2000

COUNCIL OF EUROPE CONSEIL DE L'EUROPE

Strasbourg, 16 May 2000 **T-PVS (2000) 24**
[Bern\T-PVS 2000\tpvs24e_2000]

CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE
AND NATURAL HABITATS

Group of Experts on Conservation of Large Carnivores

Oslo, 22-24 June 2000

Action Plan for the conservation of the Brown Bear *(Ursus arctos)* in Europe

Document established by
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funded by:
WWF International
Avenue du Mont Blanc
Gland, Switzerland

Acknowledgements

We are grateful to the many people who have assisted us in the preparation of this Action Plan by providing information on the brown bear, its management, and required actions for their country and/or providing comments to the text. We would like to thank Miha Adamic, Linas Balciauskas, Anders Bjärvall, Juan Carlos Blanco, Giorgio Boscagli, Jorund T. Braa, Urs Breitenmoser, Anthony Clevenger, Volodymyr Domashlinets, Eugenio Dupre, Eladio Fernandez-Galiano, Slavomir Findo, Kiril Georgiev, Dexter Hodder, Djuro Huber, Ovidiu Ionescu, Martin Kassa, Ilpo Koyola, Thomas Komberec, Petr Koubek, Arild Landa, Clifford Martinka, Yorgos Mertzanis, Branko Micevski, Ion Micu, Francois Moutou, Javier Naves, Henryk Okarma, Milan Paunovic, Valdis Pilats, Stavri Pllaha, Mario Possilico, William Pratesi-Urquhart, Pierre-Yves Quenette, Jiit Randveer, Georg Rauer, Harry V. Reynolds, Olivier Robinet, Finn Sandegren, Chris Servheen, Vadim Sidorovich, Pritpal S. Soorae, Ole Jakob Sørensen, Magnus Sylvén, Vladimir Titar, Paavo Tunkkari, Ben Tuson, Eularico Fernandez Valero, and Metodija Velevski. The addresses of those who recommended required actions for their countries are found in section 7 of this Action Plan.

This Action Plan was funded by WWF-International, with a grant from WWF-Netherlands, to the Norwegian Institute for Nature Research (NINA). The project was administered by Jon Swenson, NINA (on time provided by NINA), and he and Norbert Gerstl, WWF-Austria, were project leaders. Most of the hard work was done by Bjørn Dahle, NINA, who worked on the biology section, and Andreas Zedrosser, WWF-Austria, who worked on the management section.

The process behind the elaboration of the action plans

Each Action Plan was first elaborated by the author in early 1998. These first drafts included input and comments from many experts throughout Europe. In October 1998, governmental experts then discussed the Plans at a meeting organised by the Council of Europe in Slovakia, after which the authors incorporated the comments received.

The Plans were then reviewed by the Bern Convention Contracting Parties in December 1998 and again by the European Commission and EU governmental experts at a meeting of the Habitats Directive Scientific Committee in September 1999. All the comments received (and forwarded to the authors by the Commission via the Bern Convention Secretariat) were included in the final draft version presented at the Bern Convention Meeting of The Contracting Parties in December 1999. At this meeting, some governments advised that they still wished to comment on National Actions related to their respective countries and they were given until end February 2000 to send their comments to the Council of Europe.

The authors have made every effort to incorporate all the comments received into the final Action Plans and apologise unreservedly should any have slipped through the net. It is clear from the above that these Plans have been through an exhaustive, collaborative process and received a wide consensus, culminating in Recommendation No. 74 (Dec 1999) of the Bern Convention Contracting Parties, December 1999. Where differing figures have been given by various national experts (in particular as regards population numbers), every effort has been made to include both (or all) totals.

Disclaimer

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May 2000

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Mission statement

The Large Carnivore Initiative for Europe (LCIE)

"To maintain and restore, in coexistence with people, viable populations of large carnivores as an integral part of ecosystems and landscapes across Europe"

Background

- Europe, once a broad mosaic of natural habitats ideal for large carnivores, is now left with only scattered tracts of suitable "wildland". Brown bear, wolf, wolverine, Eurasian lynx and Iberian lynx still occur in Europe but they are forced to live in highly fragmented and human-dominated landscapes.
- There was widespread and bitter opposition to large carnivores in the past but today there is increasing public interest in their conservation. However, the predatory behaviour of large carnivores often conflicts with local economic activity, especially livestock farming.
- Their current distribution is often confined to border areas, which therefore requires cross border co-operation in order to conserve and manage populations.
- The presence of large carnivores is a measure of regional biodiversity. Viable populations of large carnivores demonstrate Europe's contribution to the conservation of global biodiversity.
- The political development within Europe, particularly within the European Union, with the partial disintegration of national borders and more unified legal and planning requirements, creates new and promising opportunities for the successful management of large carnivores populations on a European wide scale.
- Implementation of the Natura 2000 sites in Europe, the increased priority to the conservation of natural areas, and the Pan-European Biological and Landscape Diversity Strategy (PEBLDS), give exciting opportunities for enhancing Europe's biodiversity.
- It is clear that the challenge of conserving large carnivores is complex and dynamic, involving ecological, economic, institutional, political, and cultural factors and any attempt to solve this conservation issue must take this into account. Realistically, no single agency, organisation, or institution will be able to solve the carnivore conservation issue alone. No single plan or strategy can be completely comprehensive and correct as a guide for action and continual monitoring is required.
- Recognising these opportunities, and the need to build strong partnerships with land managers, researchers, citizens, government officials and international organisations and Conventions, the World Wide Fund for Nature (WWF), together with partner organisations and experts in 17 European countries, has decided to get to grips with the issue so that the future for large carnivores (brown bear, Eurasian lynx, Iberian lynx, wolf and wolverine) can be substantially improved, while the opportunity still exists. The first steps towards the development of a "Large Carnivore Initiative for Europe" were taken at a meeting in Abruzzo National Park, Italy in June 1995. Based on input from two subsequent workshops in Neuchatel, Switzerland (September 1995) and Oberammergau, Germany (January 1996), a programme plan has been developed building a network of interested parties and activities.

Actions

- Create a network of interested parties including land managers, researchers, citizens, government officials and international organisations and Conventions;
- Act as a focal point for information relative to large carnivore conservation in Europe;
- Develop and implement new ideas and methods to ensure the coexistence of brown bears, lynx, wolves and wolverines with people;
- Support and build on existing initiatives and projects within Europe, and encourage Europe-wide co-operation in order to avoid duplication of effort.;
- Disseminate valuable experience and knowledge from different countries;
- Encourage public discussion on the future of large carnivores within Europe, especially with regard to rural support systems which maintain the economic and social well being of local people as well as conserve viable populations of large carnivores;
- Address issues in four important fields of activity:
  1. Conservation of Large Carnivore populations and their habitats; Integration of large carnivore conservation into local development in rural areas;
  2. Support for large carnivores through appropriate legislation, policies and economic instruments;
  3. Information and public awareness with the aim of obtaining the acceptance of large carnivores by all sectors of society.

Species Action Plans

Large Carnivores in Europe

Europe once offered a wide range of natural habitats for its large carnivore species. Today, however, relict brown bear populations are dangerously small and highly fragmented in Southern, Central and Western Europe. The Iberian lynx has recently been labeled by the IUCN as the most critically endangered cat species world-wide. Wolf populations are under intense human pressure throughout most of their range. The Eurasian lynx has disappeared in much of Europe and even though wolverine numbers in Fennoscandia appear to have stabilised since it became protected, illegal hunting is still a constant threat.

Like many conservation issues, the future of Europe's large carnivores is dependent on cross-border co-operation between nations and, importantly, on managing their interaction with human activities. The challenge of conserving large carnivores is complex and must involve a wide range of stakeholders including land managers, local communities, governments, international Conventions and NGOs.

In response to this challenge, WWF International (the World Wide Fund for Nature), together with partner organisations and experts in 17 European countries, launched a Large Carnivore Initiative for Europe (LCIE) in June 1995. Since its inception the Initiative has grown rapidly with experts from 25 countries actively involved and many others expressing interest. The aim of the LCIE is to support and build on existing initiatives or projects across the continent, avoid duplication of effort and make the most efficient use of the available resources. One of the many activities that was identified as being of priority for the conservation of Europe's large carnivores was the elaboration of Pan-European Conservation Action Plans for the five species.

Species Action Plans for the Conservation of the Brown Bear, Wolf, Eurasian Lynx, Iberian Lynx and Wolverines

This Plan is one of a series of Pan-European Action plans elaborated for each of the five species at present dealt with under the LCIE (Brown Bear *Ursus arctos*, Wolf *Canis lupus*, Eurasian Lynx *Lynx lynx*, Iberian Lynx *Lynx pardinus* and Wolverine *Gulo gulo*). The plan should be seen as complimentary with the other four plans and actions should be co-ordinated with those taken under the other plans since in many cases a natural guild of native predators is desirable.

The plans go beyond detailed analysis of local populations' needs and focus on the specific issue of managing the species throughout Europe, stressing the necessity for a continental approach and co-ordinated national efforts. It is hoped that one of the great values of these Plans will be that they generate coherence to actions throughout the whole range ofeach given species.

These Plans are not management plans per se, but rather aim to form the basis for decisions at **international level** pointing at the importance of using **populations** as the management unit, which are often transnational. These Pan-European plans stress the need for national management plans to be drawn up in collaboration with neighbouring States where necessary , and in order to facilitate this process a volume on Guidelines for developing Large Carnivore Management Plans (D. Hofer and C.Promberger 1998) has just been produced by the LCIE.

These Plans serve as an important communication tool and their recommendations should be used to influence players in the conservation sphere at local, national, and international levels. They also provide a baseline record against which to measure change in future years as well as a common framework and focus of action for a wide range of players.

The responsibility for the elaboration of the plans was assigned to teams working under some of the top European experts for each species. During the preparation of these action plans the authors consulted a wide spectrum of sources including management authorities, researchers, NGOs and the literature. This open process included a workshop for governmental experts in Slovakia organised by the Council of Europe (Bern Convention Secretariat) specifically to discuss the five Action Plans in October 1998.

Endorsement

The Council of Europe document "Guidelines for Action Plans for Animal Species" (T-PVS-(ACPLANS)(97) 8) underlines the importance of producing Action Plans for large carnivores at a Pan-European level: "It also makes good ecological sense to choose species that serve as protective "umbrellas" for other species. Such a single species effort avoids many bureaucracies and provides many "inclusive benefits". Umbrella species are species whose own area requirements provide some index on the area requirements of the ecological systems that support them. Top carnivores or other large-bodied, long-lived slowly reproducing species at the top of their ecosystems food-chain are good examples...." The document states that " The Council of Europe through its Committee of Ministers or the Bern Convention's Standing Committee are in excellent position for endorsing such Plans."

Common Themes

All five Action Plans have clearly identified a number of important common themes, which include the following fundamental guiding principles:

- there is a need to concentrate conservation efforts at the population level, which often requires cross-border co-operation;
- the principle of management of large carnivore through a system of zoning including core areas, buffer zones and corridors;
- where re-colonisation of areas by large carnivores is desirable, the following principles should be applied:
  – priority should be to firstly support natural re-colonisation,
  – secondly to work on the augmentation on non-viable populations,
  – thirdly to release animals into areas in order to join up non-viable populations, and
  – finally, to carry out releases into new areas.
- it would be highly desirable that each country sets up a specific body that is responsible for large carnivore management issues, and who would be charged with the preparation of national management plans (A single body that is responsible for all large carnivore species is desirable);
- wherever compensation systems are in place, these should be tied to prevention incentives;
- with regard to identified "problem" animals, which create local damage, emphasis should be given to maintaining populations and not by concentrating on individuals (apart from rare exceptions);
- in-depth and scientific human attitude studies (including work on conflict resolution) have to be initiated;

The points made above just give a brief indication of some of the more important common themes or principles that are shared by all five action plans that have been elaborated as part of the series

Implementation

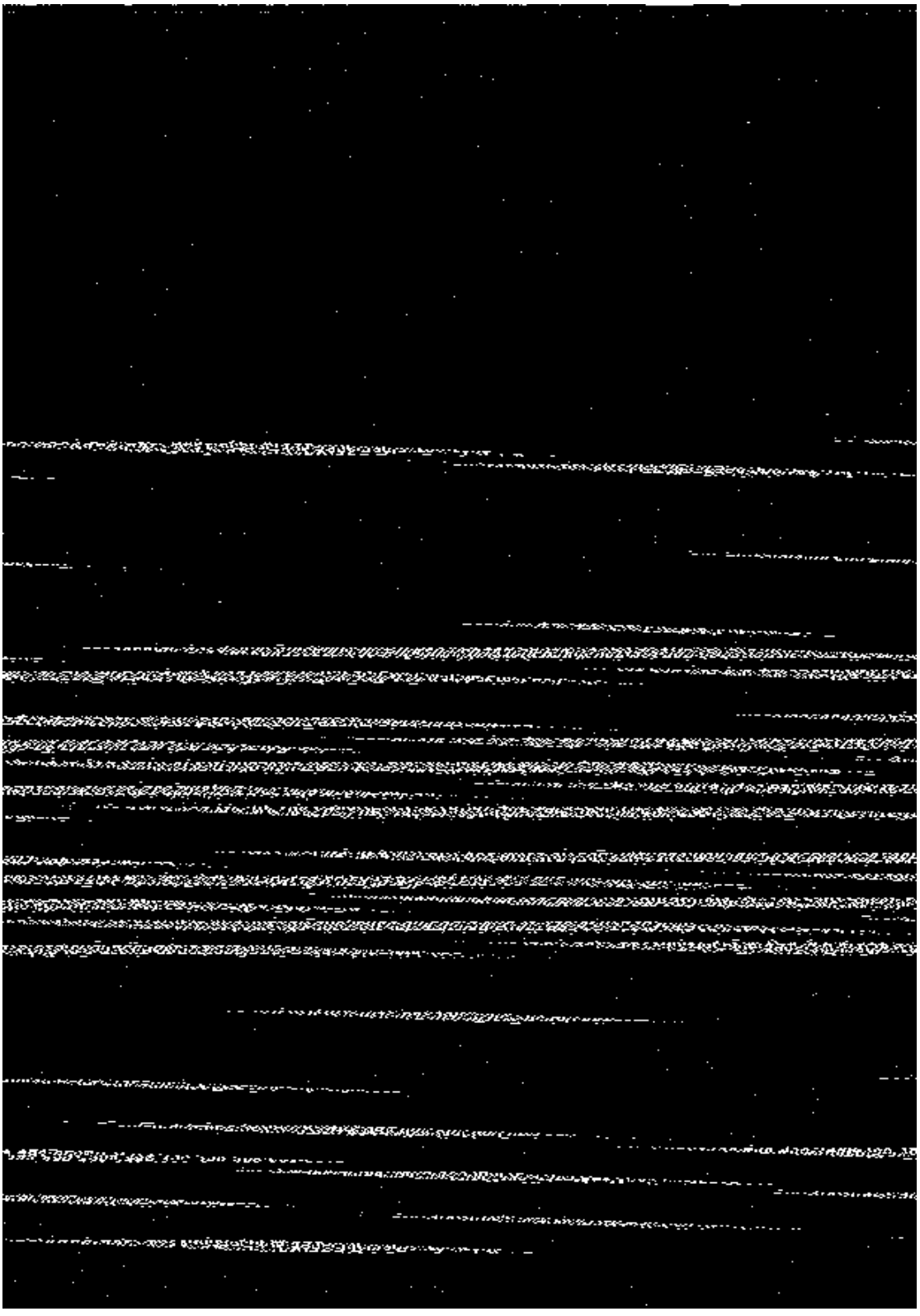
It is very important that these Action plans once "endorsed" are acted upon. These Action Plans should guide national authorities in the elaboration of National Plans and the implementation of these plans must be carried out by professional teams that involve a wide range of appropriate interest groups. The plans themselves can act as important fund raising tools to help spark off the implementation. In countries where more than one of the large carnivore species is present the elaboration of National Action Plans (as recommended by these Pan-European Action Plans) for each species should be in harmony with one another.

Conclusion

Finally we would like to thank the authors, all those who have provided data and comments and the Council of Europe for all the hard work and support that has been put in to this. We would also like to thank WWF Netherlands, Sweden, Norway, Mediterranean Programme and the Council of Europe for providing the funding for the elaboration of the Plans. We hope that these plans will form the basis for collaborative pan-European conservation work for these species over the next ten years, and that the success can be an example to other Initiatives.

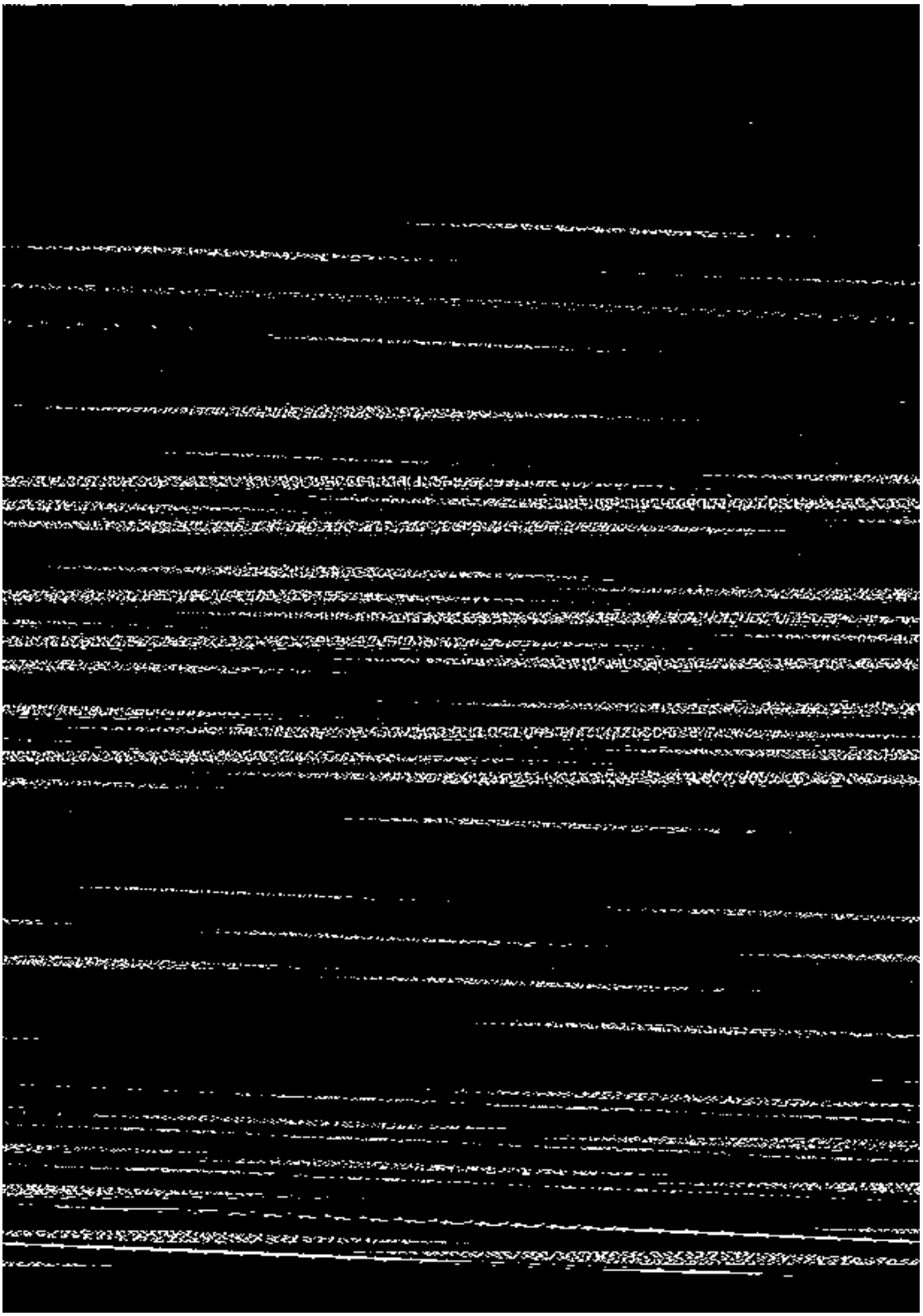
Magnus Sylven (WWF International, Chair, LCCG)
William Pratesi Urquhart (LCIE Co-ordinator)

Endorsement by IUCN – Bear Specialist Group



Endorsement by IBA

(International Association for Bear Research and Management)



Executive Summary

Europe, as defined in this action plan, presently hosts a population of about 14,000 brown bears (*Ursus arctos*) in an overall area of approximately 800,000 km². In some countries the bear population is certainly viable, whereas in other countries it is on the verge of extinction.

This action plan for the conservation of the brown bear in Europe is based on a pan-European approach. Even though management must be implemented by national political entities, the concept of managing on population level was applied. As a result of populations being shared, international cooperation is needed from several countries to ensure the long term future of the species in Europe.

The purpose of this action plan is to help countries on a national and international level to establish management actions for the conservation of the brown bear.

Europe is defined as all countries west of the border of the former Soviet Union and Turkey, but including the Baltic countries and the Ukraine. The biology of, and threats, to bear populations have been presented on a European or population level. In addition, specific actions have been suggested for individual countries.

The overall goal of the action plan is "to maintain and restore, in coexistence with people, viable populations of brown bears as an integral part of ecosystems and landscapes across Europe."

Objectives to reach this goal were defined as:

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 number 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 realize objectives 1 and 2.

Most important issues, threats and obstacles for the conservation of the brown bear were identified as:

- human-caused mortality (bear hunting, legal killing of nuisance bears, poaching);
- the relationship of brown bears and humans (public attitudes; threats to humans; damage to livestock, orchards and crops);
- biological realities (demographic viability, genetic viability);
- habitat fragmentation, habitat loss and related issues;
- livestock husbandry and farming;
- fragmentation of management authority;
- artificial food sources;

The required actions by countries to reach the above goal and objectives include the following topics:

- species conservation;
- recovery of acutely endangered populations;
- habitat protection;
- conflicts with humans;
- problem bears;
- public involvement in brown bear management;
- public awareness, education and information;
- research and monitoring;

Of major importance is the promotion or establishment of monitoring programs on a national and international level.

This Action Plan was endorsed by the International Union for the Conservation of Nature (IUCN)-Bear Specialist Group and the International Association for Bear Research and Management (IBA). The Action Plan for the Conservation of the Brown Bear in Europe presents a major step to conserve bear populations in coexistence with people across Europe.

1. Introduction

There are few animals that have captured the imagination of people as the brown bear has. They can stand on two legs, have their eyes in front of their head, walk on plantigrade feet, pick up things with their "fingers", nurse their young as we do, and eat what we eat. These similarities were certainly observed by early peoples living close to nature, and it is no wonder that bears have impressed us so deeply. Most European cultures have, or have had, rituals associated with bears. The bear and its parts had special magical and medicinal powers. These powers did not come so much from the bear's strength or cunning--although Scandinavians say that the bear has "ten men's strength and twelve men's cunning". Rather, the bear's magic came from his ability to wander between life and death. In the winter it descended into a cold grave in the ground and in the spring it came out, alive and well. Understandably, the bear became a symbol of healing and the cycles of life and death, or resurrection. Its appearance was also a promise of the coming summer vegetative period. Also, the female went into the den apparently barren and came out with young--which some cultures thought was a virgin birth.

Many Europeans have given or family names that have their roots in the name of the bear (including Bjørn Dahle, one of the authors of this plan), or live in villages, areas, or cities named after the bear (such as Berlin and Bern). Bears are common in the coats-of-arms of European administrative units and also are depicted on stamps and coins. The bear is a symbol to many people in other ways also, although the symbolism varies among people. It is a symbol of wilderness for an urban Central European, but a symbol of the multitude of threats to the livelihood of a Norwegian sheep farmer living in that "wilderness". It may represent the ultimate hunting trophy in Finland, Russia or Romania, or the very essence of endangered wildlife in Italy or France. These opposing views of the bear seem to be deeply rooted in our consciousness. Bears love their young, and our children love to snuggle up to a furry bear when they go to sleep. But, at the same time, the bear seems wild and dangerous, and many are afraid to go walking in a forest with real bears.

The bear has been a threat to our forefather's existence by preying on livestock. As a result, in many areas, man has done all he could to exterminate these bears to eliminate depredation on livestock. These efforts were often encouraged with bounties paid by the state and/or local authorities for the killing of bears. This was effective, because bears have a low reproductive rate and they are sensitive to high harvest rates. This, in combination with destruction of the large forest-covered areas they require, eventually led to the extermination of bears from most of Western Europe and many areas in Eastern and Northern Europe.

This Action Plan is based on a world-wide action plan (Servheen, et al. 1998). From this start, we have relied on some additional literature and comments from a large number of researchers and managers from throughout Europe for additional information. This world action plan is based on a country-by-country approach. Most of the populations of bears in Europe are shared among several countries. Even though some of these populations are large and increasing, in many cases they are not, and it is evident that countries must cooperate to ensure the long-term future of the species in Europe. WWF-Europe recognized this, which was one of the reasons they initiated the formation of the Large Carnivore Initiate for Europe. One of the results of this initiative is this Action Plan for the Conservation of Brown Bears in Europe. Here we have highlighted the concept of managing on the population level, even though this must be carried out by political entities. Therefore, in this action plan, we have described the biology of, and threats to bears on a European or population level, but have discussed specific required actions by country.

Before starting the Action Plan, the Large Carnivore Initiative for Europe had to decide on a definition of Europe. This was not an easy task, but it was decided to include all countries west of the border of the former Soviet Union and Turkey plus the Baltic countries and the Ukraine. We apologise to our colleagues who live east of this line, and earnestly hope that this plan will be useful to them in the conservation of bears in their countries. For completeness, we include information on bear populations in these countries that are continuous with the populations in this plan. We hope that this plan will also be useful for countries and areas that do not have bears now, but will in the future.

2. Background Information

2.1. Description of the species

The brown bear (*Ursus arctos*) is the most widespread bear in the world, with a holartic distribution in Europe, Asia, and North America, ranging from northern arctic tundra to dry desert habitats. Brown bears have a massive head with a short nose, rounded inconspicuous ears, small eyes, short tail, and a heavily built body with a prominent shoulder hump. The color varies considerably, and some individuals may seem light or dark from different angles due to the variegated guard hairs. The slightly curved claws (five on each foot) on the forefeet are longer than on the hind feet. Brown bears have a very well developed olfactory sense, although vision is probably important when bears are foraging on berries, nuts and acorns. Adult males are larger and heavier than females on average; generally males weigh 140-320 kg and females weigh 100-200 kg. All European brown bears are found inland and do not reach the extreme body sizes typical of coastal populations with access to protein- and lipid-rich spawning salmon, as in Alaska and the Russian Far East.

2.2. Distribution and population numbers in Europe

2.2.1 Definitions and population estimation methodologies

To reduce potential confusion about important terms, we have used the following definitions:

A population consists of the bears in an area that are genetically isolated, totally or substantially, from other bear populations. A population may consist of several subpopulations.

A subpopulation consists of bears in an area that have male-mediated genetic interchange with bears in nearby areas, but little or no contact or interchange among females.

A metapopulation is a group of geographically isolated subpopulations, interconnected by dispersing individuals of both sexes. Because of the limited dispersal of female brown bears, this term probably does not apply or only rarely applies to brown bears.

Europe, as defined in this Action Plan, includes the countries west of the border of the former Soviet Union and Turkey, but including the Baltic countries and the Ukraine.

It is important to stress that all the population estimates presented here are inaccurate and not directly comparable. Bears are notoriously difficult to census, and many estimates, especially those based on observations from the public, are probably overestimates. Estimates in southeastern Europe are often from counts at feeding sites that are carried out during one night. These estimates are based on the untested assumption that 80-90% of the bears visit feeding sites, and that none visit more than one site. Even the estimates from Scandinavia, which are based on marked-unmarked ratios of observed bears in two areas, are based on an extrapolation to the rest of the bears' range. Given these uncertainties, the estimates reported here must be regarded as rough and preliminary. However, the ranking of the populations by size is probably relatively accurate.

2.2.2. Status of the European populations

Brown bears originally occurred throughout Europe (except from the largest islands such as Ireland, Iceland, Gotland, Corsica and Sardinia), but later disappeared from most areas as the human population grew, suitable habitat was lost due to deforestation and agriculture, and the species was persecuted by hunting. Today the total number of brown bears in Europe is about 50,000 bears (ca. 14,000 outside Russia) within an area of more than 2.5 million km^2 (800,000 km^2 outside Russia) (Table 1). These bears are found in two large (≥5000), three medium (500-5000), one small (100-500), and six very small (< 100) populations. The original geographical distribution of brown bears in Europe is shown in Fig. 1, the present distribution in Fig. 2, and the present status of the populations is summarised in Table 1. For completeness, we include the bear populations in the former Soviet Union that are continuous with the populations we consider in this Action Plan.

Population densities vary and seem to depend on food availability, rate of harvest by humans and stage of population expansion/retreat. The highest densities (100-200 bears/ 1000 km^2) are found in Romania and the Dinaric countries, whereas extremely low densities (0.5-1 bear/1000 km^2) are found in some areas of Fennoscandia. The populations listed below are ranked by population size.

2.2.2.1. Northeastern Europe (37,500 bears)

The Northeastern European population is estimated to consist of about 37,500 bears, and is thereby the largest continuous brown bear population in Europe. It's range stretches from the Ural Mountains in the east (continuous with the bears on the east side of the mountains making it the largest brown bear population in the world) to the west coast of Finland. It ranges from 53° N in the south to 69° N in the north. Only the Finnish, Baltic and Norwegian portion of the population, which numbers 1,200-1,600 individuals, is considered here. The Finnish-Norwegian portion has received a net influx of dispersing bears from the high density Russian population, although the fence along the Finnish-Russian border has probably reduced the influx of bears from Russia. In Finland bears are distributed throughout the country except for the Ahvenamaa Islands (Åland). Thus the species has re-established most of its former range after the population bottleneck at the beginning of the 20th century, which was caused by overharvest and habitat degradation. Densities are generally low, with the highest densities in the southeastern part of the country and the lowest densities in the north and southwest. In Norway the distribution of bears in this population is restricted to the Sør-Varanger Municipality (especially the Pasvik Valley) and some occasional sightings in the eastern part of the Finnmark Plateau, both in Finnmark County. Bears on the Norwegian side number about 8-21, almost all living in an area of 1300 km^2, and thus at a much higher density than in the neighbouring Finnish area. Although the population density is low in northwestern Finland, there may be some genetic exchange with the Scandinavian population. Estonia has a large number of bears (440-600) at relatively high densities, whereas Latvia has only a few bears at the eastern edge of the country.

2.2.2.2. Carpathian Mountains (8,100 bears)

The Carpathian population includes the brown bears in Slovakia, Poland, the Ukraine and Romania (Fig. 1). The Carpathian Mountains population is estimated to about 8,100 bears and is the second largest in Europe. The population increased rapidly in the second part of this century and recently the Slovakian and Polish bear population was reconnected with the Ukrainian. This range expansion occurred rapidly, about 200 km in less than 20 years. Knowledge of the status of females in this expansion area would be of great interest, because, based on data from the Scandinavian population, one would expect that few females occur in this newly colonized area. The brown bears in the Apusen Mountains in the western part of Romania are probably partly isolated from the remaining Carpathian population, but interchange of males is suspected to

occur.

The Carpathian population probably consists of three subpopulations. No further increase in range and population size is expected as the population in the four countries has reached or passed its optimal number, and nearly all suitable habitat is occupied

2.2.2.3. Alps-Dinaric-Pindos (2,800 bears)

This population consists of brown bears in the forested areas extending from the eastern Alps in Austria and northeastern Italy in the north to the Pindos Mountains in Greece in the south. The countries involved are Austria, Italy, Slovenia, Croatia, Bosnia & Herzegovina, FYR Macedonia, the Yugoslav Federation, Albania, and Greece.

Three bears were released into central Austria in 1989-1993 into an area with a naturally occurring male bear. This central Austrian subpopulation now consists of about 13-16 bears. As there is not a continuous distribution of female bears with the rest of the Alps-Dinaric-Pindos population, but is movement of male bears, this constitutes a subpopulation.

The total Alps-Dinaric-Pindos population numbers about 2,800. The forested areas in these countries are less contiguous than in the Carpathian area, separating to some degree the functional habitat into more or less isolated subareas, although there are corridors. This suggests that the population may be divided into several subpopulations, or may become subpopulations if these corridors become unusable due to human activities. The population estimates for the Yugoslav Federation, Bosnia and Herzegovina, and especially Albania are uncertain, and the effect of the war and political unstability in this area on the bear population is unknown, but may be severe, at least locally.

2.2.2.4. Scandinavia (1,000 bears)

After heavy persecution in both countries, the once numerous brown bear population in Scandinavia was reduced to about 130 individuals in four areas where they have survived since 1930. The population has increased to about 1000 (800-1300); more than 95% of the individuals are in Sweden. Female brown bears are mostly confined to four areas in Sweden and probably represent the remnant populations after the heavy persecution. Male bears may disperse between neighboring female core areas, but when considering demographic viability they should be considered separate. This population consists of four subpopulations. In Sweden, the distribution of bears now resembles that of 1800, with bears occurring in 50% or more of the country. In Norway the bears are found mostly along the Swedish border and most individuals are dispersing young males from Sweden. The population is the most productive yet documented in the world and is increasing at a rate of 10-15% annually.

2.2.2.5. Rila-Rhodope Mountains (520 bears)

This population is located in southwestern Bulgaria and northeastern Greece. It includes the three local, but connected populations in the Bulgarian Rila Mountains and Pirin Mountains and the population in the western Rhodope Mountains on both sides of the national border. Of the total population of about 520 bears, only 15-25 are found in Greece. The connection between the bears in Greece and Bulgaria is likely to consist of dispersing males from Bulgaria. This population probably consists of two to four subpopulations. No further increase in range and population size is expected due to poaching, which in Bulgaria has increased after the political changes that occurred in 1989.

2.2.2.6. Stara Planina Mountains (200 bears)

This population of about 200 bears is located along a 120 km area from Zlatitsa-Teteven in the east to the Tryavna Mountains in the west-central Bulgaria. It became isolated from the populations to the south and west early in this century, after an effort to exterminate the species. There may be some genetic interchange however, between the Stara Planina population and the Rila-Rhodope population mediated through dispersing males. No further increase in range and population size is expected due to poaching, which has increased after the political changes that occurred in 1989.

2.2.2.7. Small isolated populations

Five very small isolated populations are found in southern and western Europe, representing the remnants of a once widespread brown bear population in this area. At least the three smallest of these populations are highly threatened with extinction. Unless prompt action is taken during the next few years, these populations will undoubtedly vanish. To underscore this point, it should noted that a small isolated European brown bear population in the Vassfaret area, southern Norway, died out as recently as the end of the 1980's.

2.2.2.7.1. Western Cantabrian Mountains (50-60 bears)

The brown bear is now found in two areas in the Spanish Cantabrian Mountains. The populations apparently have been separated since the beginning of the century and now show genetic differences. Today, they are separated by 30-50 km of mountainous terrain and interchange between the populations is thought to be unlikely, mainly due to unsuitable habitat and a high speed railway and motorway. If there is exchange, these two populations would be considered subpopulations. The most recent population estimate is 50-65 bears, distributed over an area of 2600 km^2. The population is in a steady decline due to human-caused mortality, primarily snaring to kill wild boar and poisoning to kill wolves.

2.2.2.7.2. Appenine Mountains (40-50 bears)

The population is located in Abruzzo National Park and the surrounding area in the Apennine Mountains in Italy. An estimate yielded 70-80 bears in 1985. However, since then there has probably been a population decrease and 40-50 bears may be a more realistic estimate. Some expect this population to increase as poaching has been reduced in recent years, and areas surrounding Abruzzo National Park have been protected to secure suitable habitats. However, this population exists within a densely human populated area and there are potential conflicts between bear conservation and development and recreation activities.

2.2.2.7.3. Eastern Cantabrian Mountains (20 bears)

This population, separated from the western Cantabrian population by 30-50 km of mountainous terrain, is estimated to contain about 20 bears. Its small size, combined with high human-caused mortality, such as snaring to kill wild boars and poisoning to kill wolves, makes survival of this population very unlikely unless appropriate management actions are carried out soon.

2.2.2.7.4. Western Pyrenees (6 bears)

The Western Pyrenean brown bear population is found in a 1000 km^2 area located on both sides of the national border between France and Spain (Fig. 2), however, only one half of this area is used regularly. The present population is estimated to be 6 individuals. The last documented reproductions occurred in 1995 and 1998. This population is doomed to extinction, unless drastic measures such as population augmentation are taken soon.

2.2.2.7.5. Southern Alps (4 bears)

This population is located in the province of Trentino in the northeastern part of the Brenta Mountains in Italy. The potential bear habitat occupies only 1500 km^2, of which only 240 km^2 is used regularly. No reproduction has occurred during the last 8 years. Recently, DNA analysis of hair and excrement samples documented only 3 individuals, and no more than 4 bears are likely to be found in this area. These data are presented in Table 1. In 1999, augmentation of this population was begun with the release of 2 bears from Slovenia. This augmentation is planned to continue during the next two years with the release of an additional 7 bears. Reduction of habitat degradation and fragmentation is necessary for the successful augmentation and conservation of this population.

2.2.2.8. Reintroduced populations

In Europe there have been two reintroductions of brown bears into areas with no bears, and two augmentations of existing populations.

The first reintroduction was in Poland, when a total of 10 bears were introduced into the Bialowieza area in 1938-44. This introduction was not successful. The last tracks were observed in 1947, except for one set of tracks observed in 1963, which may have been from a dispersing bear from Belarus. The last introduction is one in the central Pyrenean Mountains (3 individuals in 1996-1997, the population now numbers 5 bears).

The two augmentations, in central Austria and northern Italy, are described in section 2.2.2.3 and section 2.2.2.7.5, respectively.

2.3. Life history

2.3.1. Food

The omnivorous diet of brown bears is reflected by their dentition and adaptations in the digestive tract. Brown bears have large canines, which may be used for defense, killing prey, and dismembering carcasses, but the small premolars, and postcarnassial molars with large grinding areas are associated with a diet consisting largely of vegetarian foods and invertebrates. The digestive tract is basically a carnivore tract that has been lengthened, probably to allow better digestion and absorption of plant material. Brown bears have no caecum (as do ruminants) or enlarged vermiform appendix (as do horses, rhinoceros, and elephants), where microorganisms can digest cellulose. Therefore they can not digest the structural parts of plants, but they can, however, digest about half of the protein present in plants and most of the starch and sugar.

Brown bears pass through three biochemical and physiological stages in their active period from spring to autumn, changing from low food intake (hypophagia) in spring, a stage of normal activity in summer, to a high food intake (hyperphagia) in autumn, even though they might gain weight also during spring. The importance of high energy foods during late summer and autumn must be underscored, as this is the period of accumulation of the adipose tissue that is essential for hibernation. Brown bears have a large worldwide distribution and rely on different foods depending on area, and time of the year. They select the most nutritious food items available at a given time.

Green vegetation, such as graminoids and forbs, are eaten mostly in their most nutritious preflowering stages in spring and early summer. Bears switch to berries and fruits when they ripen. Later in autumn, and also during winter and spring, bears may consume large amounts of hard masts like acorns (*Quercus*), beechnuts, (*Fagus*), chestnuts (*Castanea*), and hazelnuts (*Corylus*) where they are available. A major difference in food habits of brown bears at northern and southern latitudes in Europe is the lack of hard mast, and large soft mast such as plums (*Prunus*), apples (*Malus*) and pears (*Pyrus*) in northern latitudes. Brown bears in the northern populations rely on berries such as bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum* spp.)

and cowberry (*V. vitis idaea*) for fattening during autumn. Bears farther south make extensive use of hard masts, as well as berries and large soft masts.

Due to its high digestibility and high nutritional value, meat, obtained either as prey, as carcasses or as baits seems to be selected when available. In southeastern Europe, feeding stations and hunting baits, serving as an artificial food source for brown bears, seem to be common. Baits placed by hunters or photographers are also found in some northern areas. Most studies of brown bear food habits are based on fecal analysis, and have underestimated the importance of animal matter, especially large mammals, in the diet.

Bears are not effective hunters of adult wild ungulates, unless they are favored by hard snow crust during spring. In North America brown bears were found to kill 40-50% of the neonatal moose calves (*Alces alces*). Predation rate on moose calves in an area in central Sweden with a high bear density (20-25 bears/1,000km²) is about 25%. During late spring/early summer, moose calves are the most important food for bears. In general brown bears seem to be more predaceous in the north than in the south and more predaceous in expansion areas than in core areas.

Domestic animals, which for generations have been bred for characteristics favored by humans, have become quite defenseless against large carnivores. This has made domestic animals, especially sheep, an easy prey for brown bears in parts of Europe where effective guarding techniques have been abandoned. However, on a European level domestic animals are not important food for brown bears.

Insects, especially the order Hymenoptera (ants, bees and wasps) may be seasonally important foods. Especially in spring, when snow covers the ground in northern areas and very limited food sources are available, bears dig out *Formica* anthills and break open down logs to obtain *Camponotus* ants. High in protein, insects may serve as one of a few sources of proteins in the spring and may provide essential amino acids. Tracking studies in Sweden have documented that female bears utilize ants more than males during spring, the season when ants are most often eaten.

2.3.2. Reproduction

Brown bears exhibit a long life span, late sexual maturity, and protracted reproductive cycles. It is a polygamous species and several males may mate with a female and each female may mate with several males during the mid-May to early July breeding season. Multiple paternity in litters has been documented. After fertilization embryos develop to the blastocyst stage, but development is delayed until implantation in late November. The effective gestation period is 6-8 weeks and females give birth to 1-4 small (0.5 kg) helpless cubs in their den in January-February. Young reach independence at the age of 1.4 or 2.4 years in Europe, the latter age is more common in the northernmost populations. European brown bears seem to be more productive than North American brown bears. Female brown bears in Scandinavia (the most intensively studied European population) give birth to their first litter at the age of four to six years (mean of 4.4), have relatively large litter sizes (mean of 2.4), and relatively short interbirth interval (mean of 2.4 years). These parameters are the highest reported for the species, although reproductive rates in central and southern Europe are probably similar.

2.3.3. Hibernation

By late autumn, brown bears have gained sufficient adipose tissue to hibernate for 3-7 months. Dens are either dug into the ground or old anthills (common in eastern Scandinavia) or they use natural cavities under rocks, etc. In southern populations (e.g. in Croatia and Spain) some bears may remain active all year. Denning is probably an adaptation to lack of food during winter and perhaps for birth of tiny young that are incapable of thermoregulation.

2.3.4. Activity and home range

Brown bears may be active at both day and night, depending on environmental conditions, abundance of food, and human activity. Human persecution may have caused brown bears in Europe to become more secretive and nocturnal than Siberian and North American brown bears. Like most other large carnivores, brown bears occur at low densities, especially in northern populations (e.g. 0.5 bears/1000 km^2 in southeastern Norway, 20-25 bears/1000 km^2 in one area of central Sweden, 100-200 bears/1000 km^2 in Romania) and have large home ranges. Home range size for adult males and females varies between areas, probably due to variation in food availability and distribution, and population density. For example home ranges in core areas are 6-10 times greater in the Scandinavian boreal forest than in the productive forest of Croatia, where hard mast and feeding stations are available. These home ranges are not completely comparable, because of a generally greater numbers of locations per home range in Scandinavia, but the difference is great. Male home ranges averaged 1,600 and 128 km^2 in central Sweden and Croatia, respectively, whereas the female home ranges were 225 km^2 and 58 km^2, respectively. Dispersing young males may roam over areas up to 12,000 km^2.

2.3.5. Social organisation and dispersal

Little is known about the social organization of brown bears, but the relationship among individuals, especially adults, depends largely on spacing and mutual avoidance except during the mating season. Brown bears exhibit male-biased dispersal, and females generally establish home ranges in or adjacent to their mothers' home range. However, extreme dispersal from the mother's home range has been documented in the expanding Scandinavian population. Greater incidence and distance of dispersal, which promotes range expansion and gene flow, is associated with a positive growth rate in brown bear populations. There seems to be extensive overlap in home ranges estimated by the minimum convex polygon method, although the real overlap in more concentrated activity areas is less known.

2.3.6. Habitat requirement

The original distribution of the brown bear in Europe (Fig. 1) illustrates its adaptability to different environmental conditions. With little or no human interference, brown bears occupied not only deciduous and coniferous forests, but also steppes and northern and alpine tundra. Today, most of its former range is not suitable habitat due to human habitat alteration and human presence. Bears are found in forested areas with generally low human density where they survived the persecution that, in most places, did not stop before sometime during the first half of this century.

Components of habitat can be grouped into three main categories: food, escape cover, and den sites. Bear movements and habitat use, as well as reproduction and survival of bears, are strongly affected by availability of food. Furthermore, population density is positively associated with food availability, and populations in the productive oak and beech forests in the Carpathian and Dinaric Mountains reach far higher densities than populations in the northern coniferous forests. Areas with a high availability of preferred foods, such as berries, fruits, hard mast, colonial Hymenoptera, and ungulates, are of special importance for brown bears.

The survival of brown bears in forests is not determined by food alone. Food availability may be quite good in more open habitats, but bears prefer to take refuge in nearby forests during day. In areas where bears are subject to hunting and poaching and have a long history of being persecuted by man, protective shrub or forest cover will likely be an indispensable part of the bears home area and crucial for their survival. Topography may also be important, as steep slopes are associated with low human activity. However the need for forest and/or steep slopes might decline over time with reduced human persecution of bears.

Den sites are often associated with remote areas with low human disturbance, and concentrations of dens are known from many areas, such as Norway and European Russia, Spain, the Caucasus Mountains, and Alaska. Disturbances in the denning period may drive bears to leave their den. This may be especially critical for pregnant females and females with cubs. In Sweden pregnant females that changed dens prior to parturition, lost cubs in or near the den ten times more often than those that did not move.

Brown bears have large home ranges, which stresses the need for large areas of suitable habitat to support a viable population. However, home range size varies greatly, apparently in relation to habitat productivity. If two or more populations are separated by a distance exceeding the distance of female dispersal, these populations must be treated as separate populations, and not as metapopulations when considering demographic viability. In a metapopulation, an extinction in one area can be counteracted by a recolonisation from a nearby area, the so-called ”rescue effect”. This stresses the importance of large continuous areas of suitable habitat, which is able to support an interconnected viable population.

To summarise, bears need large continuous areas of habitat with a sufficient availability of preferred foods and escape cover. If poaching is a problem, these areas should be relatively inaccessible to humans.

2.4. Brown bears and humans

2.4.1. Public attitudes

Little is known about the public attitudes towards the brown bear on a European level, but some national surveys have shown that people from the countryside are generally more negative than urban dwellers. Also, young age and higher education is often associated with a more positive attitude towards bears. High depredation of domestic livestock and fatal bear maulings may cause a rapid shift in attitude from positive to negative.

2.4.2.Threat to humans

The size and physical strength of this carnivore makes it capable of injuring and killing humans. However, attacks on humans do not appear to be a result of predatory behaviour, but rather a result of the bear defending itself, cubs or a carcass against humans. The presence of a wounded bear is the most dangerous situation. Several factors contribute to increase the level of a bear’s aggression. They are, in decreasing importance: the presence of cubs, presence of a carcass, a surprised bear, a bear at its den, and presence of a dog.

A comparison of data from Eurasia and North America showed that the European brown bear is much less aggressive than the brown bear found east of the Ural Mountains and North American brown bears. Nevertheless in recent years people have been killed by bears in Romania, Russia, Slovenia, Bosnia & Herzegovina, Croatia and Finland, and have been injured in many other countries. Advice about how to avoid or reduce problems when confronted with a bear is an important message in public education and information campaigns.

2.4.3. Damage to livestock, orchards and crops

Domestic animals, which for generations have been bred for characteristics favored by humans, have become quite defenseless against large carnivores. The effective guarding techniques necessary for coexistence of sheep and cattle husbandry and large carnivores have vanished in many areas of Europe, partly as a result of economic, social and political changes, and as a result of the extermination of large carnivores in most of their former ranges. Bears expanding into their former range have therefore easy access to unattended free-ranging domestic livestock, especially sheep and goats, and this often results in losses to predation. Cattle and horses are sometimes killed by bears, however numbers are much less than for sheep and goats. Sheep husbandry that lacks protective measures for the sheep is not compatible with the expansion of brown bear populations and is a major factor complicating the reestablishment of bears in former ranges. In addition, livestock losses, due to brown bear predation, cause a negative attitude towards bears among the public, especially in rural areas. Damage to oats occur in Finland, but not to a very big extent. In Bosnia & Herzegovina, Slovenia and Romania bears sometimes cause damage in orchards.

2.5. Threat, limiting factors, and obstacles to conservation

Brown bears have a low reproductive rate and the events in the past show us that they are very vulnerable to human-caused mortality. In addition they require large areas to live. This makes brown bears vulnerable to changes in, or lack of, management. Improper management may result from lack of knowledge about bears and their biology among people in general, and especially among politicians and managers. Political and economic instability may further complicate the situation for proper brown bear management. In eastern Europe land use was under centralized state administration for many decades and now has gone back to private ownership. As a result state agencies have often lost control over land use, including wildlife management. In addition, land use developments have tended to follow the Western patterns, with more intensive use of productive areas and less intensive use in less productive and remote areas. Main threats to the different populations are listed by country in Table 2.

2.5.1. Bear hunting, legal killing of nuisance bears, and poaching

Regulated hunting based on accurate population estimates and a knowledge of demographic parameters is not a problem for viable bear populations. This requires precise population estimates and monitoring of the population trend. In Sweden, the population trend was correlated with the rate of legal brown bear harvest eight years earlier. Female quotas are often set to regulate the effect of hunting on population growth. Killing of adult males, however, is also documented to have a population effect, probably because immigrating males kill cubs during the breeding season. Due to higher productivity of European brown bears than North American brown bears, European brown bears can sustain harvest rates far exceeding sustainable harvest levels in North American populations. Brown bears are popular hunting trophies, and legalisation of bear hunting may increase acceptance for bears and thereby facilitate the conservation of a viable bear population. Over 700 bears were killed legally in the countries covered in this Action Plan, when we sum the harvests from the last available year for each country (Table 4). We do not have any evidence that legal hunting is reducing the size of a bear population in Europe, except in Romania, where population reduction is a management goal. According to Article 16 of directive 94/43/EEC, the taking of a limited number of bears, which are listed in Annex IV, is allowed only in the absence of other satisfactory solutions. Therefore, hunting for other reasons seems not to be allowed in the EU.

Bears that prey on livestock, visit orchards, apiaries, and garbage dumps, or that are involved in injuries/killing of humans are collectively called nuisance bears, as these activities lead to conflicts with humans. The problem with nuisance bears may increase where bears are expanding their range, and before livestock, orchards, apiaries and garbage dumps are made inaccessible for bears. These bears are often killed legally, and legal killing of nuisance bears can be expected to represent a threat to the population if the rate of killing becomes too high or if the population is small. This may happen especially in expansion areas where bears have been rare or absent long enough that humans are no longer used to their presence.

Contrary to legal hunting, poaching is a threat to many, but not all populations. Poaching is not dependent on population size or density in a specific area. There is no sex discrimination, and females with cubs are also killed. This makes management of populations with widespread poaching difficult. As economic and social conditions have worsened in countries, such as Albania, Bulgaria, Bosnia & Herzegovina, the Yugoslav Federation, and FYR Macedonia, poaching probably occurs more often. Poaching of bears is also a problem where semidomestic reindeer are raised in the Nordic countries. Bears are poached as nuisance bears, for trophies, or for economic reasons. In Albania, Bulgaria and the Yugoslav Federation, adult females with cubs may be killed to obtain cubs for street performances (dancing bears). The increased demand for bear parts (especially the bile) in Asian countries like South Korea and China has led to a tremendous increase of poaching in Russia. Poaching to supply the Asian bear part market is also a problem in North America. Adequate law enforcement is essential for brown bear recovery and conservation in Europe.

Illegal killing may also be unintentional, as when bears are killed in snares set illegally for wild boars or killed by poison set out illegally for wolves. These are important sources of mortality in Spain.

2.5.2. Demographic viability

The small size of the isolated brown bear populations in western Europe is in itself a threat, as extinction can occur as a result of stochastic factors alone. An analysis of the viability of small brown bear populations has been made, based on the data from radio-marked brown bears in Sweden. This study found that a starting population of at least 6-8 females (>1 year), with the high survival found in the Swedish bears, was necessary to assure the criteria of less than 10% chance of becoming extinct within 100 years. This is demographic viability, and disregards all genetic effects of small population size. Until other data become available, this may be used as a very minimum estimate for the demographic viability of European brown bear populations unless the adult female mortality rate is expected to exceed 5-10%. The Eastern Cantabrian, Southern Alpine, and Western and Central Pyrenean populations are at or below this level, based on current population estimates.

2.5.3. Genetic viability

All European brown bear populations (except perhaps some in Russia) have been through a population bottleneck during the first half of this century and therefore reduced genetic variation should be expected in these populations. Inbreeding depression has been found in brown bears in Nordic zoos, but inbreeding depression has not yet been documented as a problem for small populations in the wild. The average heterozygosity in the formerly isolated

western Carpathian population was within the range commonly found in mammals. Heterozygosity in the four Scandinavian subpopulations is similar to that found in some brown bear populations in North America that have not gone through a population bottleneck. However the small Southern Alpine, Western Pyrenean, and Eastern Cantabrian populations apparently have low genetic heterozygosity. From this it is obvious that the genetic status of each population should be documented, even though we are not able to predict the consequence of reduced heterozygosity at this time.

Three different mitochondrial DNA lineages are found among European brown bears; 1) the bears in southernmost Scandinavian subpopulation and the Iberian Peninsula, 2) the closely related bears in the Southern Alpine population, Apennine population, the Alps-Dinaric-Pindos population, the Rila-Rhodope population and the Stara Planina population, and 3) the bears in the Carpathian population, the Northeastern European population and the three northernmost Scandinavian subpopulations. This lineage is genetically farther from 1) and 2). The borders between these lineages may be sharp as in Scandinavia, or diffuse, as in Romania. Thus, when augmentation is considered, these genetic lineages should be taken into account. However, suspected genetic adaptation to environmental conditions and feeding habits must be kept in mind. Augmenting Pyrenean or Cantabrian populations with bears from south Sweden appears to be the appropriate thing to do genetically, but for obvious reasons is inappropriate ecologically. In addition, we know that the southernmost Scandinavian subpopulation has had extensive genetic mixing with the northern subpopulations.

2.5.4. Habitat loss

The present distribution of brown bears in Europe is a result of the combined effects of the former exterminatory policy in the European countries and habitat loss. Habitat loss here is defined as the physical loss of habitat that could be used by bears. The best bear habitat was probably lost long ago, as the most productive areas were the first to become settled, cleared, and used for farming and agriculture. Food availability is an important habitat factor and limits population density and range. Food availability is probably not limiting the density in low density and heavily hunted populations, but population growth may be limited as reproduction is strongly correlated with food availability. Habitat loss may be temporary (e.g. agricultural land may be abandoned and reforested) or permanent (e.g. urbanisation).

All habitat loss and habitat degradation seems to be a result of human activity, especially forestry, agricultural expansion and intensification, resource extraction, road development, recreation development and urban expansion. The effect of human activity on bears may be summarised as: 1) loss of suitable habitat; 2) bears avoiding areas with human activity, thereby decreasing their range; 3) bears becoming habituated to humans; and 4) bear-human conflicts resulting in bear mortality. The degradation of habitat quality may range from minor to total.

2.5.5. Forestry

Exploitation of forests is common in the range of all the European brown bear populations. Logging in itself is not necessarily destructive to bear habitat. For example, the Swedish boreal forest is one of the most intensively managed forests in the world, yet the brown bears in Sweden have the highest productivity that has yet been documented for the species. Large clear cuts are probably more negative than small ones, as brown bears avoid open areas, and open areas are exposed to drying, which may reduce amounts of lush vegetation. Food availability in the harvested areas may be altered as the production of berries in the clear-cuts may decrease or increase. Timber harvest in oak and beech forests decreases the production of acorns and beechnuts, which are important foods in autumn and spring. Habitat degradation in this forest type is especially serious when the harvested areas are replanted with coniferous forest. It is also

possible that proper forestry management may be beneficial to bears. Planting of food-producing trees could be a beneficial action in some areas. It is obvious that accurate local information is essential when evaluating the effect of forestry practices on bears. Besides the direct effect on habitat, forestry is accompanied by the construction of roads, which are discussed later. Increasing tree mortality (15% of all trees damaged in certain areas of Bosnia and Herzegovina), attributed to environmental pollution may alter the composition of species in the forest and in the worst case lead to deforestation.

2.5.6. Fragmentation and isolation of habitat

The fragmentation of suitable habitat may in some cases be more destructive than loss of habitat, especially for a species with such large area requirements as the bear. By splitting the areas of suitable habitat into smaller ones, each of these may be too small to support a viable population. At a smaller scale, the areas of continuous habitat may be so small (keeping the large home ranges in mind) that bears have to cross a dangerous barrier to fulfil their requirements for food, cover, and den sites. Linkage zones may enhance the viability of populations that are separated by some distance by facilitating the exchange of individuals and maintaining demographic vigor and genetic diversity.

The construction of roads and highways has been mentioned as the most important factor associated with habitat fragmentation. Apart from being potential barriers to brown bear movements, bears are killed in collisions with vehicles and trains. This is particularly problematic along high-speed motorways making their way through suitable bear habitat in areas connecting high human density centers in Greece, Slovenia, Croatia, Italy, Austria, Spain, and France. Hydroelectric dams may also severely fragment bear habitat as in the Cantabrian Mountains. Intensification of farming is suspected to increase habitat fragmentation, especially in Poland. The conversion of bear habitat to agricultural land and urban areas is the major force behind habitat fragmentation in Europe, but mostly occurred long ago.

2.5.7. Increased human access to bear habitat

Most brown bear mortality is presently human-caused. Habitat with characteristics that provide protection against this mortality is therefore essential for maintaining viable bear populations. Hunting, poaching, and traffic-caused deaths seem to be increasing as a result of increased human access to an area.

Forest use, resource extraction and tourism promote the construction of roads into formerly roadless areas. These roads give humans easy access to once remote areas and may affect bears and their habitat. It is the human activity associated with roads and dwellings that influences the bears and not the structures themselves. Back country tourists, berry and mushroom pickers, fishers, hunters, and poachers all contribute to increased human disturbance. Increased human recreational activities in bear habitat may cause bears to avoid the disturbed area, or become more nocturnal, which both can led to nutritional stress, especially in lactating females. Bears often avoid areas in the vicinity of ski lifts, cabin concentrations, and areas with high density of forestry roads. This reduced use of human-influenced areas is equivalent with reduced habitat quality. Increased recreational activities are also associated with increased bear-human conflicts which results in bear mortality. In North America bears in some well visited national parks have become habituated to hikers and the number of direct confrontations has increased. Tourism seems to be a threat to bears in countries like Poland, Spain and Italy, and should be regulated in such areas to avoid conflicts. Given the easy access to all forest areas, increasing unemployment, increased market demand, intensive berry picking may decrease the natural food base of the bear in countries like Slovakia and Bosnia & Herzegovina.

Roads give hunters and poachers easy access to bears. The level of hunting and poaching is higher in areas with good road access in North America. These areas may function as population sinks. Habitat lacking roadless areas does not support black bears in the Southern Appalachian Mountains of North America, even if it has adequate food and den sites. This may also apply to brown bears in parts of Europe. However, poaching is not equally as great a problem in all parts of Europe (see 2.5.1). In Finland, the amount of roads did not affect the occurrence of bears.

Another aspect is hunting for species other than bears. Driving hunts e.g. for wild boar rarely result in the shooting of bears. However it may result in disturbance, and thereby nutritional stress, in a very important foraging season.

2.5.8. Livestock husbandry and farming

Brown bear predation on livestock results in conflict with livestock owners. The former livestock guarding techniques have vanished in many areas, usually motivated by low predatory losses after the extermination of the large carnivores. The brown bear is now expanding into parts of its former range and conflicts escalate rapidly there. Sheep farming, where sheep graze unattended and free-ranging in forests and mountains, is not compatible with the re-establishment of bears. Therefore sheep farming may complicate eventual reestablishment of viable bear populations. Bears that prey on livestock are often killed as nuisance bears. This is not necessarily demographically important for large viable population, but may be critical to small or re-establishing populations.

Grazing, and especially overgrazing, alters the undergrowth and may degrade bear habitat. Areas of intensive grazing by sheep and cattle have been found to be avoided by bears.

Apiaries, orchards and grain fields are attractive to bears due to the high nutritional value of honey and fruits. However, electrical fencing can reduce damages.

Damages to livestock, orchards, and beehives occur in areas where bear range includes human settlements, but these damages are compensated for in some ways in most countries (Table 3). Killing of bears that are causing damages to livestock, (and orchards and beehives) has been reported to be a serious threat to bears in several populations (Table 2).

2.5.9. Fragmentation of management authority

In some European countries brown bear management is carried out at a regional (provincial) level with little or no co-ordination among the various regions. In these cases, national legislation is only a general umbrella without much effect. In addition, the Forest Service, Game Boards, Regional or Provincial Boards and various ministries all have a say in brown bear management in some countries. This fragmentation makes any real implementation of a national plan very difficult and must be overcome. Brown bear management cannot be carried out effectively at the sub-national level because the spatial distribution and movements of brown bears are such that national and international transboundary management plans are necessary. Indeed, this Action Plan stems from the recognition that a continental transboundary approach is required to overcome the diversity of approaches implemented at national levels

2.5.10. Artificial food sources

Brown bears are opportunistic feeders and rapidly learn to utilize new food sources as they become available. Garbage left by humans at garbage dumps, in garbage cans or dispersed garbage from recreational activities may serve as an artificial food source for bears. Use of garbage has been documented in most areas where brown bears occur.

In parts of eastern Europe, feeding stations provide bears with large amounts of food such as corn, animal remains, and even garbage. These feeding stations are used as bait for bear hunting or to supplement the bears' diet. In Finland huge amounts of meat are placed along the Russian border to attract bears for photographic purposes. Artificial foods that are associated with human presence often have created problem bears. Bears that become habituated to humans are most likely ones to be involved in conflicts (including injuries) with humans. In some cases artificial food sources also attract human visitors that want to watch bears. Sometimes reckless persons may find themselves in tragic conflicts with bears. However, supplementary feeding of bears at established bait stations in remote areas does not seem to increase the risk of bears becoming food conditioned. Bears rather seem to become site conditioned and shy elsewhere.

2.5.11. Public opinion

The brown bear is known from legends and prejudice. Although not suffering from this as much as the wolf does, true facts about it are difficult to instill permanently in the public opinion. The lack of an ad hoc survey of European public opinion towards the brown bear makes it impossible to prepare and implement an efficient plan to educate and inform the public. Yet no significant conservation objective can be reached without considerable support and participation of local people. Public opinion management will have to be based on a sound understanding of the attitudes of various social and economic segments of the population.

2.6. Conservation status and recent conservation measures

2.6.1. National management

The brown bear is a protected or game species in all of the countries covered by this Action Plan. Most of the countries manage the brown bear at the national level, although several ministries are often involved. Almost half of the countries have prepared or are preparing a management plan for brown bears (Table 4). In addition, most countries engage in some form of activities within monitoring, research, information and conservation (Table 5). The European Union has contributed to national management programs, through the LIFE program, in Austria, France, Greece, Italy, and Spain.

2.6.2. International agreement

2.6.2.1. Bern Convention: Convention on the Conservation of European Wildlife and Natural Habitats (19.09.1979, Bern)

The goal of the Bern Convention is to preserve wild living animal species and their natural habitats. Signatory states must pay special attention to endangered and potentially endangered species. The contracting parties shall take requisite measures to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific, and cultural requirements, while taking account of economic and recreation requirements and the needs of sub-species, varieties or forms at risk locally. Protective measurements have to be included into planning and development. The spreading of information on the necessity of preserving wild animal species and their habitats has to be promoted. The European brown bear is listed in Annex II (strictly protected fauna species). Useful and necessary actions have to be taken to enhance the special protection of species listed in Annex II; especially forbidden is every form of capture, keeping or killing, the willful disturbance, and the possession and trade with these species. The re-colonisation of indigenous species has to be promoted, if a contribution to the preservation of an endangered species is thereby given.

Article 9 permits exceptions; a state may authorise the hunting or culling of populations and then is obliged to inform the Standing Committee of the Convention every two years on which

exceptions have been made, the reason for the exceptions and the impact on the population. This is done regularly by Norway and Romania. Exceptions can be granted under the following conditions: prevention of serious damages to livestock, culture and property; public health and safety reasons; use for scientific purposes, restocking and re-colonisation.

Article 22 permits any state to make one or more reservations regarding certain species specified in Appendices I to III regarding certain means or methods of killing, capture, or other exploitation. For the brown bear, reservations have been made by Bulgaria, Czech Republic, Finland, Slovenia, Slovakia, Ukraine, and Turkey (Table 4).

2.6.2.2. CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora (03.03.1973, Washington)

The brown bear populations of Bhutan, China, Mexico and Mongolia are listed in Annex I (species in the danger of extinction). All European brown bear populations are listed in Annex II (potentially endangered species). Annex II includes all species not in actual danger of extinction, but potentially endangered, if the trade with specimen of this species is not strictly controlled. The export is allowed with a special export permission only. This permission is given, if, among other things, the export of specimen has no negative impact on the population; if the danger of injury, danger of health and cruelty to animals during the preparation for transport and during the transport can be excluded. Import of species listed in Annex II is permitted only, if an export permission has been granted.

2.6.2.3. Biological Diversity Convention: UNCED-Convention (05.05.1992, Rio de Janeiro)

The main objective of the Convention is the conservation and sustainable use of biological diversity. A presupposition is the preservation of ecosystems, natural habitats and wild populations of species of wild fauna and flora. To reach this goal, the following actions have to be taken: identification of specially protected areas; strengthening the protection of ecosystems and preserving natural habitats of viable populations; degraded ecosystems have to be restored and the restoration of endangered species has to be promoted. Research for the identification, protection and the spreading of information on the status of biological diversity has to be promoted; protective measurements have to be included in planning and development. The brown bear per se is not mentioned specifically in this convention.

2.6.2.4. Resolutions and Directives in the European Union for the Protection of the Brown Bear within the Community (European Union member countries only)

European Parliament Resolution, 17.02.1989 (A2-339/88, ABL C 69/201, 20.3.1989).

The European Commission is herewith asked, to promote programs for the protection of the brown bear in Europe and to continue existing programs. These programs should cover the whole area of the European Union. In return for protective measurements set by communities for the brown bear, actions for socio-economic development will be promoted. Systems for bear damage prevention and damage compensation are supposed to be developed. A connected net of reserves and specially protected areas should be established.

European Parliament Resolution, 22.04.1994 (A2-0154/94, ABL C 128/427, 09.05.1994).

The European Commission is herewith asked, to not support and finance spatial development with negative impact on bear populations. Actions with negative impact on bear populations should be corrected by the establishment of protected areas and corridors for genetic exchange. Measurements against killing and capture of bears and for the protection of bear habitat are supposed to be taken. Financial support for damage compensation and compensation for economic restriction due to bear conservation should be taken.

The weakness of these resolutions becomes obvious when considering the fact that the European Parliament has no legal authority, but can only make recommendations to the European Commission.

Council Directive 92/43/EEC, Conservation of Natural and Wild Fauna and Flora (ABL L 206, 22.07.1992).

The main goal of the so-called FFH-directive is to secure species diversity by protection of habitats and protection of species of wild fauna and flora. Actions have to be taken by the signatory states to preserve all species of wild fauna and flora and their habitats. The European brown bear is a priority species of the European Union. It is mentioned in Annex II (needs specially protected areas), except the populations of Finland and Sweden, and Annex IV (strictly protected species; capture, killing and willful disturbance is not permitted). According to Article 16 of directive 94/43/EEC, the taking of a limited number of bears, which are listed in Annex IV, is allowed only in the absence of other satisfactory solutions. Therefore, hunting for other reasons seems not to be allowed in the EU. A so-called priority species is a species which needs special responsibility and actions for its conservation. An area of common interest is an area which is significant for the conservation of a priority species. The possession, transport and trade with Annex IV species is strictly prohibited. Exceptions can be given only if this has no negative impact on the preservation of the species. Under the following conditions, exceptions can be allowed: the prevention of serious damage to culture and livestock; public health, sanitary and safety reasons; for scientific, restocking and re-colonisation purposes.

3. Goal and objectives

3.1. Goal

The overall goal of this action plan is ”to maintain and restore, in coexistence with people, viable populations of brown bears as an integral part of ecosystems and landscapes across Europe”. In order to reach this goal, it is necessary to identify and mitigate or remove threats to the brown bear populations and their habitat. The successful conservation of brown bears in Europe is a measure of our success in maintaining biodiversity.

Objective 1

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.

Objective 2

Secure the viability of the presently small isolated brown bear populations by increasing their population numbers and range.

Objective 3

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.

4. Actions required to meet the goal and objectives on the European level

A summary of the actions deemed to be relevant for each country is given in Table 6, and a list for each country is presented in section 5.

4.1. Species conservation

Brown bear management should be at the population level. Because most populations are transnational in distribution, the conservation and management of brown bears should be carried out co-operatively across national borders. The conservation and reestablishment of brown bears in many countries depends on the management of brown bears in neighbouring countries. To secure cross-border co-operation, cross-border management plans and formal agreements between countries sharing brown bear populations are required. The signatory countries of the Bern Convention should adopt this Action Plan and thereby make brown bear recovery/conservation a political goal for all member countries

To implement the European continental policy on the national level, it is essential to work out a national brown bear management plan, designed and approved within the guidelines of the present Action Plan. By doing so, each national authority shall co-ordinate strategies with neighbouring countries with which they share a brown bear population.

It will be most important to include, from the beginning, all the authorities and organisations interested in or affected by the arrival or presence of brown bears in the process of elaborating such a national strategy. Potential interest groups, like hunting organisations, livestock owners, regional authorities and conservation organisations must be taken seriously.

A national plan should include detailed regulations on legal matters concerning damage assessment, damage prevention and compensation, educating and training of specialised staff, public awareness, implementation of a monitoring program, and promoting scientific research. The national Management Plan will also identify and suggest all changes to the national and/or sub-national legislation that will be necessary to implement the plan. To initiate, co-ordinate, enhance and supervise all this work, the national authorities in each country should form its own "brown bear management group".

In order to set up a realistic, feasible, and effective brown bear management plan, the government should first identify priorities. A working group including interested groups of persons (non-governmental organisations, administrators, scientists, shepherds, hunters, local conservation interests, etc.) may help the government to identify priorities towards brown bear management.

The brown bear should be protected by law, and hunting should only be legalised in populations that are documented to be viable and where management plans have been completed that list population goals and how hunting will be used to realise these goals. The term ”hunting”, as used in this action plan, must occur within the framework of international law and the Habitat Directive of the European Union. This allows limiting the growth rate of the population, the numbers of bears, and their distribution. People living in bear habitat may feel that this is a positive aspect and will more readily accept bears. Also hunters may be more accepting of bears if they are a game animal and not just a competitor for their game animals. Hunting may also provide a positive economic benefit.

To allow appropriate management of bear populations, law enforcement is necessary, with substantial penalties that make poaching very expensive.

Actions:

4.1.1. The Bern Convention adopts this Action Plan.

4.1.2. All countries identify and establish national brown bear management groups and empower them to design and produce national brown bear management plans on the population level according to this Action Plan. Countries sharing a brown bear population produce these national management plans co-operatively to secure cross-border management.

4.1.3. Countries that expect bears to occur in the foreseeable future should prepare management plants to prepare for this event.

4.1.4. The brown bear is protected by law and hunting is only allowed in populations that are documented to be viable and where management plans have been completed listing population goals and how hunting will be used to realise the goals.

4.1.5. Law enforcement is intensified in areas where poaching is identified as an important threat or limiting factor for the population. Appropriate penalties are adopted.

4.2. Recovery of acutely endangered populations

The isolated populations in the Pyrenees, the eastern Cantabrian Mountains and the Southern Alps are likely to vanish within the foreseeable future unless the populations receive additional bears. Augmentation is necessary in the Pyrenees and the Southern Alps. These populations should be augmented by bears from the large Alps-Dinaric-Pindos population. Bears in the southernmost Swedish population belong to the same mitochondrial DNA lineage as the Iberian populations, but have interbred extensively with bears from the eastern European mitochondrial-DNA lineage. Furthermore, Swedish brown bears are probably less adapted to the Iberian and Alpine ecosystems than Alps-Dinaric-Pindos bears. In the Eastern Cantabrian Mountains, measures to allow the two Cantabrian populations to re-establish contact and to merge together naturally would be preferable to augmentation. Reducing adult mortality might be an important measure to promote population expansion and increased dispersal, which should provide this contact. It is not possible to attain this natural contact, augmentation may be necessary.

Reintroductions of brown bears into suitable habitat can promote the reestablishment of viable bear populations in their former range. These reintroductions should be prioritized in bear-free areas between subpopulations, thereby linking these subpopulations together and enhancing both demographic and genetic viability. Reintroductions should only proceed when public information campaigns and input from local publics in the reintroduction area demonstrates support for reintroduction. The need for public information when a reintroduction or an augmentation is considered must be emphasised. Experience has shown that the public often more easily accepts naturally recolonising bears than bears introduced by agencies or organisations. The results of any reintroduction should be monitored and scientifically evaluated.

Actions:

4.2.1. Increase the viability of the small isolated populations through augmentation.

4.2.2. Increase the viability of the Eastern Cantabrian population by taking measures to allow the two Cantabrian populations to reunite.

4.3. Habitat protection

To conserve brown bear populations, the ecosystems they rely upon must be managed so that habitats are not lost nor their quality degraded. Activities not compatible with the conservation of viable brown bear populations should be carefully controlled or prohibited within the areas that will be managed for bears. Brown bear core areas, buffer zones and travel corridors should be identified and assessed to protect the areas of greatest importance for brown bear conservation. It would be positive to include as much bear habitat as possible in the EU within the Natura 2000 Network.

The fragmentation of bear habitat is one of the most serious threats to maintaining viable brown bear populations. Further habitat fragmentation should be stopped to secure the continuity of viable brown bear populations. Future highway or railway upgrades or construction projects should not be built through bear habitat unless an adequate number of wildlife passages are built to avoid transportation-related mortality, minimise fragmentation of the brown bear population, and promote dispersal.

Linkage zones will enhance the viability of populations separated by some distance by facilitating the exchange of individuals and maintaining demographic vigor and genetic diversity. Linkage zones should receive special attention and be protected against human interference and habitat degradation. Restoration of brown bear habitat through planting food trees and shrubs may be an effective way to conserve linkage zones and increase the food base for brown bears in some areas.

Intensive large scale forest practices that have been shown to be detrimental to brown bear habitat quality should be abandoned, especially in critical bear habitat. When harvested areas are replanted, priority should be given to native tree species that provide bears with cover and a sufficient food base.

Easy access to bear habitat has been shown to result in increased human-caused bear mortality in many areas and generally reduces the habitat quality for bears. To stop this situation, access to areas that are critically important to bears should be regulated during the critical seasons. The construction of forestry roads and other roads for resource extraction should be restricted in critically important areas, and be closed for public traffic in areas where high human-caused mortality is a problem. This will reduce easy access for people in bear habitat, at least in the areas where this traffic is detrimental to bears.

New localities for recreational activity that result in substantially increased human activity should not be placed in important bear habitat or in travel corridors between important bear habitats. For winter activities, den concentration areas should be avoided.

Actions:

4.3.1. Classify areas within present and potential brown bear range according to their suitability and importance as brown bear habitat in order to identify and manage core areas for brown bear conservation.

4.3.2. Identify and maintain or recreate linkage zones in fragmented populations.

4.3.3. Evaluate the impact of existing and planned infrastructure within brown bear range and mitigate potentially negative impacts where necessary.

4.3.4. Carefully control or prohibit human activities proven or suspected to be detrimental to brown bears in the brown bear core areas and linkage zones.

4.4. Conflicts with humans

Conflicts with humans usually involve livestock farmers and bee keepers, although more direct conflicts involve injuries of humans. In addition there may be a conflict between conservation and development. Conflicts should be reduced to avoid legal and illegal killing of nuisance bears, to reduce injuries or deaths to humans, and to create a positive attitude for bears. The social framework, economic perspectives and policies of the human populations within the areas necessary to achieve conservation and recovery, should be documented to fully understand which conflicts might exist between development and conservation (see 4.7).

Coexistence of brown bears and domestic livestock without some depredation is probably impossible. Limited livestock losses may be acceptable for conservation purposes, but extensive damages are unlikely to be tolerated. In areas where livestock farming in bear range is a threat to bear conservation, effective guarding techniques should be adopted or livestock farming should be abandoned in favour of other forms of production that are compatible with bear conservation. Economic incentives to reduce conflicts with livestock holders may be necessary for successful brown bear conservation and incentives should be given to encourage farmers to adopt forms of livestock husbandry that are compatible with bears in important bear habitat. Among the techniques to protect livestock, the most efficient seems to be a combination of the use of livestock guarding dogs, corrals, barns, electric fences and/or shepherding. The most appropriate measures will vary from area to area.

One of the most important steps in helping mitigate the conflict between farmers and brown bears is a system of compensation for the damages caused by brown bears. Some countries oppose compensation programs, arguing that it creates dependency. It is also important to take into account that some farmers strongly object if any livestock are killed. In that way the question is not only financial, but also emotional. This is why prevention is of utmost importance. However, a compensation/insurance system is also necessary, especially when dealing with protected brown bear populations. Compensation programs should be designed with certain precautions and conditions:

a. Payment of compensation for damage alone is passive. Prevention is active and is the only system that will help to diminish damages. Thus, compensation has to be linked with prevention (electric fences, night enclosures, livestock guarding dogs etc.).

b. The prices paid as compensation should be equal for damage done by different predators living in the area. Identifying the predator that is responsible is very important.

There are several ways of establishing compensation programs. However, common to most of them is that compensation for depredation loss should be linked to the farmers' effort to prevent damages. Similar compensation/prevention systems should be established for damages to apiaries and orchards

Other ways to reduce conflicts would be to avoid attracting bears to people. No artificial food should be available to bears in or near settlements. Artificial feeding, in any form that may create food-conditioned and human-habituated bears, should be avoided, including compost that is not bear proof. This means that garbage dumps in bear range must be inaccessible for bears, and that feeding areas for bears or baiting areas must be located far from settlements and in areas closed to general human use.

Aversive conditioning (e.g. rubber bullets, fire crackers) directed toward problem bears may be an effective management technique to reduce conflicts between bears and humans. This technique will be most effective when problems first occur, rather than after problems have become chronic.

Creation of bear management zones, with different levels of management priorities for bear conservation, may be a way to reduce conflicts and direct funding toward management activities in some countries. Bear management zones exist in Finland, Norway and Slovenia.

Actions:

4.4.1. Establish compensation programs with built-in measures to minimise cheating.
4.4.2. Link these compensation programs to the individual farmer's use of preventive measures.
4.4.3. Make garbage dumps and other human waste inaccessible to brown bears.
4.4.4. Abandon artificial feeding that may create food- or human-habituated bears.

4.5. Problem bears

Bears that cause agricultural damages, visit garbage dumps, or bears involved in injuries/killing of humans are collectively called nuisance or problem bears, as these activities lead to conflicts with humans. If preventive efforts to minimise conflicts have failed, other solutions must be considered. In large viable populations such individuals should be removed. In small threatened populations, each bear constitutes a significant proportion of the population, and therefore the effect of removing a problem bear must be weighed against the negative effect on population size. Removed animals can be killed or translocated, although few translocations have been successful.

Actions:

4.5.1. Minimize the creation of problem bears through actions 4.4.1-4.4.5 and 4.7.1.
4.5.2. Remove problem bears in viable populations if preventive efforts have failed.
4.5.3. Carry out cost (for the population in short and long term) - benefit (for the society and bear population in the long term) analysis before considering removal of problem bears in threatened populations.

4.6. Public involvement in brown bear management

If people affected by brown bears oppose their presence or reestablishment, this will result in their eradication or expensive guarding systems to enforce legal protection. Acceptance of brown bears by locals is increased if they have been part of the management process. Local involvement is best achieved through a public participation program. This program includes a management board which is involved in the planning process. The idea is that people support decisions they helped make. A board with local stakeholders or representatives for the values that exist in the area (agriculture, hunting, environment, tourism etc.) will ensure that the planning process is responsive to local conditions and needs. The board should be involved in deciding how many bears should be allowed in an area and where bears should be allowed to re-establish. The final decision should be political, preferably at the national level.

Actions:

4.6.1. Identify opinion leaders and stakeholders in brown bear management; set up local management boards and involve them in management planning and implementation.
4.6.2. Establish a protocol of consultations with local people about their needs and the management actions to be implemented in their area.

4.7. Public awareness, education and information

In order for the brown bear conservation strategy to be successful, the public must be committed to making it work. Only an informed public will be able to share a commitment to brown bear conservation. People living in or frequenting bear habitat must be educated about the presence of bears, how to avoid contact with bears, how to keep bears out of garbage and other human food sources, and what to do when they meet a bear in a threatening situation. This information should be directed to decision makers, those with commercial interest within bear habitat, and the public in general.

A good educational campaign should be prepared and conducted by going through the following steps:

a. Find a lead agency, group or person, who raises the funding for all the other necessary steps following.
b. Identify target groups, their existing knowledge levels and attitudes as well as assess the current educational information.
c. Design efforts and messages targeted by group.
d. Identify individuals within the different target groups to deliver the messages in order to increase the chance of a successful implementation.
e. Implement the educational campaign.
f. Conduct an evaluation of the educational efforts. What effects did they have? What has to be improved? How far were attitudes of the target group changed and what brought about the change? etc.
g. Monitoring: Attitudes and beliefs of the target groups as well as the goals of the campaign have to be reassessed in a continual process. In other words, after running an educational campaign for some time we have to go back to step "b" again and start the process over again.

A campaign to inform the public should be an integral part of the conservation program. Its action must be continuous and widespread, and it could be assigned to a credible association, which would follow a plan previously agreed upon in terms of content, instruments and personnel with the concerned ministries and regional administrations. The more precisely the information has been tailored, the more effective it will be. An information campaign will cover several aspects, including:

Bear ecology

People should be informed about brown bear ecology to understand the management of the bears and their habitat.

Damage to livestock and how to limit damages

People should be informed about the magnitude of the damages caused by brown bears to domestic livestock, and the real facts about the way in which these damages occur (where, when, why, under what conditions etc.). In particular the information will have to cover the methods that can be used to prevent and limit damages.

Human safety

By teaching people how to behave in bear range, and when they meet a bear, they will be able to better avoid situations that may endanger themselves and the bears.

Waste management

People should learn how and why garbage and other human waste, which may serve as an attractant for brown bears, should be handled and stored to keep it inaccessible for bears.

Actions:

4.7.1. Initiate information campaigns designed for different target groups following the guidelines listed in the management plan.

4.8. Research and Monitoring

Most brown bear populations in Northern and Eastern Europe have increased in numbers and expanded their range during the last 50 years, although other populations are at the edge of extinction. In order to manage this species properly, we need specific research about several aspects of brown bear ecology. It is important to create a body that can co-ordinate scientific research on brown bears at the European level, and maintain a close link among all researchers working on brown bears in Europe. Co-ordinated research implies that research funds, such as European Union funds, should be made available at the European level, including adjacent non-Union countries that can conduct relevant research. This proposed body should also co-ordinate the regular gathering of all necessary data to monitor the management and biological conditions of brown bears in European countries. For this type of co-ordination to function, it is important that the ownership of data be properly respected and that questions of authorship of publications be resolved early in the process. We recommend that future research be concentrated on the following topics (not listed in prioritised order):

Population dynamics

To be able to adequately manage a bear population, its population dynamics need to be carefully studied and described. This is because hunting is the most reasonable way to stabilise the number of bears after a population goal has been reached, but bear populations are known to be very sensitive to overharvest. Research should focus on rate of reproduction, age and sex structure, survivorship, and the effects of various harvest rates and hunting methods. If the population goal is not being reached, this research is necessary to determine the reason.

Dispersal

The reestablishment of the brown bear into new areas depends on the species' ability to disperse. As a population size increases, information about dispersal patterns and which factors promote and hinder dispersal become very important to predict dispersal directions and speed.

Genetic studies

Genetic analyses to estimate levels of genetic drift, gene flow, and inbreeding would provide valuable information necessary for classification of population units as well as for establishing and managing linkage corridors.

Brown bear-prey relationships

Various studies have been carried out on the feeding habits of brown bears in Europe, most of them have used indirect methods based on analysis of digestive remains. This approach has limited value in clarifying the relations between brown bears and their prey. Furthermore, predation on domestic and wild ungulates by bears expanding into new areas should be investigated to make managers and the public prepared for possible changes. Research should also be initiated on the effects of multiple predators on prey populations, such as bear and wolf predation on moose.

Habitat use

A large-scale study of habitat selection by brown bears and mapping of suitable bear habitat in Europe by using radio telemetry and Geographical Information Systems (GIS) would provide information about where reintroduction, augmentation and habitat restoration should be directed to secure the bear populations and their habitats from fragmentation. Linkage zone prediction models should be developed to identify critical area needing to be managed in order to maintain genetic interchange between subpopulations and enhance reestablishment of bears into new areas.

Brown bear behaviour and human activities

Behavioral studies of brown bears should be undertaken to document behavioral responses to human disturbance in form of recreational activity and human-caused mortality. The effect of different types of forestry practices and other forms of resource management on bears should be better documented to make human resource use more compatible with bear conservation. In general, it is important to document the human-influenced factors that are least compatible with brown bear conservation. With this knowledge, managers can regulate the important human activities. Several of the south European populations coexist with relatively dense human populations. Overregulation of human activities would be detrimental to public acceptance of bear management and conservation.

Public opinion

Public opinion surveys should be conducted to determine special target groups for information, how information should be presented, and which management actions that are most likely to be successful.

Monitoring

When a new conservation strategy is implemented, one of the most essential programs that has to be put into place is a plan for monitoring the state of the environmental components and the positive and negative aspects of the strategy's application. Monitoring is essential for evaluating the progress of the conservation strategy, for adjusting and correcting erroneous actions, and for suggesting new ones. A monitoring program must be implemented at the same time as other actions called for by this Action Plan. Monitoring of brown bear populations is difficult, and population estimates based on different criteria and data from the same population may give very different results. To secure a sustainable management of bear populations, the development and evaluation of reliable methods to estimate population size and population trends should be given high research priority. Some population estimates are very uncertain or not up to date, and the estimates for several countries are no more than qualified guesses.

Prevention and limitation of damages

Methods to limit the conflict between bears and humans (such as livestock holders, apiary tenders, and orchard owners) should be developed further and communicated.

Actions:

4.8.1. Coordinate scientific research on brown bears at the European level, and maintain a close link among all researchers working on brown bears in Europe.

4.8.2. Coordinate the regular gathering of all necessary data to monitor the management and biological conditions of brown bears in European countries.

5. Required actions by country

Albania

Population: Alps-Dinaric-Pindos

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Austria

Population: Alps-Dinaric-Pindos

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.

- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Bosnia-Herzegovina

Population: Alps-Dinaric-Pindos

- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Bulgaria

Population: Stara Planina Mountains; Rila-Rhodope Mountains

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.

- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Additionally proposed actions:
- Co-ordinate public awareness, education and information campaigns at the regional and European level, and co-ordinate exchange of ideas and materials.
- Solve the problem with captive-bred bears.

Croatia

Population: Alps-Dinaric-Pindos
- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.

- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Czech Republic

Population: none

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.2.1: Increase viability of small isolated populations through augmentation.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.

- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Estonia

Population: Northeastern Europe

- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Finland

Population: Northeastern Europe

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4. 4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Additionally proposed actions:

- Regulated hunting in viable populations where hunting is listed as an action to reach the management tool.

France

Population: Western Pyrenees; Central Pyrenees

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- *Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).**
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.2.1: Increase viability of small isolated populations through augmentation.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: *Link of compensation system to individual farmer's use of preventive measures.**
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: *Evaluation of costs and benefits before removing problem bears in threatened populations. **
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

* The actions in italics are those which were not chosen by both/all respondents, when more than one responded.

Greece

Population: Alps-Dinaric-Pindos; Rila-Rhodope Mountains

- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.

- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Hungary

Population: none

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.2.1: Increase viability of small isolated populations through augmentation.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Italy

Population: Apennine Mountains

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: *Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.**
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their

suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: *Establishment of compensation systems.**
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: *Removal of problem bears in viable populations if preventive efforts have failed.**
- Action 4.5.3: *Evaluation of costs and benefits before removing problem bears in threatened populations.**
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Additionally proposed actions:
- Assess the status of all recovering and small populations, including counting or monitoring of bear abundance, identifying bear habitat quality and quantity.
- Identify the status of populations and establish a monitoring program including health status.

* The actions in italics are those which were not chosen by both/all respondents, when more than one responded.

Italy

Population: Southern Alps
- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans cooperatively).
- Action 4.2.1: Increase viability of small isolated populations through augmentation.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.4.1: Establishment of compensation systems.

- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Additionally proposed actions:
- Assess the status of all recovering and small populations, including counting or monitoring of bear abundance, identifying bear habitat quality and quantity.
- Identify the status of populations and establish a monitoring program including health status.

Latvia

Population: Northeastern Europe
- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.4.1: Establishment of compensation systems.

Additionally proposed action:
- Development of a national monitoring program.

Norway

Population: Northeastern Europe; Scandinavia
- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: *Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.**
- Action 4.1.5: *Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.**
- Action 4.2.1: *Increase viability of small isolated populations through augmentation.**
- Action 4.3.2: *Identification and maintenance or recreation of linkage zones in fragmented populations.**
- Action 4.4.3: *Inaccessibility of garbage dumps and human waste for brown bears.**
- Action 4.4.4: *Abandon artificial feeding that may create food- or human-habituated bears.**

- Action 4.5.1: *Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.**
- Action 4.5.2: *Removal of problem bears in viable populations if preventive efforts have failed.**
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

* The actions in italics are those which were not chosen by both/all respondents, when more than one responded.

Poland

Population: Carpathian Mountains

- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Romania

Population: Carpathian Mountains

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Additionally proposed action:

- Improvement of the habitat quality
- Abandon artificial feeding for hunting purposes

Slovakia

Population: Carpathian Mountains

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.

- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Slovenia

Population: Alps-Dinaric-Pindos

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimise the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.

- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Spain

Population: Western Cantabrian Mountains; Eastern Cantabrian Mountains

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans cooperatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.2.1: *Increase viability of small isolated populations through augmentation.**
- Action 4.2.2: Increase the viability of the Eastern Cantabrian population by taking measures to allow the two Cantabrian populations to reunite.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: *Control or prohibition of human activities detrimental in bear core areas and linkage zones.**
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: *Inaccessibility of garbage dumps and human waste for brown bears.**
- Action 4.4.4: *Abandon artificial feeding that may create food- or human-habituated bears.**
- Action 4.5.1: Minimize the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: *Removal of problem bears in viable populations if preventive efforts have failed.**
- Action 4.5.3: Evaluation of costs and benefits before removing problem bears in threatened populations.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Coordinated scientific research on brown bears in Europe.
- Action 4.8.2: Coordination of gathering necessary data to monitor management and biologial conditions of brown bears in European countries.

* The actions in italics are those which were not chosen by both/all respondents, when more than one responded.

Switzerland

Population: none

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.4.1: Establishment of compensation systems.
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Sweden

Population: Scandinavia

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: *Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans cooperatively).**
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.2: *Identification and maintenance or recreation of linkage zones in fragmented populations.**
- Action 4.3.4: *Control or prohibition of human activities detrimental to bear core areas and linkage zones.**
- Action 4.4.1: *Establishment of compensation systems.**
- Action 4.4.2: Link of compensation system to individual farmer's use of preventive measures.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
- Action 4.4.4: Abandon artificial feeding that may create food- or human-habituated bears.
- Action 4.5.1: Minimize the creation of problem bears through actions Action 4.4.1-Action 4.4.5 and Action 4.7.1.
- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.5.3: *Evaluation of costs and benefits before removing problem bears in threatened populations.**
- Action 4.6.1: *Identification and involvement of public opinion leaders and stakeholders in brown bear management.**
- Action 4.6.2: *Establishment of permanent consultation protocol with locals about their needs and necessary management actions.**

- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Coordinated scientific research on brown bears in Europe.
- Action 4.8.2: Coordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

* The actions in italics are those which were not chosen by both/all respondents, when more than one responded.

Ukraine

Population: Carpathian Mountains

- Action 4.1.1: Adoption of Action Plan by Bern Convention.
- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental in bear core areas and linkage zones.
- Action 4.4.3: Inaccessibility of garbage dumps and human waste for brown bears.
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- Action 4.5.2: Removal of problem bears in viable populations if preventive efforts have failed.
- Action 4.6.1: Identification and involvement of public opinion leaders and stakeholders in brown bear management.
- Action 4.6.2: Establishment of permanent consultation protocol with locals about their needs and necessary management actions.
- Action 4.7.1: Initiate information campaigns designed for different target groups.
- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

Yugoslav Federation

Population: Alps-Dinaric-Pindos

- Action 4.1.2: Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).
- Action 4.1.4: Protection of brown bear by law; game species only where viability is proven and hunting is used to reach population goals identified by management plans.
- Action 4.1.5: Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.
- Action 4.3.1: Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.

- Action 4.3.2: Identification and maintenance or recreation of linkage zones in fragmented populations.
- Action 4.3.3: Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.
- Action 4.3.4: Control or prohibition of human activities detrimental to bear core areas and linkage zones.
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- Action 4.8.1: Co-ordinated scientific research on brown bears in Europe.
- Action 4.8.2: Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

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8. Tables

Table 1. The 1996 status, distribution and expected population trend of the European brown bear populations covered by this Action Plan (including continuous populations outside the countries covered by the Action Plan). The populations are listed from the largest to the smallest.

Population	Number of bears	Country	Number of bears	Distribution area (km^2)	Present status
Northeastern Europe	37,500	European Russia	36,000	1,7000,000	Increasing?
		Finland	800-900	300,000	Increasing
		Estonia	440-600	15,000	Stable
		Belarus	250 (120?)	60,000	?
		Norway	8-21	5,000	Stable
		Latvia	20-40	10-15,000	Stable?
Carpathian Mtns.	8,100	Romania	6,600	38,500	Decreasing
		Ukraine	400(970?)	11,400	Decreasing
		Slovakia	700	3,000	Increasing
		Poland	100	4,000	Stable
		Czech Republic	2-3	2,000	?
Alps-Dinaric-Pindos	2,800	Bosnia & Herzego.	1,200	10,000	Decreasing?
		Yugoslav Fed.	430	2,000	Decreasing?
		Croatia	400	9,800	Stable
		Slovenia	300	3,000	Stable
		Greece	95-120	6,200	Decreasing
		FYR Macedonia	90	820	Stable
		Albania	250	3,000	Stable
		Austria	23-28	8,000	Increasing
		Italy	?	?	Increasing
Scandinavia	1,000	Sweden	1000	250,000	Increasing
		Norway	18-34	60,000	Increasing
Rila-Rhodope Mtns.	520	Bulgaria	500	10,000	Decreasing
		Greece	15-25	2,400	Decreasing
Stara Planina Mtns.	200	Bulgaria	200	?	Decreasing
W. Cantabrian Mtns.	50-65	Spain	50-65	2,600	Decreasing
Apennine Mtns.	40-80	Italy	40-80	5,000	?
E. Cantabrian Mtns	20	Spain	20	2,500	Decreasing
Western Pyrenees	6	France	3-4	500	Decreasing
		Spain	1-2	500	Decreasing
Central Pyrenees	5	France	5	?	?
Southern Alps	3-4	Italy	3-4	1,500	Decreasing
Europe total	~50,000			~2,500,000	

Table 2. Identified threats to brown bears in the countries covered by this Action Plan.
XX: Serious threat, X: minor threat, (X): suspected threat in the future, L: local threat. Open spaces may result from the lack of information

Population	Hunting of bears	Killing nuisance bears	Poaching	Forestry	Livestock husbandry & farming	Habitat frag-mentation & isolation	Human access to bear habitat	Traffic kills	Artificial food sources	Negative public attitude	Political/ economic instability	Management fragmentation
Northeastern Europe												
Finland			L						L	(X)		
Norway					XX							X
Carpathian MTNS.												
Poland			X	X		X	XX		X			X
Romania					X				X			
Slovakia	X		(X)			X	X					
Ukraine		L	XX	X		(X)	X				XX	
Alps-Dinaric-Pindos												
Albania			X									
Austria				X		XX	XX					XX
Bosnia & Herzegovina			X	XX	X	(X)	X				XX	
Croatia	X?		X	X		X	X	X	X		X	X
FYR Macedonia			X	X?							X	
Greece			XX	X	L	XX	X	(X)		(X)		X?
ITALY												XX
Slovenia				X		X	X	X	X	(X)		
Yugoslav Fed.			X	X		(X)					XX	
Scandinavia												
Sweden			L						L	(X)		
Norway		XX	X		XX					X		X
Rila-Rhodope Mtns.												
Bulgaria		X	XX		X	XX	X		X	X	XX	
Greece			XX	X	L	XX	X	(X)		X		X
Stara Planina Mtns.		X	XX		X	XX	X		X	X	XX	
W. Cantabrian Mtns.			XX	X	X	XX	XX					XX
Apennine Mtns.			X	XX	X	XX	XX	X	X	X		XX
E. Cantabrian Mtns.			XX	X	X	XX	XX					XX
Western Pyrenees				X	XX	XX	XX					X
Central Pyrenees				X	XX	XX	XX			X		X
Southern Alps			X	X		XX	XX	X				XX

Table 3. Damage and compensation due to the brown bear in the European countries covered by this Action Plan. (Abbreviations: 0 = zero; ? = number unknown; - = no information, none = not found in the country).

	Official damage, in number killed or destroyed						Compensation	
Country	sheep	goats	cattle	horses/ donkeys	reindeer	beehives	Paid?	Amount (Euro)
Albania	?	?	?	?	none	?	no	0
Austria	30/year (1990-1996)	none	1/year (1990-1996)	0	none	30/year (1990-1996)	yes, by hunters and state insurance	3,689 (1996)
Bosnia & Herzegovina								
Bulgaria	-	-	-	-	none	-	no, but in preparation	0
							yes, by hunter clubs	
Czech Republic	0	0	0	0	none	0	no	0
Estonia	-	-	-	-	none	-	no	0
Finland	?	?	?	?	800 (1996)	-	yes, by state	461,114 (1996)
France								
FYR Macedonia	-	-	-	-	none	-	no	0
	12 (1996)		124 (1996)					66,330 (1996)
Italy	2 (1996) Apen. Mtns.	1 (1996) Apen.. Mtns.	8 (1996) Apen. Mtns.	4 (1996) Apen. Mtns.	none	2 (1996) Apen.. Mtns.	yes, by regional government	5,061 (1996)
Latvia	-	-	-	-	none	-	no	0
Norway	1,821 (1995)	0	0	0	32 (1995)	0	yes, by state	454,047 (1995)
Poland	35/year	0	0	0	none	40/year	yes	?
Romania	-	-	-	-	none	-	yes, by hunter clubs	-
							yes, by state or hunters	
Slovenia	~ 300 (1996)	~ 30 (1996)	~ 10 (1996)	1-2 (1996)	none	~ 20 (1996)	yes, by hunter clubs	48,509 (1996)
							yes, by regional government	
Sweden	24 (1995)	0	0	0	496 (1995)	0	yes, by state insurance	172,790 (1995)
Ukraine	-	-	-	-	none	-	no	0
Yugoslav Federation	-	-	-	-	none	-	no	0

Table 4. Management and legal status of the brown bear in the European countries covered by this Action Plan. (Abbreviations: 0 = zero, ? = number unknown, - = no information, n = national; r = regional/provincial, l = local, (yes) = in preparation, * = the bear is protected, but hunting is allowed by special permission from the government)

Country	Bern Convention		Management of bears				Kills	
	Signed?	Reserva-tion?	Institution in charge	Level	Mgmt Plan?	Status	Legal	Illegal
			General Directorate of Forestry					10 (1996)
Austria	yes	No	Regional Governments	r	yes	protected	2 (1994)	?
Bosnia & Herzegovina						game species		
Bulgaria	yes	Yes	Ministry of Environment, Ministry of Agriculture, Forests & Agricultural Reforms	n	no	protected	8 (1996)	~30
						game species	16/yr (1986-92)	
Czech Republic	Yes	Yes	District Governments	r	no	protected	-	0
						game species		
Finland	Yes	Yes	Ministry of Agriculture and Forestry	n	yes	protected, hunting*	97 (1996)	?
								1 (1997)
FYR Macedonia	Yes	No	Ministry of Forestry, Agriculture and Water Economy	n	no	protected	2 (1996)	?
								12 (1996/97-1997/98)
Italy	Yes	No	Regional Governments	n/r/l	yes	protected	0	5 (1989-1996)
			Ministry of Environmental Protection and Regional Development					
Norway	Yes	No	Directorate for Nature Management	n	yes	protected	1 (1996)	0 (1996)
			Ministry of Environmental Protection, Forestry and Natural Resources					
Romania	Yes	No	Ministry of Waters, Forest and Environmental Protection	n	no	game species	299 (1992)	-
			Ministry of Agriculture, Ministry of Environment			protected, hunting*		
Slovenia	Yes	Yes	Ministry of Agriculture and Forestry Ministry of Environment and Spatial Planning	n	yes	protected, hunting*	37 (1996)	?
Spain	Yes	no	Regional Governments	r/p	yes	protected	0	?
Sweden	yes	no	Environmental Protection Agency	n	(yes)	protected, hunting*	30 (1996)	4 (1996)
			Ministry of Environmental Protection & Nuclear Safety, State Forestry Committee					
Yugoslav Federation	no	no	Ministry of Agriculture	n	no	game species		32 (1987)

Table 5. Monitoring, information and research activities on brown bears in the European countries covered by this Action Plan. (Abbreviations: x = yes, (x) = in preparation, blank = no, - = no information)

Country	Monitoring	Research	Information	Conservation programs
Albania				
Austria	x	x	x	x
Bosnia & Herzegovina	x			
Bulgaria			x	x
Croatia	x	x	x	x
Czech Republic	x	x		
Estonia	x			
Finland	x	x	x	x
France	x	x	x	x
FYR Macedonia			x	x
Greece	x	x	x	x
Italy	x	x	x	x
Latvia				
Norway	x	x	x	x
Poland	x	x		x
Romania	x	x		
Slovakia	-	-	-	-
Slovenia	x	x	(x)	
Spain	x	x	x	x
Sweden	x	x	x	x
Ukraine	x	x		
Yugoslav Federation	(x)	(x)	(x)	(x)

Table 6. Relevant actions for the conservation of the brown bear per country. (Abbreviations: x = necessary action, (x) = necessity of action depending on different view of respondents, blank = action not necessary, - = no information).

Country	Relevant actions, giving the last two numbers (see section 4 for description)																					
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	6.1	6.2	7.1	8.1	8.2
Albania	x	x		x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Austria	x	x		x					x		x	x	x	x	x	x			x	x	x	x	x
Bosnia & Herzegovina																							
Bulgaria	x	x		x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Croatia	x	x		x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Czech Republic	x	x		x		x			x	x	x	x	x			x			x	x	x	x	x
Estonia																						x	x
Finland	x	x		x	x			x				x	x	x	x	x	x	x		x	x	x	x
France	x	(x)		x	x	x		x	x	x	x	x	(x)	x	x	x	x	(x)	x	x	x	x	x
FYR Macedonia	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greece														x		x	x					x	x
Hungary	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
Italy/Apen. Mtns.	x																						
Italy/S. Alp.	x	x				x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Latvia	x			x				x				x											
Lithuania	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	x	x		(x)	(x)	(x)			(x)					(x)	(x)	(x)	(x)	x			x	x	x
Poland		x						x	x	x			x			x	x	x	x	x	x	x	x
Romania	x	x		x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Slovakia	x	x						x	x	x	x		x	x		x	x		x		x	x	x
Slovenia	x	x		x				x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
Spain	x	x		x	x	(x)	x	x	x	x	(x)	x	x	(x)	(x)	x	(x)	x	x	x	x	x	x	x
Switzerland	x	x						x	x	x		x	x						x	x	x	x	x
Sweden	x	(x)		x	x				(x)		(x)	(x)	x	x	x	x	x	(x)	(x)	(x)	x	x	x
Ukraine	x	x		x	x			x		x	x			x		x	x		x	x	x	x	x
Yugoslav Federation		x		x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Figure 1. Historic distribution of the brown bear in Europe and adjacent areas.
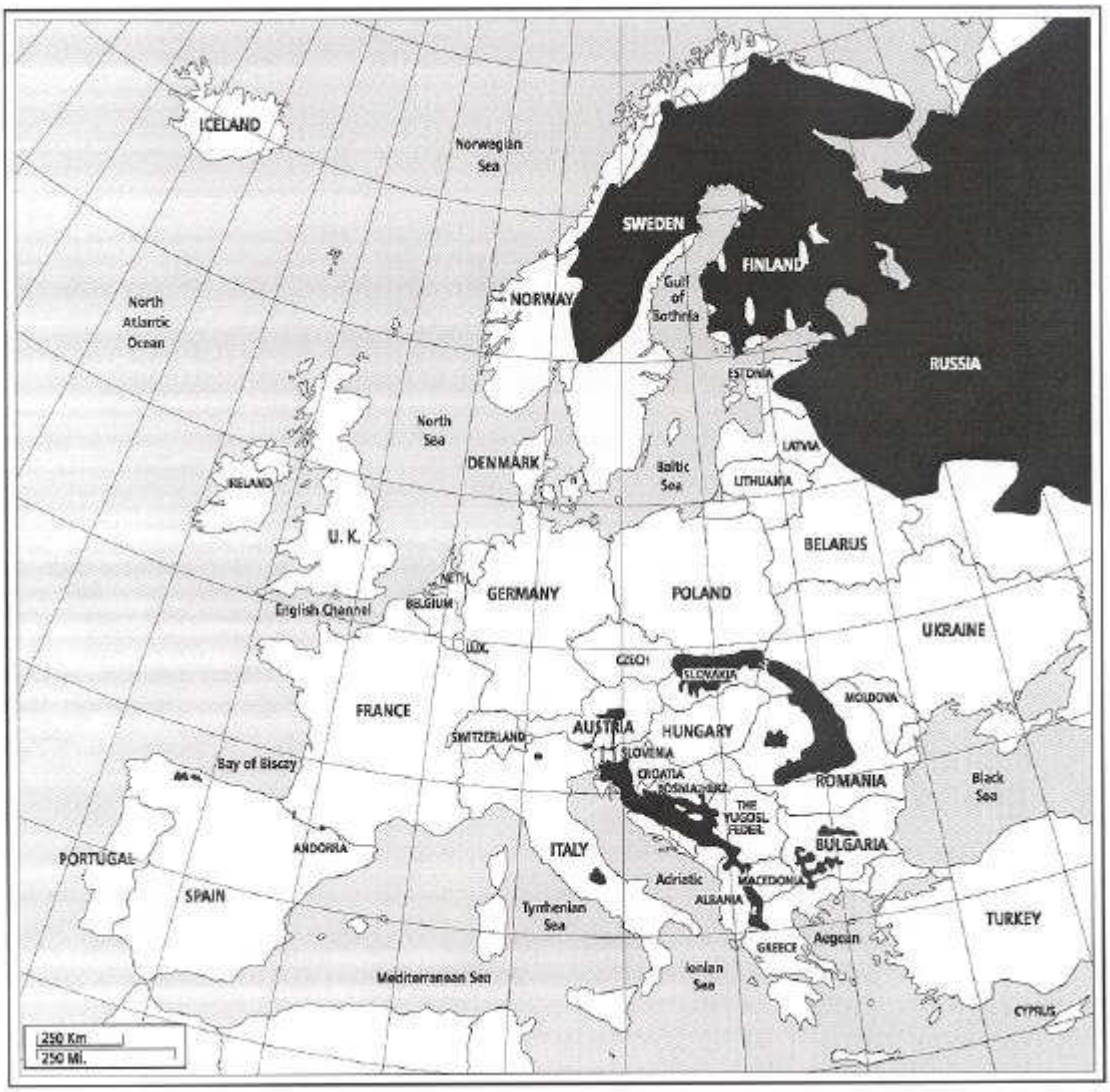
Figure 2. Present distribution of the brown bear in Europe and adjacent areas.