficient, long-term monitoring system of the outcomes being achieved through protected area systems in relation to the goals and targets of this work programme.
4.1.3 Draw upon monitoring results to adapt and improve protected area management based on the ecosystem approach.
Suggested supporting activities of the Executive Secretary
4.1.4 In collaboration with the key partners and based upon the best practices promote available guidance for parties minimum standards for planning, selecting, establishing, managing and governance of protected area sites and systems.
4.1.5 Compile information on best practices and case-studies on effective management of protected areas and disseminate it through clearing-house mechanism and facilitate exchange of information.

Goal 4.2 – To evaluate and improve the effectiveness of protected areas management

Target

By 2010, frameworks for monitoring, evaluating and reporting protected areas management effectiveness at sites, national and regional systems, and transboundary protected area levels adopted and implemented by Parties.

Suggested activities of the Parties

4.2.1 Develop and adopt, by 2006, appropriate methods, standards, criteria and indicators for evaluating the effectiveness of protected area management and governance, and set up a related database, taking into account the IUCN-WCPA framework for evaluating management effectiveness, and other relevant methodologies, which should be adapted to local conditions.

4.2.2 Implement management effectiveness evaluations of at least 30% of each Party's protected areas by 2010 and of national protected area systems and, as appropriate, ecological networks.

4.2.3 Include information resulting from evaluation of protected areas management effectiveness in national reports under the Convention on Biological Diversity.

4.2.4 Implement key recommendations arising from site- and system-level management effectiveness evaluations, as an integral part of adaptive management strategies.

Suggested supporting activities of the Executive Secretary

4.2.5 Compile and disseminate information on management effectiveness through the clearing-house mechanism and develop a database of experts in evaluation of protected area management effectiveness and consider the possibility of organizing an international workshop on appropriate methods, criteria and indicators for evaluating the effectiveness of protected area management.

4.2.6 In cooperation with IUCN-WCPA and other relevant organizations, compile and disseminate information on best practices in protected area design, establishment and management.

Goal 4.3 – To assess and monitor protected area status and trends

Target

By 2010, national and regional systems are established to enable effective monitoring of protected-area coverage, status and trends at national, regional and global scales, and to assist in evaluating progress in meeting global biodiversity targets.

Suggested activities of the Parties

4.3.1 Implement national and regional programmes to monitor and assess the status and trends of biodiversity within protected area systems and sites.

4.3.2 Measure progress towards achieving protected area targets based on periodic monitoring and report on progress towards these targets in future national reports under the Convention on Biological Diversity as well as in a thematic report at COP-9.

4.3.3 Improve and update national and regional databases on protected areas and consolidate the World Database on Protected Areas as key support mechanisms in the assessment and monitoring of protected area status and trends.

4.3.4 Participate in the World Database on Protected Areas maintained by UNEP-WCMC, and the United Nations List of Protected Areas and the State of the World's Protected Areas assessment process.
4.3.5 Encourage the establishment and establishment use of new technologies including geographic information system and remote sensing tools for monitoring protected areas.

Suggested supporting activities of the Executive Secretary

4.3.6 Develop and consolidate working partnerships with appropriate organizations and institutions that have developed and maintained monitoring systems and databases on protected areas, in particular with the UNEP-WCMC and the IUCN World Commission on Protected Areas.
4.3.7 Explore establishment of a harmonized system and time schedule for reporting on sites designated under the Convention on Wetlands, the World Heritage Convention, and UNESCO MAB programme, and other regional systems, as appropriate, taking into account the ongoing work of UNEP-WCMC on harmonization of reporting and the IUCN protected area management category system for reporting purpose.
4.3.8 Prepare an updated format for the thematic report on protected areas covering, inter alia, integration of protected areas and national systems of protected areas into relevant sectors and spatial planning taking into account decision VII/25 on national reporting.

Goal 4.4 – To ensure that scientific knowledge contributes to the establishment and effectiveness of protected areas and protected area systems

Target

Scientific knowledge relevant to protected areas is further developed as a contribution to their establishment, effectiveness, and management.

Suggested activities of the Parties

4.4.1 Improve research, scientific and technical cooperation related to protected areas at national, regional and international levels.
4.4.2 Promote interdisciplinary research, to improve understanding of the ecological social and economic aspects of protected areas, including methods and techniques for valuation of goods and services from protected areas
4.4.3 Encourage studies to improve the knowledge of the distribution, status and trends of biological diversity.
4.4.4 Encourage collaborative research between scientists and indigenous and local communities in accordance with Article 8(j) in connection with the establishment and the effective management of protected areas
4.4.5 Promote the dissemination of scientific information from and on protected areas including through the clearing-house mechanism.
4.4.6 Promote the dissemination of, and facilitate access to, scientific and technical information, in particular publications on protected areas, with special attention to the needs of developing countries and countries with economies in transition, in particular least developed countries and small island developing States.
4.4.7 Develop and strengthen working partnerships with appropriate organizations and institutions which undertake research studies leading to an improved understanding of biodiversity in protected areas.

References

- Amgalan L., 2003. Mongolian Saiga population survey. WWF, MPO Unpublished report.
- Amgalan, L. 2004. Current status of Mongolian Saiga population. Khovd aimag, Proceedings of the survey consequences: Khar Us Basin Natural Resource, Biodiversity and socio-economy. p6–12.
- Amgalan, L. and Nyambayar, B., 2000. Report of research on Mongolian Saiga Antelope in Sharga and Khuisiin Gobi (October). WWF Project office, unpublished source, in Mongolian.
- Bedunah, D. J. and Schmidt, S. M., 2004. Pastoralism and Protected Area Management in Mongolia's Gobi Gurvansaikhan National Park. In: Institute of Social Studies. 2004. Development and Change 35(1): 167–191. Blackwell Publishing, UK.
- Bennett, A., 1998. Linkages in the Landscape: The Role of Corridors and Connectivity in Wildlife Conservation. IUCN-The World Conservation Union, Gland, Switzerland.
- Biringer, J. and Hansen, L. 2005. Restoring Forest Landscapes in the Face of Climate Change, In: Mansourian, S., Vallauri, D. and Dudley, N. (eds) 2005. Forest Restoration in Landscapes, Beyond Planting Trees, Springer, New York.
- Bishop, K., Dudley, N, Phillips, A., and Stolton, S., 2004. Speaking a Common Language, The uses and performance of the IUCN System of Management Categories for Protected Areas. Cardiff University, IUCN – The World Conservation Union and UNEP – World Conservation Monitoring Centre, UK.
- CBD. 2004. Programme of Work on Protected Areas. CBD, Montreal, Canada.
- CBD. 2005. Review of Experience with Ecological Networks, Corridors & Buffer Zones.
- CBD, IUCN, TNC & WWF. 2004. Protected Area Commitments under the Convention on Biological Diversity. An action guide for policymakers and practitioners, prepared by Charles Victor Barber.
- Darman, Y., and Williams, L. (Eds) 2003. Conservation Action Plan for the Russian Far East Ecoregion Complex, WWF, Russia.
- Dinerstein, E., Powell, G., Olson, D. et al. 2000. A workbook for conducting biological assessments and developing biodiversity visions for ecoregion-based conservation, Conservation Science Program, World Wildlife Fund US, Washington DC.
- Dudley, N. and Stolton, S. 2003. Running Pure: The importance of forest protected areas to drinking water. WWF and the World Bank, Gland, Switzerland and Washington DC.
- Dudley, N. and Mulongoy, K. J., Cohen, S., Stolton, S., Barber, C. V. and Gidda, S. B. 2005. Towards Effective Protected Area Systems. An action guide to implement the CBD Programme of Work on Protected Areas. CBD Technical Series No.18, 108 pp
- Dulamtseren. S. and Tulgat, R., 1993. Saiga census in Shargiin Gobi. (unpublished source)
- Dulamtseren, S. and Amgalan. L., 1995. Current status, distribution, population number of the Mongolian Saiga. Natural condition, biological resources of Great Gobi protected area.
- Gruzdev, V. and Sukhbat, Kh., 1982. Mountain ungulates of Mongolia. Hunting and hunting farms 9, 41–43 (In Russian)
- Guzmán López-Ocón, J., N., García González, F., J., Garrote Alonso, G., Pérez De Ayala Balzola, R., Iglesias Llamas, C. and Heredia Armada, B., 2002. Censo-Diagnóstico De Las Poblaciones De Lince Ibérico (Lynx Pardinus) En España, Informe inedito, Ministerio De Medioambiente, Madrid, Spain

- Guzmán N. (In press). Seguimiento y estatus del Lince Ibérico en España 2002–2004. II International Seminar and Workshop on the conservation of the Iberian lynx.
- Honhold, N., 1995. Livestock Population and Productivity and the Human Population of Mongolia, 1930 to 1994. Ministry of Food and Agriculture, Ulaanbaatar, Mongolia.
- Institute of Biology 2001. Argali (Ovis ammon) population census in Mongolia, unpublished report.
- Luschekina, A. A., 1994. The Status of argali in Kirgizstan, Tadjikistan and Mongolia. Unpublished report. Office of Scientific Authority, US Fish & Wildlife Service, Arrington, Virginia, USA.
- Malkhasyan, A. and Asmaryan, S., 2005. The Persian Leopard Prowls Its Way to Survival, Endangered Species UPDATE, Vol 22. No. 2.
- Mallon, D. P., Bold, A., Dulamtseren, S., Reading, R. P. and Amgalanbaatar, S., 1997. Mongolia. p. 193–201 in: Shacleton, D. M., Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae. IUCN, Gland, Switzerland and Cambridge, UK.
- Margules, C.R. and Pressey, R.L. 2000. Systematic conservation planning. Nature 405: 243–253.
- Maroney, R. L., 2003. Argali (Ovis ammon) Conservation In Western Mongolia And The Altai-Sayan, Thesis presented in partial fulfillment of the requirements for the degree of Master of Science, The University of Montana, USA.
- Milner-Gulland, E. J., 2005. Feature Article – Saiga MOU signed at last! In: Saiga News, Winter 2005, Issue 2.
- Milner-Gulland, E. J., Kholodova, M. V., Bekenov, A. Bukreeva, O. M. Grachev, Iu. A., Amgalan, L. and Lushchekina, A. A., 2001. Dramatic declines in saiga antelope populations. Oryx. Vol 35. No 4. October 2001.
- Mulongoy, K. J. and Chape, S., 2004. Protected areas and biodiversity : An Overview of Key Issues, UNEP-WCMC and CBD, UK and Canada.
- Ricketts, T., Dinerstein, E., Boucher, T. et al, 2005. Pinpointing and preventing imminent extinctions, PNAS, December 20, 2005. Vol. 102. No. 51, 18497–18501.
- Rodrigues, A., Andelman, S., Bakarr, M., et al. 2003. Global Gap Analysis: towards a representative network of protected areas. Advances in Applied Biodiversity Science 5. Conservation International, Washington DC.
- Rodrigues, A., Andelman, S., Bakarr, M. et al. 2004. Effectiveness of the global protected area network in representing species diversity. Nature, Vol. 428, 8 April 2004, pp. 640–643.
- Rodríguez, A. and Delibes, M., 1990. El lince ibérico (Lynx pardinus) en España. Distribución y problemas de conservación. Colección Técnica. ICONA. Madrid.
- Shagdarsuren et al., 1987. Mongolian Red Book. Ulaanbaatar.
- Shepherd, G. 2004. The Ecosystem Approach: Five Steps to Implementation. IUCN, Gland, Switzerland and Cambridge, UK.
- Sokolov. M. E., Dulamtseren, S., Khotolkhuu, N., Orlov, M. N.,1978. Rare species ungulates (hoofed animals) of Great Gobi Protected Area (Mongolia) Current status and perspectives. Geography and dynamics plant and animals world Mongolia. Moscow. T10/7–11
- UNDP, UNEP, World Bank and WRI, 2000. World Resources 2000–2001, World Resources Institute, Washington DC.

- Völk, F., Glitzner, I. and Wöss, M., 2001. Kostenreduktion bei Grünbrücken durch deren rationellen Einsatz, Kriterien-Indikatoren-Mindeststandards. Straßenforschungsauftrag Nr.3.195, BM VIT, 97pp.
- Ward, D. 2005. Reversing Rabbit Decline: One of the biggest challenges for nature conservation in Spain and Portugal, SOS Lynx, Pelicano SA and One Planet Living, and in collaboration with the IUCN Cat Specialist Group, the IUCN, Lagomorph Specialist Group and Ecologistas en Acción – Andalucia, Spain.
- WWF, no year (a). Ecoregion Action Programmes: A Guide for Practitioners, WWF US. Washington, DC.
- WWF, no year (b). Ensuring Long-Term Conservation of the Altai-Sayan Eco-Region. Project Objectives, Outputs, and Activities, WWF.
- WWF. 2002. Conserving Tigers in the Wild: A WWF Framework and Strategy for Action 2002–2010.
- WWF. 2004a. The Alps: A Unique Natural Heritage. A Common Vision for the Conservation of their Biodiversity. Frankfurt.
- WWF, 2004b. (Loh, J. and Wackernagel, M. (eds)). The Living Planet Report, WWF, Switzerland.
- WWF. 2005. (Written and edited by Lassen, B. and Savoia, S.) Ecoregion Conservation Plan for the Alps, WWF European Alpine Programme, Bellinzona, Switzerland.
- Zedrosser, A., Gerstl, N., Rauer, G., 1999. Brown Bears In Austria: 10 Years of Conservation and Actions for the Future, Federal Environment Agency – Austria, Wien, Austria.
- Zhirnov, L. V. and Ilyinsky, V. O., 1986. The Great Gobi Reserve – refuge for rare animals of the Central Asian Deserts. USSR/ UNEF Project, Programme for Publication and Information Support, Centre for International projects, GKNT, Moscow.

Websites

- www.panda.org
- www.biodiv.org
- www.amur-leopard.org
- www.nationalgeographic.com/wildworld
- www.catsg.org
- www.wild-russia.org
- whc.unesco.org
- www.unep-wcmc.org
- www.saigak.biodiversity.ru
- www.rollinghillswildlife.com
- www.savethetigerfund.org

Contacts

Contacts

- **Darman, Yuri**
  Director WWF Russia
  Far Eastern Branch
  18a Verkhneportovaya St.
  690003 Vladivostok
  Russian Federation
  YDarman@wwfrfe.ru

- **Dick, Gerald**
  Programme Development Manager
  Europe/Middle East
  WWF Global Species Programme
  c/o WWF Austria
  Ottakringerstraße 114
  A-1160 Wien
  Gerald.Dick@wwf.at

- **Kirilliuk, Vadim**
  WWF Russia, Far Eastern Branch
  18a Verkhneportovaya St.
  690003 Vladivostok
  Russian Federation

- **Krever, Vladimir**
  Coordinator Biodiversity Programme
  WWF Russia, Post Box 3
  109240 Moscow
  Russian Federation
  vkrever@wwf.ru

- **Pereladova, Olga**
  Head WWF Central Asia Programme
  WWF Russia, Post Box 3
  109240 Moscow
  Russian Federation
  opereladova@wwf.ru

- **Proschek, Michael**
  Species Policy Officer
  WWF Austria
  Ottakringerstraße 114
  A-1160 Wien
  Michael.Proschek@wwf.at

- **Suárez Arangüena, Luis**
  Head Species Programme
  WWF Spain
  Gran Vía de San Francisco, 8
  28005 Madrid
  Spain
  lsuarez@wwf.es

- **Yondon, Onon**
  Species Programme Officer
  WWF Mongolia Programme Office
  Amar Street-4
  Sukhbaatar district, 8-khoroo
  Ulaanbataar 46
  Mongolia
  mpo-species@wwf.mn

www.panda.org/species

www.wwf.at
www.wwf.es
www.wwf.ru

WWF is one of the world's largest and most experienced independent conservation organizations, with almost 5 million supporters and a global network active in more than 100 countries.

WWF International
Avenue du Mont-Blanc
CH-1196 Gland
Switzerland
tel: +41-22 364 9111
fax: +41-22 364 0640

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption

WWF®

for a living planet®