MANAGEMENT PLAN FOR THE BROWN BEAR *URSUS ARCTOS* IN POLAND

Nuria Selva
Tomasz Zwijacz-Kozica
Agnieszka Sergiel
Agnieszka Olszańska
Filip Zięba

University of Life Sciences
Warsaw 2011

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DRAFT

November 2011

Authors:

Nuria Selva, Tomasz Zwijacz-Kozica, Agnieszka Sergiel, Agnieszka Olszańska, Filip Zięba

INFRASTRUKTURA I ŚRODOWISKO
NARODOWA STRATEGIA SPÓJNOŚCI

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ ROZWOJU REGIONALNEGO

Projekt współfinansowany przez Unię Europejską
ze środków Europejskiego Funduszu Rozwoju Regionalnego
w ramach Programu Infrastruktura i Środowisko

NFOŚiGW

Dofinansowano ze środków Narodowego Funduszu
Ochrony Środowiska i Gospodarki Wodnej

Other contributors:

Michał Bednarski (consultation standard protocols)

Teresa Berezowska (workshop logistics)

Katarzyna Bojarska (genetic sampling)

Isabel Elguero-Claramunt (genetic sampling)

Néstor Fernández (habitat model)

Marcin Górny (ecological corridors)

Djuro Huber (consultation standard protocols)

Andrzej Kepel (law consultation)

Ignacio Luque Márquez (genetic sampling)

Maciej Markowski (genetic analysis)

Robert Maślak (captive bears)

Zuza Nowak (genetic analysis)

Tomasz Piasecki (consultation standard protocols)

Paweł Struś (fragmentation analysis)

Dawid Sześciło (consultation spatial plans)

State Forestry Administration, Forestry Districts: Brzozów, Dukla, Dynów, Gorlice, Jeleśnia, Kołaczyce, Krasiczyn, Krościenko, Łosie, Myślenice, Nawojowa, Nowy Targ, Piwniczna, Stary Sącz, Sucha, Ujsoły, Węgierska Górka and Wisła; LZD in Krynica; National Parks: Babiogórski, Bieszczadzki, Gorczański, Magurski, Pieniński, Tatrzański; Association for Nature "Wolf", Carpathian Brown Bear Project (brown bear presence and reproduction questionnaires)

Association Workshop for All Beings (data on ski lifts)

Regional Directorates for Environmental Protection in Katowice, Krakow and Rzeszow (brown bear damages and compensation)

Peer-reviews: Prof. Grzegorz Jamrozy, Prof. Zbigniew Głowaciński, Prof. Djuro Huber, Prof. Jon Swenson

Acknowledgements: Andrzej Bereszyński, Przemysław Chylarecki, Krystyna Cielniak, Djuro Huber, Javier Naves, Andrés Ordiz, Wanda Olech, Maribel Pérez and Jon Swenson, the Mammal Research Institute library and all contributors.

Cover picture: Adam Wajrak

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Preface

The Brown Bear Management Plan for Poland is the first comprehensive document to offer fundamental guidelines for brown bear conservation and management in Poland. This plan is (1) based on current scientific knowledge, (2) based on accepted and ratified international conventions, guidelines and recommendations related to brown bear conservation worldwide and in Europe, and (3) placed within the legislative, administrative, and social frameworks present in Poland. It is envisioned as a flexible document, to be revised periodically and adapted to new situations, framed with a broad and European perspective.

This conservation plan is conceived as a concise and operative document for the implementation of bear management in practice, thus we have kept it as short and clear as possible. However, we did not want to miss the opportunity to provide additionally a brown bear "manual" (Annex 1, "Ecology, status and management of the brown bear in Poland") which encompasses all updated information we consider relevant for a sensitive management of the species in Poland. This is of special importance because, opposite to the other two species of large carnivores, for which extended research and numerous scientific papers exists in Poland, the brown bear has received comparatively much less attention. As a result, brown bear management has been often based rather on impressions than on real data. This compilation of the current scientific knowledge on brown bears into Annex 1, with all pertinent references and analysis, into a single document is, thus, of high value by itself. It has two main goals: to provide authorities and managers with basic information to take decisions and to have a critical opinion, and to provide scientific support for our recommendations and proposed measures. In this sense, it represents a crucial change in relation to past experiences, by promoting decision making on the basis of real scientific data. We also provide a summary of proposed measures for each suggested line of action, and a concrete schedule of the implementation of the plan.

Workshops have constituted an important part in the preparation of this document (Annex 2, 3, 4 and 5). Numerous people, institutions and NGOs have contributed to this management plan; they have generously provided unpublished data, unpublished results and reports of bear observations for the good of bears and the plan. The advice and consultation of experts on specific topics, such as legislation or the preparation of standard protocols, has been constant. Few studies have been conducted specially for this plan, like the bear number assessment based on molecular genetic data and the analysis of habitat fragmentation and ecological corridors.

The Brown Bear Management Plan for Poland promotes modern, science-based management, which involves considering the brown bear as a relevant element of the ecosystem and highlighting the importance of preserving natural bear habitats and promoting their sustainable use. We believe the present plan represents a milestone in the future conservation of brown bears in Poland and the Carpathians.

1. Introduction

The brown bear (*Ursus arctos*) in Poland is a protected species, listed in Annexes II and IV of the Habitats Directive and classified as a priority species. Some of the obligations derived from the Habitats Directive are to maintain a favourable conservation status of the brown bear population, to monitor and report it periodically to the European Commission and to guarantee enough suitable habitat. The legal requirements at the international level, together with the fact that brown bears can also get in conflict with humans, makes highly recommended to develop and implement a management plan for the brown bear in Poland[1]. On the other hand, the brown bear population in Poland is transboundary and represents the most northern range of the Carpathian population. The existence of clear conservation policy and goals within the management plan in Poland may greatly facilitate the coordination of management policies and agreements among neighboring countries sharing the bear population (Slovakia and Ukraine).

Some of the key problems that the present management plan tries to face and solve are: (1) the lack of reliable monitoring methods, (2) the lack of or insufficient coordination and communication among responsible institutions and sectors involved in bear management in the region, (3) the lack of or insufficient scientific knowledge on species biology, ecology and conservation in Poland, and (4) the lack of or insufficient proper implementation of the existing legislation and real protection of brown bears. One of the most important challenges for the conservation of brown bears in Poland is the preservation of their habitat. The lack of spatial planning in Poland, leading to the fragmentation and loss of bear habitat through unplanned and dispersed building, often in remote areas, is a key issue. Human disturbance to bears, conflicts with humans, mainly damages to beehives, increasing food conditioning due to intentional feeding and inadequate management of rubbish, are among other problems to be solved as soon in the field. The situation of captive bears, the cooperation with neighboring countries, mainly Slovakia, and the promotion of research and education are also pending issues.

[1] Swenson J.E., Gerstl N., Dahle B. & Zedrosser A. 2000. Action plan for the conservation of the brown bear (*Ursus arctos*) in Europe. T-PVS (2000) 24. Council of Europe, Strasbourg, France.

The Polish society is undergoing rapid changes, also in the perception of its natural heritage. Society demands for an effective protection of bear and its habitat, as well as the need for recreation may be expected to increase in the close future. Our common duty is to ensure that bears can survive in their natural habitats in Poland, coexist with people, and next generations will still enjoy them.

2. Brown bear biology and ecology

The brown bear is a species with large spatial requirements, low reproductive rates and is very sensitive to habitat loss and fragmentation and to human disturbance, especially in winter. The impact of human persecution on the current distribution range of the species has been significant, so the habitats presently used by bears do not necessarily represent the most suitable for the species. The areas occupied by bears must provide not only abundant food, but also the opportunity to cover. Across Europe, bears are mostly constrained to forested and rather remote and mountainous areas. Brown bears in Poland belong to the same genetic lineage which was found in Slovakia, i.e. to the most widespread clade which includes brown bears from northern and eastern Europe (northern Scandinavia, Baltic region, eastern Russia, northern Carpathians), Asia and Alaska. In adult individuals there is a considerable sexual dimorphism in body size, males being bigger. Within and between-year variation of individual body weight is also very large.

Bears are omnivores. The composition of their food varies depending on the local food availability and season. At the biogeographical scale, their diet also changes with the location (latitude, longitude and altitude) and mainly with environmental factors (temperature and snow cover). In the forests of the temperate zone, fruits and invertebrates prevail in bear diet, whereas in the tundra vertebrates do. In some locations, food of anthropogenic origin (e.g. supplemental food, fruits from orchards) represents the main component of bear diet.

The annual cycle of bears is divided into four physiological states: winter dormacy, hypophagia, normal activity and hyperphagia. Far north, winter dormancy may last even longer than 7 months; however, in populations from warmer regions some individuals may stay active throughout the year. The length of winter dormancy varies among bear populations and, as a general pattern, the higher the latitude, the longer the period of hibernation. Pregnant females enter winter den sites the first and emerge from them the last. The duration of winter denning also depends on the age of individuals. Adult males are the last to den and the first to leave their dens. Females with cubs stay relatively close to their den sites until mid-May. Although bears usually

show a high degree of fidelity to their denning areas, winter dens are reused only exceptionally.

The mating season of the brown bear usually begins at the beginning of May and lasts till July. The individuals at reproductive age belonging to both sexes mate multiple times often with several partners. Cubs are born during winter dormancy from December to March. At the time of birth, cubs are bald and blind and weigh about 350-500 grams. The average litter size ranges from 1.3-2.6 cubs and varies among populations. Cubs in one litter can be sired by different fathers. The reproductive period of females can last from 3 to 29 years of age, with the highest productivity at the age of 8-9 years. In most populations, the mother nurses her offspring for 1.4 to 3.5 years. The largest mortality among brown bears occurs in the first year of life. Infanticide by males is considered to be a major cause of cub mortality, at least in some populations. In most brown bear populations the main cause of mortality is of human origin. In nature, the oldest bears observed were over 30 years; the oldest captive bear was 50 years old, and the oldest female 42 years.

Brown bears are not territorial, and their home ranges significantly overlap. This overlapping is greatest in the case of females, especially if they are kin-related. Home ranges of males are usually larger, encompassing those of several females. Annual home range sizes vary considerably among populations. In Europe, the home ranges of males vary from 128 km^2 in Croatia to 1,600 km^2 in central Sweden, whereas for females from 58 km^2 to 225 km^2, respectively. Dispersing young males may have annual home ranges up to 12,000 km^2. In Scandinavia, females at the age of 2 to 4 years move on average 28 km from the center of their natal home range, while 4-year old males disperse an average distance of 119 km. The maximum dispersal distance recorded is 467 km for males and 90 km for females. More information and references in Annex 1.

3. Brown bear numbers and distribution in Poland

Brown bears living in Poland represent a small part of the Carpathian population, which currently extends over the Czech Republic, Slovakia, Poland, Ukraine, Romania and Serbia. It is estimated to be about 8,100 of individuals. Although bears can be found along the Carpathian range, the distribution of breeding females is discontinuous. The population divides into three segments. The western segment covers most of Slovakia, and the Tatra Mountains and Beskid Żywiecki in Poland. The largest part of the Carpathian population inhabits the main Carpathian chain and extends from the Bieszczady region (encompassing Bieszczady Mountains and surrounding areas) and Slovakian "Poloniny" through Ukraine and Romania to Serbia. The third segment occupies the Apuseni Mountains in western Romania. The whole Carpathian population has been classified as “vulnerable” (at risk of being endangered); in some regions bears are locally endangered[2]. The whole brown bear population in Poland is transboundary, thus bears are under various protection measures, depending on which side of the border they stay, and ranging from complete protection in Poland to protected, but game species in Slovakia or game species in Ukraine (Table 1).

Brown bears, which once were found nearly across all Europe, disappeared from most regions of the continent by end of the 17th century. Already in the beginning of the XIX century, the western and eastern subpopulations of the northern Carpathians become isolated, which is reflected in their current genetic differentiation[3]. In Poland, after the World War II, bears persisted only in the Tatra and Bieszczady Mountains; their total numbers at that time were estimated in 10- 14 individuals. Since then, the population started to recover slowly. According to the last report on the conservation status of

[2] Linnell J.D.C., Salvatori V. & Boitani L. 2008. Guidelines for population level management plans for large carnivores in Europe. A Large Carnivore Initiative for Europe report prepared for the European Commission (contract 070501/2005/424162/MAR/B2).

[3] Straka M., Paule L., Ionesku O., Štofík J. & Adamec M. Microsatellite diversity and structure of Carpathian brown bears (*Ursus arctos*): consequences of human caused fragmentation. Conservation genetics. Published online 8th of October 2011.

the brown bear in Poland for the Europen Commission[4], the number of bears in the Polish Carpathians was estimated to be 95 individuals in 2007. The most important population was noted in the Bieszczady region (66 individuals) and the second in the Tatra Mountains (12-15 individuals). In other bear refuges their number oscillates from 2 to 5 individuals. This estimation of bear numbers was based on annual questionnaire surveys sent to the Forest Administration and National Parks in areas of bear presence.

Table 1. Current status of the brown bear population in the Carpathian countries according to the conservation status national reports[a] (implementation Art. 17 of the Habitats Directive; in other cases the source is indicated). Full references in Annex 1.

Country	Status	Number estimates	Trend (reporting period)	Conservation status
Poland	strict protection	95 (68-117) 147 [b]	increase (1946-2005)	U1
Slovakia	protected and game	700-900 800 [c, d]	increase (1977-2006)	FV
Ukraine	game	>300 [e]	decrease[c]	
Romania	protected and game	6000 [f]	stable[d]	
Czech Republic	protected	30 grids 2-5[g]	stable (2000-2006)	U2
Serbia	game, protection period all year round	50 in total, >10 in the Carpathians [h]	decrease [f]	

[a] http://eea.eionet.europa.eu/Public/irc/eionet-circle/habitats-art17report/library?l=/datasheets/species/mammals/mammals/ursus_arctospdf/_EN_1.0_ia=d

[b] Polish Statistical Yearbook 2011. Mały rocznik statystyczny Polski 2011. Warszawa.

[c] Rigg R. & Adamec M. 2007. Status, ecology and management of the brown bear (*Ursus arctos*) in Slovakia. Slovak Wildlife Society, Liptovský Hrádok, Slovakia.

[d] Koreň M., Find'o S., Skuban M. & Kajba M. 2011. Habitat suitability modelling from non-point data: the case study of brown bear habitat in Slovakia. Ecological Informatics 6:296-302.

[e] Ševčenko L. & Škvirâ M. 2009. Vedmìd Burij. W: Akìmova Ì.A. (red.). Červona kniga Ukraïni. Tvarinnij svìt. Globalkonsalting, Kiïv: 537.

[f] Linnell J.D.C., Salvatori V. & Boitani L. 2008. ibid.

[g] Jan Šíma, pers. comm.

[h] Paunović M. & Ćirović D. 2006. Viability increase and recovery of brown bear (*Ursus arctos* L. 1758) population in northeastern Serbia. Feasibility study. Faculty of Biology, University of Belgrade, Serbia.

[4] Jakubiec Z. 2008. 1354 Niedźwiedź *Ursus arctos*. In: Monitoring gatunków i siedlisk przyrodniczych ze szczególnym uwzględnieniem specjalnych obszarów ochrony siedlisk Natura 2000. Wyniki monitoringu. Report for the Chief Inspectorate for Environmental Protection, Warsaw.

In 2010, within the framework of the project for the preparation of the present plan, systematic bear hair sampling was conducted during all the year in the Tatra Mountains and Bieszczady region for population estimates based on molecular methods (see Annex 1 for details). The total number of individual bears identified by genotyping in 2010 was 20 in Tatra and 55 in the Bieszczady region. Of these 75 unique genotypes, a total of 33 individuals were recaptured throughout the whole year (6 bears in Tatra and 27 in Bieszczady). The population investigated is open, i.e, the bears are not confined into a determined area, delimited by topographical or other barriers, but they wander all over the place, including also the neighboring areas from Slovakia and Ukraine. Therefore, the number of individuals identified may include also bears that visit Poland occasionally and/or which have most of their home ranges in the neighboring countries. As the whole Polish population is transboundary and brown bears moved across the border, it is difficult to estimate the numbers of "Polish" bears, without a joint study with Slovakia and Ukraine. Further validations and analysis still going on, some jointly with Slovakia, will contribute to be more precise in the estimates.

Table 2. Preliminary results of brown bear genetic monitoring conducted in the main Polish bear refuges during 2010.

Region	Collected samples	Analysed samples	Genotyped samples	Unique genotypes	Recaptured genotypes
Tatra	280	67	45	20	6
Bieszczady	1025	266	190	55	27
Total	**1305**	**343**	**235**	**75**	**33**

According to the report for the European Commission mentioned above, the area inhabited by the species increased tenfold between the years 1946 and 2006, from ca. 1,000 km^2 to ca. 10,000 km^2. During the last few years bear distribution and main refuges have not changed significantly. The report estimates that the current bear range in Poland covers 6,500 km^2, whereas the "favorable reference range" is 10,000 km^2. These numbers are consistent to those obtained using the predictive habitat

model (see chapter 7.1). Although traditionally and also in this report[5], the brown bear distribution in Poland is considered continuous, in our opinion there are not reliable data supporting this statement.

The current distribution of brown bears in Poland was estimated for the purpose of the present plan on the basis of (1) our own research and observations carried out mainly in the Tatra mountains and the Bieszczady region, (2) the information obtained through questionnaires from the forestry districts and national parks located in the rest of the Polish Carpathians, (3) the location of damages caused by bears collected by the Regional Directorates of Environmental Protection, and (4) data on bear occurrence in the Beskid Śląski and Żywiecki provided by the Association for Nature "Wolf". Only the most recent data, obtained in the period 2009-2011 were used to estimate the current bear distribution (Fig. 1 and 2). The permanent distribution is clearly discontinuous, with two main reproductive areas in Tatra (western segment) and Bieszczady region (eastern segment). The third area of permanent bear presence and occasional reproduction is Beskid Żywiecki. In other parts of the Polish Carpathians, especially in the region between Tatra and Bieszczady, bears are observed rather occasionally and, in some regions, they have not been observed at all in the last two years. Bears in Tatra and Beskid Żywiecki are parts of the western segment of the Carpathian population, while these from the Bieszczady region belongs to the eastern segment. The connectivity between the western and eastern segments seems to be very limited, not only in Poland, but also in Slovakia[6,7]. Although the habitat in the linkage zone between Tatra and Bieszczady seems to be suitable, bears are not settling there. This issue deserves further investigation (see in further chapters). Dispersing individuals can be sometimes observed far from the areas of permanent presence, and in very exceptional occasions even in north-eastern Poland (Fig. 1 and 2).

[5] Jakubiec Z. 2008. *Op. cit*.

[6] Find'o S., Skuban M. & Koreň M. 2007. Brown bear corridors in Slovakia. Carpathian Wildlife Society Slovakia, Zvolen, Slovakia.

[7] Straka M., Paule L., Ionesku O., Štofík J. & Adamec M. *Op. cit*.

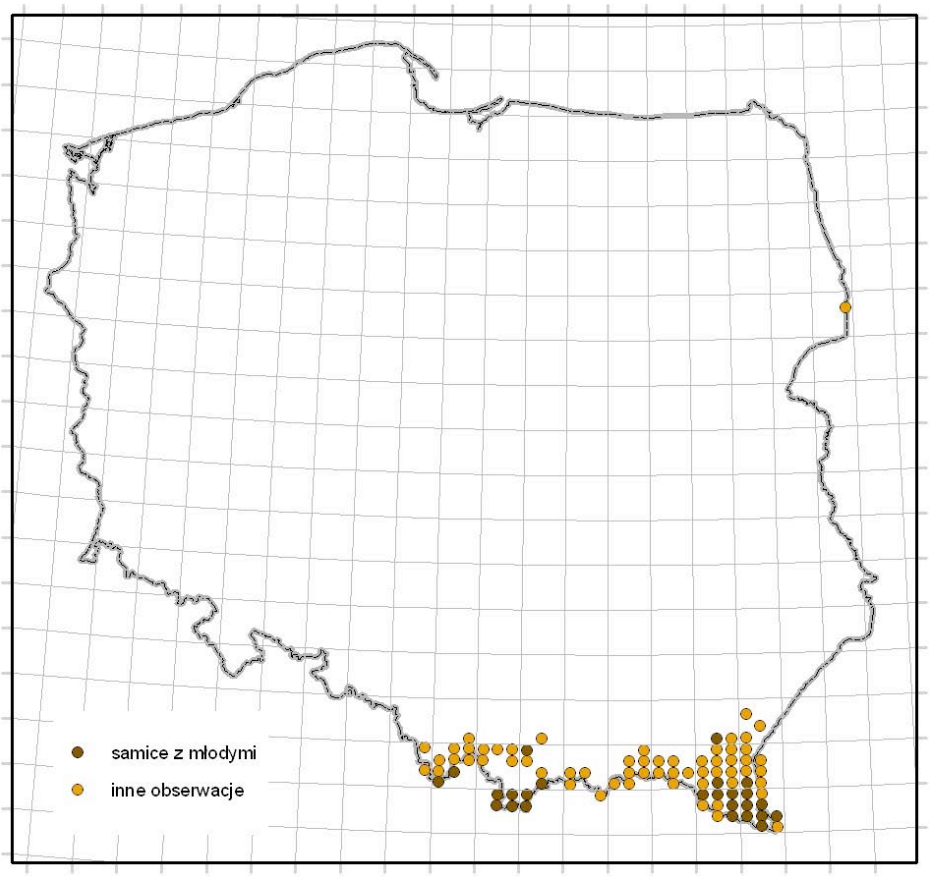

Fig. 1. Distribution of the brown bear in Poland in 2009-2011 according to the data gathered and following the geographical system of the Atlas of Polish Mammals[8].

[8] http://www.iop.krakow.pl/ssaki/

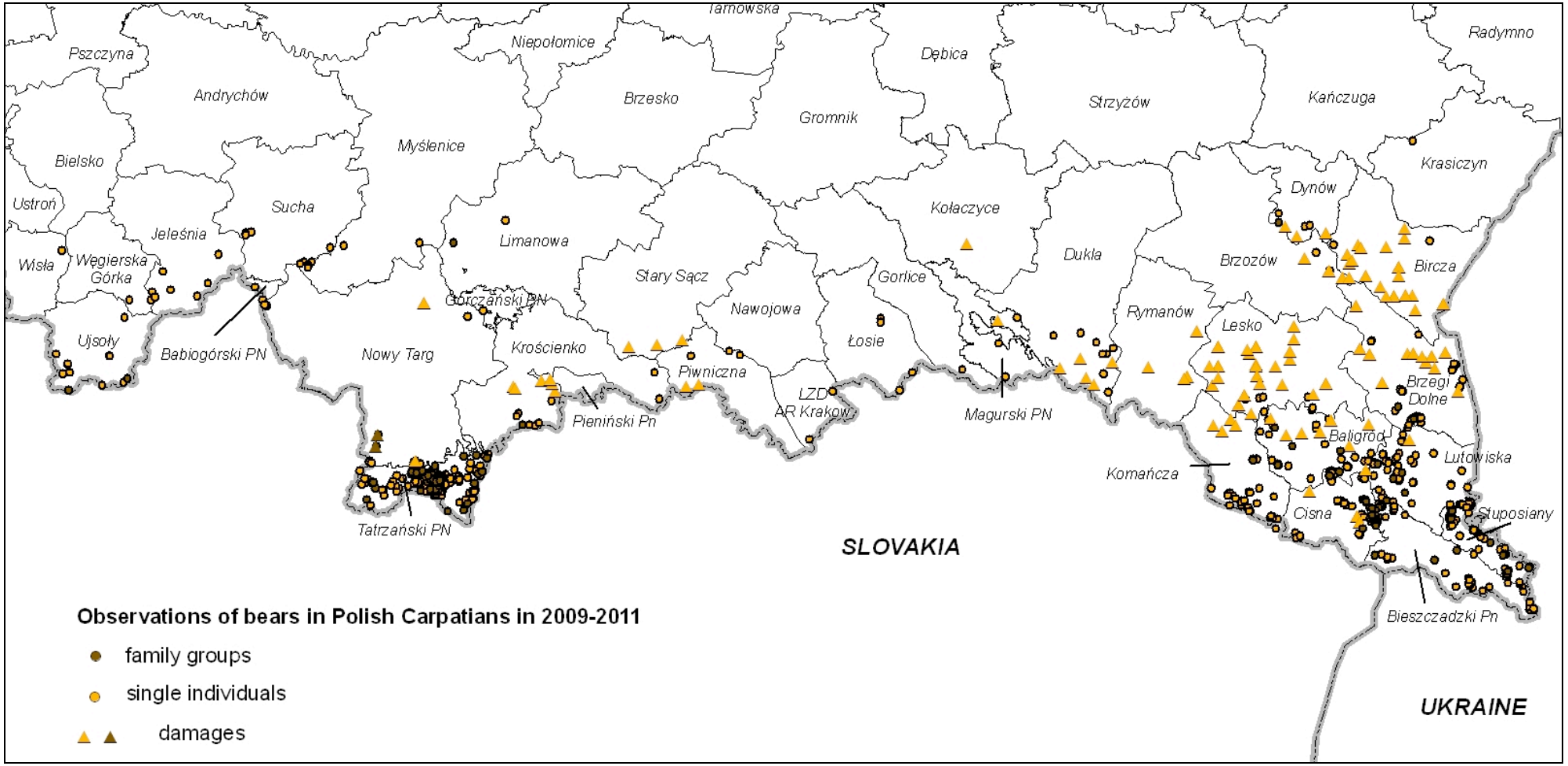

Fig. 2. Brown bear records in the Polish Carpathians in 2009-2011, including females with cubs and damages.

4. Goals of the management plan

The vision of this plan is the **preservation of a viable natural brown bear population and its habitat in a favourable conservation status in coexistence with humans.** This vision reflects an ecosystem approach and calls for promoting the bears' natural behavior, preserving their natural habitat, maintaining ecological processes and considering bears as an important element of forest ecosystems. The plan also aims at providing **reliable data and detailed guidelines** to authorities and managers to solve existing or potential conflicts and take management decisions based on **scientific evidence.**

The general goal of the management plan for the brown bear in Poland is **to guarantee the long-term conservation of the species and its habitat by providing the managers, authorities and interest groups with effective conservation measures, precise information on the population and habitat conservation status and guidelines to prevent and/or solve the conflicts with humans**. The plan will set the framework for the coordination of the management measures and for future decisions based on scientific data and monitoring. This goal will be accomplished only if the following specific objectives are achieved:

(1) Preserve the natural bear habitat and its quality.

(2) Prevent, react to and provide solutions to all kinds of human-bear conflict situations.

(3) Avoid bear habituation and food conditioning.

(4) Minimize bear damages, especially to beehives.

(5) Preserve and improve the connectivity between the reproductive nuclei in the western and eastern Polish Carpathians.

(6) Maintain a stable and continuous bear population along the northern Carpathian range in cooperation with Slovakia and Ukraine.

(7) Decrease and control brown bear mortality due to human factors.

(8) Implement a solid and coherent monitoring program and create a reliable and available brown bear Data Bank.

(9) Promote the coordination of management activities and information flow among involved sectors.

(10) Improve the scientific and public knowledge on the species in Poland.

(11) Keep the public informed by making available monitoring data and annual reports.

(12) Establish a permanent and close cooperation with Slovakia and Ukraine and increase the international cooperation.

(13) Promote public awareness and participation in brown bear issues and monitoring.

(14) Improve the living conditions of captive bears.

(15) Promote environmental education in all social sectors.

(16) Guarantee the proper implementation of the existing legislation and a real protection of brown bears and their habitat.

5. Tools for the implementation of the management plan

The coordination of all parties involved is the first and most important step, and one of the main objectives of the presented plan. The establishment of the Bear Working Group, Bear Emergency Team, Bear Data Bank, and Standard Protocols are proposed as the most effective tools for the implementation of the management plan. They represent an answer to the poor coordination in relation to the availability of data and information, conservation and research activities and communication. The underlying ideas that form the basis of these proposals are transparency, involvement of all interested groups in bear management, teamwork and strong cooperation within the group, as well as an open access to information and data. Detailed information on the tools to implement the management plan is provided in Annex 1.

5.1. Bear Working Group

The concept of the proposed Bear Working Group is based on the experiences of working groups from other countries. These experiences show that the coordination of management actions by a group of experts is a guarantee for a high-quality output and information flow and exchange. The Bear Working Group is a competent, transparent and democratic body that provides substantial support for all population management issues, coordinates measures and activities, and supervises the implementation of the management plan. The Group is formed by an **interdisciplinary team** of scientists, biologists, conservation experts, veterinarians, NGOs and administration representatives and is based on the voluntary involvement of its members. The Bear Working Group will be formally established by the decision of the head of the General Directorate for Environmental Protection, who will also accept the Group's rules and bylaws. All information and reports on the activities of the Group will be available to the public. The Group acts as an independent and advisory body for the Ministry of Environment, and General and Regional Directorates for Environmental Protection.

Objective and structure

The primary objective of the establishment of the Bear Working Group is, in agreement with those of the management plan, **an effective protection and coordination of the brown bear population management in Poland, guaranteeing the survival of the species and the maintenance of a viable population in a favourable conservation status in coexistence with humans**. The Group will promote and support the implementation of the plan, identify management issues and set up priorities for conservation measures and population management, as well as for research, captive bears' welfare improvement and Bear Emergency Team trainings with the specific objectives:

(a) Active protection of the brown bear population and problem solving by: (1) periodic evaluation and updating of the brown bear management plan and the development of annual action plans, (2) identifying and defining conservation problems and proposing solutions, (3) giving recommendations for human-bear conflict prevention, and coordinating appropriate actions in case of emergency interventions, (4) assessing the effectiveness of legislation and recommending changes, (5) informing the responsible authorities and advisory bodies (State Council for Nature Conservation) on activities which may adversely affect the bear population or habitat, (6) following-up and supporting court procedures related to direct or indirect threats to the bear population, (7) strengthening international cooperation, especially with countries in the Carpathian region, and (8) promoting conservation projects and cooperation with interested groups, also in fundraising for bear conservation activities;

(b) Coordination of monitoring and scientific and applied research by: (1) coordinating and implementing the monitoring program proposed in the present document, (2) monitoring the bear habitat quality and investments that may affect the status of the population, (3) developing, implementation and standardization of protocols for population monitoring and their periodic updating, (4) monitoring of the situation of captive bears and promoting applied research and educational activities in this area, (5) promoting

coordination and ensuring the information flow between interest groups, (6) identifying gaps in scientific knowledge and promoting basic and applied research in these areas, and (7) establishing the Bear Data Bank;

(c) Education and public information by: (1) promoting periodic workshops on the species, (2) creating a network of contacts between the administration, scientists, forestry administration, NGOs and media, (3) publishing annual reports on the Group activities, including the results of monitoring and updates of ongoing research, (4) supporting initiatives related to conservation education, (5) dissemination of knowledge on bear biology and ecology and promoting meetings and workshops with the participation of all sectors and people interested, and (6) raising public awareness through the creation of an official website containing information about the species and its population management and monitoring and that will promote public involvement in the monitoring program.

We propose that the Bear Working Group will consist of 10 members with clearly defined tasks and competences. Each member is responsible for specific actions within the objectives of the Group: (1) **Member on Monitoring**, (2) **Member on Conservation**, (3) **Member on Veterinary Issues**, (4) **Member on Science**, (5) **Member on Education and Communication**, (6) **Member on Captive Bears**, (7) **Member on Bear Emergency Team**, (8) **Member/Representative of the administration responsible for the species protection** (the General Directorate for Environmental Protection), (9) **Member/Representative of Slovakia** and (10) **Member/Representative of Ukraine**. For a detailed description of each member's tasks, please see Annex 1. People interested in management issues, representatives of the Regional Directorates for Environmental Protection, experts from Slovakia and Ukraine, representatives of NGOs, or experts from other countries will be welcomed to take part in meetings of the Group.

Implementation of the Bear Working Group

The following schedule for the implementation of the Bear Working Group is proposed:

- The Bear Working Group will be established and approved by the Head of the General Directorate for Environmental Protection early in 2012.

- The rules, working protocol and work schedule of the Group will be set at the first establishing meeting; terms accepted by all members and the General Directorate for Environmental Protection, and available for the public.

- The Bear Working Group will meet each two or three months, depending on the current needs, and at least once per year, preferably for two days, to evaluate the situation on management plan implementation, develop an action plan for the coming year, discuss current issues, update information, monitoring results and activities of the Bear Emergency Team and to work out the public annual report. In addition to regular meetings, members of the Group work and keep regular correspondence through emails. An **official website** to inform the public about the activities of the Bear Working Group, Bear Emergency Team, development of the Bear Data Bank, as well as brown bear status and management in Poland, will be created, preferably linked to the General Directorate for Environmental Protection.

- A **coordinator and vice-coordinator** shall be elected among the members of the Group by voting once per three years. The General Directorate for Environmental Protection, through its representative in the Bear Working Group, approves the elected members and, decides on the appointment of coordinators in case of equal number of votes.

- The composition of the Group will be appointed every **six years**. The representative of the General Directorate for Environmental Protection will be responsible for collecting nominations, consultations with current members and providing the list of potential candidates to the General Directorate for Environmental Protection, which ultimately decides on the Group composition. Candidatures, as well as the

final composition of the Group, should be announced to the public through the official website.

- A budget of approximately 10,000 PLN is secured annually in the financial plans of the General Directorate for Environmental Protection (or through regional directorates in the areas of a bear's presence). This budget is used to cover the meeting costs and other activities of the Bear Working Group.

5.2. Bear Emergency Team

The proposal for the creation and maintenance of a Bear Emergency Team (BET) arises from **the need of fast and professional actions under crisis situations**, together with the expected increase of human-bear conflicts in the close future. The BET also provides expertise and advice to local inhabitants on measures of prevention of conflicts with bears (safe garbage disposal, damage prevention, behaving in case of encounter with bears). The BET is a body in close relationship with the Bear Working Group and in contact and under the supervision of the administrative units responsible for the species conservation. The BET also works in cooperation with the regional centers for crisis interventions. Officially appointed by the Head of the General Directorate for Environmental Protection and empowered to take appropriate actions, the BET will be responsible for interventions in human-bear conflicts and emergency situations. According to its working protocol, the BET members are obliged to fill the Standard Protocols, take samples and measurements for the Bear Data Bank, prepare the corresponding report and sent them all to the Bear Working Group (with a copy to the General Directorate for Environmental Protection and the appropriate regional directorate). The BET is to react in any case, even if the threat is assessed as low, in order to ensure the feeling of safety in the people living in the area where the problem is observed, and to develop a positive attitude towards the co-existence with bears.

The BET members should be **trained** and have all the **required skills and equipment**, as well as the physical ability to conduct appropriate and professional interventions (e.g. aversive conditioning, capturing, immobilization, sampling, help injured animals). The

BET consists of people with large experience in the fields of wildlife capturing, marking and handling, veterinary anesthesia, prevention of problem bears and identification of bears' signs of presence, aversive conditioning, and handling emergency situations. People appointed to work in the BET may be primarily national parks rangers, scientists, veterinarians, zoo experts, damage inspectors, foresters, hunters and any other person fulfilling the requirements and with enough skills and field experience. It is important that members will react as soon as possible in case of emergency, so the majority of members are permanently settled in the areas of bear presence (few members per each region).

The BET members will be required to:

- have all needed permits and competence (according to applicable regulations, see Annex 1) to: (1) capture and mark bears (microchip, radio-collar, tattoo and/or ear-tag), (2) collect samples according to the Standard Protocols for immobilization and dead bear sampling (see below), (3) use a gun for aversive conditioning, and (4) use a gun with immobilization drugs (veterinarian);

- be trained and equipped to (1) assist in damage inspections, (2) handle interventions in case of accidents involving an injured or traffic-killed bear, and (3) handle interventions with problem bears.

Once the BET is created, a **working protocol** should be developed to clearly define the diagram of information flow, network of contacts and institutions, notifications, system for decision-making and responsibilities (intervention reports, protocols, sample collection and regulations on their deposition in the Bear Data Bank). The BET working protocol should guarantee a good coordination in crisis situations, especially among the BET, the Bear Working Group and the Regional Directorates for Environmental Protection.

Implementation of the Bear Emergency Team

A first step is the establishment of the Bear Working Group. The Member on Bear Emergency Team from the Working Group will be responsible for pushing forward its

creation, organizing a proper training and the final establishment of the BET. Further proceedings are proposed as follows:

- After the Bear Working Group starts working, its **Member on BET** begins to organize the team (searching for candidates, organization of training, identification of potential funding sources).

- The Member on BET from the Bear Working Group, in cooperation and upon consultation with the corresponding authorities (General Directorate for Environmental Protection, regional directorates), proposes the composition and working protocol of the BET in the Ministry of Environment and/or the General Directorate for Environmental Protection for official approval.

- The composition of the BET is announced to all involved sectors and also in the official website to inform the public.

- The BET meets regularly, at least once per year, for training and to exchange experiences. Trainings and meetings are organized by the Members on BET and on Education and Communication of the Bear Working Group. The BET is continuously working to improve the scheme of information flow, working protocol and procedures during interventions.

For additional information, see Annex 1.

5.3. Bear Data Bank

The coordination of monitoring and data collection is an integral part of any effective population management. To gather the results of brown bear population and habitat monitoring in Poland, as well as brown bear samples, information on dead individuals, damages caused by bears, or human-bear conflicts into one common information system is one of the key elements for achieving a good knowledge of the population and documenting trends. Given the current absence of such system, the fragmentation and non-availability of information, and the lack of standardization of monitoring

methods and protocols, the proposed creation of a central Bear Data Bank is **crucial**. The availability of the data collected in the Data Bank will promote research studies and largely improve the current knowledge on the bear population. The Bear Data Bank also aims to be a transparent body, establish appropriate policies on data availability and use, improve data collection through standardization of protocols, and promote the use of existing data and support research.

The Bear Data Bank will maintain records of the existing information on the population, particularly the **results of monitoring, Standard Protocols, intervention protocols and the archive for biological samples**. The General Directorate for Environmental Protection will appoint the institution responsible to archive data and samples and to maintain the Bank. Annual reports on the current status of the Bear Data Bank and the outputs from the use of the material or data will be posted on the website and published as part of the Bear Working Group annual reports. The policy of use of raw data or samples will be similar to those existing in other data banks, museums and scientific collections in Poland and other countries. The final terms of use will be developed by the Bear Working Group and responsible institution, after the official establishment of the Bear Data Bank. All mentioned does not preclude the authors' rights for the publication of results.

The institution responsible for the Data Bank should have permits for collecting and keeping bear samples from the General Directorate for Environmental Protection, and, in the case of collecting samples in a national park, also from the park director. The institution can have a single permit and then authorize a number of persons for those tasks. Samples sent for analysis abroad need the CITES permit if shipped outside EU (unless the institution is registered according to the art. 63 of the Act on nature protection) or a permit from the General Directorate for Environmental Protection if shipped within EU. No permit is required for keeping urine and faeces samples collected non-invasively. More information in Annex 1.

Implementation of the Bear Data Bank

To summarize, the activities towards implementation of the Bear Data Bank are proposed as follows:

- The Bear Data Bank will be created by decision of the Head of the General Directorate for Environmental Protection. The Director will appoint the institution (e.g. research institute, national park, regional directorate) responsible for the Data Bank and agree the conditions. The institution responsible for the Bear Data Bank needs to have all required permits.

- The rules of the Bear Data Bank will be determined by the General Directorate for Environmental Protection. The **appointed institution** will work in close cooperation with the Bear Working Group and the Chief Inspectorate for Environmental Protection, which is responsible for the National Environmental Monitoring Programme.

- The organization and filing of monitoring data and reports of the Bear Working Group and the Bear Emergency Team, as well as the updating and administration of databases, will be supervised by the Member on Monitoring from the Bear Working Group in close cooperation with the institution responsible for the Bear Data Bank.

5.4. Standard Protocols

The protocols proposed in this section have been prepared for the purpose of the present management plan. The main goals are to implement best practices for bear immobilization and to unify and standardize the procedures for measuring, marking, sampling and data collection from immobilized and dead bears. The Standard Protocols will facilitate gathering information relevant for the management of the brown bear population, bear research and Bear Data Bank.

Immobilization and bear handling protocol

The immobilization and bear handling protocol, provided in Annex 6, is divided into three parts related to specific procedures: immobilization, marking and measurements, and sampling. The **immobilization** procedures include the following sections: (1) the process of immobilization, (2) life sign monitoring, (3) general examination, and (4) body condition assessment. An introductory part deals with general information on the reasons for immobilization (research, injured bear, intervention), location and date, as well as the names of the participants and details on methods and procedures. Section 1 introduces a table for listing the stages of immobilization regarding the time of drug injection, the dose, method and site of the injection as well as all reactions of the bear from the beginning until the end of procedure. Section 2 addresses the key parameters that need to be measured in the immobilized animal: temperature, heart rate, respiratory rate and oxygen saturation. Section 3 relates to the general state of the bear (e.g. injures, signs of disease), while Section 4 provides guidelines to score the condition of the bear.

The part on **marking** collects basic information about the type, placement and technical features of marking devices (microchip, ear tag, tattoo, telemetry collar) and the bear individual code. **Morphometry** describes the body measurements to be taken. Measuring and sampling are established to obtain as much data as possible given that the procedure of capturing and immobilizing is very invasive. A **sampling table** is provided for a control of the samples taken, their numbers and the places of storage.

Dead bear sampling protocol

The dead bear sampling protocol represents a crucial tool for monitoring brown bear mortality. It is provided in Annex 7 and it consists of a **general description** (including the site and exact location), **general examination**, details on **body disposal** (e.g. person keeping the mounted animal, hide or skull), **measuring** and **sampling**. The parts

on general examination, measuring and sampling are common to those of the immobilization protocol. Detailed information on how to fill the protocols in Annex 1.

The samples collected together with the corresponding Standard Protocols should be sent in a relative short period of time to the Bear Data Bank. A copy of the protocols is to be sent to the Bear Working Group, which will inform the administration through its Member representative of the General Directorate for Environmental Protection. Providing information (protocols) and samples from dead and immobilized bears could be a prerequisite for people and institutions to obtain the permits from the Regional Directorates to keep the skull, skin or mounted bear or to capture animals.

6. Monitoring program

The design of a monitoring program should include clear **objectives** or questions, the establishment of appropriate **methods** to answer them, and a continuous **evaluation** of the objectives against the results obtained. Besides, effective monitoring programs share some good habits, such as to be cost-effective (minimize expenses, while maximizing data quality), to facilitate the frequent use of the data, to guarantee the accessibility of the data to the public, to rigorously archive the data, and to publish and report results. The lack of permanent funding, not establishing policies of data use and the decentralization of monitoring activities represent significant constraints. Without a robust system for bear population monitoring, their changes (trends) will remain unknown, leaving responsible authorities without a clear idea of the situation and the policies that need to be adopted.

Among the large carnivores, bears are probably the most difficult to monitor as they are not strictly territorial and ground track surveys in winter are not feasible. The recognition of individual bears, by tracks or direct observations, is generally impossible, unless they had some characteristics features (e.g. cut ear or track with a missing toe). Except for females with young, assessing sex and age of a bear from direct observations is not possible in most cases. The methods commonly used to monitor bear populations, with special reference to methods used in Poland, are provided in Annex 1, together with references. Up to now, the brown bear monitoring done in Poland, conducted by the Institute of Nature Conservation PAN, has been based almost exclusively on the annual collection of questionnaires from forestry units and national parks. This method allows inferring with relative accuracy the areas of bear occurrence; however the interpretation of the observations registered in the questionnaires into real bear numbers is questionable[9]. More information in Annex 1.

[9] Linnell J.D.C., Swenson J.E., Landa A. & Kvam T. 1998. Methods for monitoring European large carnivores - a worldwide review of relevant experience. NINA Oppdragsmelding 549: 1-38.

6.1. Legal framework of the monitoring program

Monitoring of the conservation status of the brown bear population in Poland is an obligation arising from Article 11 of the Habitats Directive for all species of Community interest. This provision is not restricted to Natura 2000 sites and data need to be collected both in and outside the Natura 2000 network to achieve a full appreciation of conservation status. The assessment of the **conservation status** in relationship to **favourable reference values**[10] has to be reported to the European Commission every six years, according to Article 17 of the directive. The next national reports are due by 2013 (reporting period 2007-2012) and 2019 (reporting period 2013-2018). In addition to the surveillance of conservation status, there is an explicit obligation under Article 12(4) to establish a system to monitor the incidental capture and killing (e.g. by car collision) of Annex IV(a) species. However, there is no legal obligation to inform about brown bears found dead. Currently, the Chief Inspectorate of Environmental Protection is responsible for the national monitoring of species and habitats[11].

6.2. Goals of the brown bear monitoring program in Poland

The main goal of the monitoring program is to **provide valuable information on the conservation status of the brown bear in Poland and human-bear conflicts as well as to assess the effectiveness of the measures chosen**. It will allow provide scientific-based expertise on bear habitat and population conservation status. Specific goals of the national monitoring program are to:

(1) identify the area of bear occurrence and assess changes in the range of distribution of the brown bear in Poland (stable, declining, expanding);

(2) assess the population trend and provide estimates of the number of brown bears in Poland;

[10] European Commission. 2005. Brussels, 15 March 2005. DG Env. B2/AR D(2004) Note to the Habitats Committee. Assessment, monitoring and reporting of conservation status – Preparing the 2001-2007 report under Article 17 of the Habitats Directive (DocHab-04-03/03 rev.3).

[11] www.gios.gov.pl/siedliska

(3) estimate the connectivity between the western (Tatra) and eastern (Bieszczady) segments of the brown bear population in Poland;

(4) provide general data on bear reproduction events and identify the areas of bear reproduction;

(5) identify the causes of brown bear mortality and the areas of highest mortality risk;

(6) provide data on the population health status;

(7) provide morphological data and measurements for brown bears in Poland;

(8) provide information on human-bear conflicts, mainly on damages caused by bears (number, type, trends, location), also in relation to implemented preventive measures;

(9) assess changes in the quality and quantity of brown bear habitat;

(10) identify brown bear winter denning areas and habitat;

(11) establish common monitoring protocols and coordinate the monitoring activities conducted by different administrations, institutions and organizations;

(12) create a centralized Data Bank where monitoring data will be compiled and stored;

(13) analyse systematically the monitoring data and produce a public report annually;

(14) create a website where the monitoring reports are available and monitoring protocols can be filled online, as a way to involve the public, and;

(15) cooperate with Slovakia and Ukraine in monitoring issues, trying to achieve a joint monitoring, at least in the “management units”.

6.3. Description of the brown bear monitoring program

The proposed monitoring scheme for the brown bear in Poland is an **adaptive** monitoring, i.e., can be modified in response to new situations or questions and upon justification. An important part of the program will be the production of **annual reports** summarizing the monitoring data. These reports will be published in the

official website dedicated to brown bear issues and monitoring in Poland. The monitoring program should also involve the **public**. The person responsible to push forward and coordinate the monitoring program is the **Member on Monitoring** from the Bear Working Group, with the support of the Group and the General Directorate of Environmental Protection. More information is provided in Annex 1.

The proposed monitoring program consists of a **continuous baseline monitoring**, passive, rather crude and inexpensive, and a **periodical intense monitoring**, active and expensive, that will provide precise information based on genetic and habitat monitoring periodically. The parameters to be monitored include brown bear distribution, abundance, reproduction and mortality, winter dens, population trends, habitat and human-bear conflicts. The monitoring program should also work on developing "favourable reference values" to be reached and to monitor against the objectives. Given its flexible character, the program also may include **ad-hoc monitoring** activities, focused on a special target. For the current situation in Poland, a six-pronged system is recommended:

Baseline monitoring

(a) Annual survey through questionnaires

Information on brown bear distribution, reproduction events as well as denning and reproduction areas will be obtained through annual questionnaires. The questionnaire should be kept simple (see proposal in Annex 8). Only confirmed and reliable bear records should be considered, especially in areas of sporadic bear occurrence. Attention should be put in the records of females with young and their winter dens and in records from the regions of Beskid Sądecki and Beskid Niski, which may serve as connection between the main bear reproductive nuclei of Tatra and Bieszczady. The questionnaires should be sent to the Forestry Administration, National Parks, hunting units, Regional Directorates for Environmental Protection, researchers and NGOs to be filled throughout the year (Tables 3 and 4, see Annex 9 for a potential list). It is recommended that respondents complete the questionnaires as soon as a bear record is gathered. The questionnaires should be also available for the public through the

official bear website. The annual report summarizing the results from the monitoring data should be sent to the respondents and published in the website. It is highly recommended to work out some observation index, effort-corrected and validate it with independent and more precise methods[12].

(b) Register of dead bears

Data from dead animals are of outstanding importance for monitoring any population[13] and, in the case of brown bears their registration is a legal obligation. The Regional Directorates for Environmental Protection play a key role in accomplishing the difficult task of compiling all information from dead bears and in encouraging hunters, researches and people working in the field to contribute to this register within the Data Bank. Each time a bear is found dead, it is necessary to inform the corresponding Regional Directorate for Environmental protection. Information and samples should be collected according to the protocol for dead bears and send to the Data Bank. Samples from dead bears will be periodically analysed under the framework of the genetic monitoring or upon need or request of interested groups. It is recommended that the register will try to gather information about the bear deaths occurring in past years.

(c) Monitoring conflicts and damages

Damages caused by brown bears outside National Parks are well inventoried by the Regional Directorates of Environmental Protection in Rzeszów, Katowice and Kraków. The goal here will be to produce systematically a joint annual report with the information from the Regional Directorates and National Parks that will summarize all bear damages in Poland and that will be part of the annual monitoring report. It is highly recommended to include in the field protocols and damage database the geographical coordinates, distinguish the dates of damage from date of inspection, collecting hair samples when available and transferring to the Data Bank, and provide

[12] Kindberg J., Ericsson G. & Swenson J.E. 2009. Monitoring rare or elusive large mammals using effort-corrected voluntary observers. Biological Conservation 142: 159-165.

[13] Breitenmoser U., Breitenmoser-Würsten Ch., Von Arx M., Zimmermann F., Ryser A., Angst Ch., Molinari-Jobin A., Molinari P., Linnell J., Siegenthaler A. & Weber J.-M. 2006. Guidelines for the Monitoring of Lynx. Kora Bericht Nr. 33e, Muri, Switzerland.

information about the prevention methods used when the damage happened. Information about other human-bear conflicts should be similarly gathered.

Table 3. Summary of the different stages, tasks and timeframe for the different branches of the brown bear monitoring program in Poland

Monitoring type	**Stages and tasks**	**Timeframe**
Website	Creation	2012
	Working/maintenance	2012-2018
Annual report		2012-2018 (July)[1]
BASELINE MONITORING (continuous, every year)		
Questionnaires surveys	Circulate & collect questionnaires of previous year	2012-2018 (Jan-Feb)
	Database input	2012-2018 (Mar-Apr)
	Data analysis & report preparation	2012-2018 (May-Jun)
	Send report previous year	2012-2018 (July)[1]
Dead bears	Data archive	2012-2018
	Genetic analysis	2017-2018
	Other analysis	Upon request
	Report	2017-2018 (July)[1]
Damage monitoring	Field inspection & sample collection	2012-2018
	Joint database & report	2012-2018 (July)[1]
INTENSIVE MONITORING (periodical, every 6-10 years)		
Genetic monitoring	Sample collection	2017
	Laboratory analysis	2018
	Data analysis & report	2018
National presence surveys	Design, preparation of protocols, explanatory workshops, field work, blog creation	2013
	Database creation, data analysis, report	2014
Habitat monitoring	Fragmentation analysis	2013-14
	Habitat model building	2014
	Register habitat deterioration points	2013 , during other field activities
AD HOC MONITORING (when needed)		
Connectivity study Tatra-Bieszczady	Bear presence survey and genetic monitoring	2013-2014

[1]Coinciding with the Bear Working group annual report

Intensive monitoring

(d) Genetic monitoring

Nowadays, the most reliable method to obtain estimates of bear numbers and population trends is genetic monitoring. This method may also provide valuable data on the genetic connectivity between the western (Tatra) and eastern (Bieszczady) segments of the bear population. A complete genetic monitoring may require about two years, the first for **sampling** (design, permits, collection, database) and the second for **analysis** (genetic and statistical) and preparation of the report. It should cover the area of bear distribution obtained from the questionnaire surveys. The areas of permanent bear occurrence (Tatra, Bieszczady, Beskid Śląski and Zywiecki) can be sampled intensively in a more systematic way for a short period (e.g. the autumn months). However, the areas of temporal bear occurrence (Beskid Sądecki, Beskid Niski, Babia Góra, Gorce, Pieniny, Spisz) may be sampled opportunistically and for longer periods (e.g. the whole year). As it is very demanding in terms of time, effort and money, genetic monitoring may be repeated **every 6 years**, to synchronize it with the report on the brown bear conservation status for the European Commission (Tables 3, 4 and 5). The 2013 report for EC will include the results from the present management plan. The next genetic monitoring should be conducted in 2017-2018 and the results included in the 2019 report. See Annex 1 for more details.

(e) Presence surveys

A systematic survey of bear presence should be conducted periodically to determine precisely the bear distribution and correct for biases from the questionnaires surveys. The national brown bear survey should be conducted **every 10 years**, to follow the same time-lag that the updates of the CORINE Land Cover[14] (Coordination of Information on the Environment, last update June 2010). It is recommended to conduct the next presence survey in 2013, thus the habitat suitability model can be prepared in 2014 (see next point) and all done together with the connectivity study between two main reproduction nuclei, Tatra and Bieszczady. The following presence survey and habitat model should coincide with the genetic monitoring in 2023-2024

[14] http://www.eea.europa.eu/publications/COR0-landcover

(Tables 3, 4 and 5). The area of bear distribution (inferred from the questionnaires) plus a buffer area should be surveyed, following an established grid, ideally the one used in the Atlas of Polish Mammals (10' x 5'). Surveys should be done in all or selected cells following a established design, statistically robust, effort-corrected and that considers the features of the terrain. The protocol for bear presence surveys may be prepared by the Bear Working Group, specifically by the members on Monitoring and Scientific Issues. **Public involvement** in the national bear survey is highly desirable. Volunteers will receive training in explanatory sessions and workshops before the survey. The creation of a blog where all participants can exchange results from the survey and documentation is available is very positive, as experiences from other countries show. See Annex 1 for details.

(f) Habitat monitoring

Because the preservation of bear habitat in Poland is of main concern for the long-term conservation of the population, the periodical evaluation of habitat quality should be an important part of the monitoring program. Habitat monitoring should be done in connection with the national surveys of bear presence. The first year will be dedicated to field work within the presence survey, whereas during the second year, the spatial analysis, report and habitat suitability model will be conducted. Next evaluations of bear habitat should be conducted in 2013-14 and 2023-24 (Tables 3, 4 and 5). We recommend three approaches for habitat monitoring in the areas of brown bear distribution. A first approach focuses mainly on evaluating **habitat fragmentation** and in identifying high quality areas. It includes estimations of changes in road density, traffic volume, urban development and unfragmented areas, as well as an update of the situation of the ecological corridors in the northern Carpathians. The second approach includes obtaining a current **habitat suitability model** for the brown bear and compare with previous model and distribution. The third approach focuses on **habitat deterioration** and requires registering locations with accumulation of rubbish, illegal dumps or unprotected rubbish containers in bear areas. This information will be included in the protocol for presence surveys and can be obtained during any monitoring activity in the field. The webpage dedicated to bear monitoring should

facilitate the flow of such information to the Bear Working Group and the General Directorate for Environmental Protection from the public. See Annex 1 for details.

Ad hoc monitoring

(g) Study of the connectivity between Tatra and Bieszczady

There is an urgent need to determine the degree of connectivity between Tatra and Bieszczady, the main reproductive nuclei. Although the habitat model for the brown bear in Poland predicts a suitable habitat in the linkage area (see chapter 7.1), field data indicates that bears occur there only occasionally and that no reproduction has been observed recently. In Slovakia the gap between the western and eastern population segments is huge; there are practically no bears inhabiting that linkage area and, according to a recent model, the habitat is not suitable[15,16]. There is a complete lack of precise information in that linkage region and an urgent need to get real evidence whether the distribution of the brown bear in the northern Carpathians is continuous or not. We propose to conduct as soon as possible a special monitoring in the linkage region between Tatra and Bieszczady aimed at determining (1) areas of temporal and permanent bear presence , (2) bear numbers, and (3) genetic flow among the eastern and western population segments. This *ad hoc* monitoring will consist of genetic monitoring combined with field surveys of bear presence following a similar methodology as described above. It will take advantage of the recent genetic results and bears genotyped. The initial timeframe proposed to conduct this *ad hoc* monitoring is 2013-2014, within the framework of the first national bear presence survey and habitat monitoring (Tables 3, 4 and 5).

6.4. Schedule and estimated costs

This section provides a summary of tasks, time schedule and approximate costs.

[15] Find'o S., Skuban M. & Koreň M. 2007. *Op. cit.*

[16] Koreň M., Find'o S., Skuban M. & Kajba M. 2011. *Op. cit.*

Table 4. Estimated costs for each part of the monitoring program.

	Approximate costs (zł)	Frequency
BASELINE MONITORING (questionnaires, monitoring of bear mortality and damages)	10,000	Each year
GENETIC MONITORING	250,000	Every 6 years
PRESENCE SURVEYS	200,000	Every 10 years
HABITAT MONITORING	20,000	Every 10 years
AD HOC MONITORING (Connectivity study)	100,000[1]	Inmediately (2013-2014)

[1]Approximate costs if conducted in coordination with the national survey of bear presence; if conducted independently the cost will be about double

Table 5. Schedule of the monitoring program in Poland for the period 2012-2025.

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Strategy into force	Report to EC						Report to EC						Report to EC
Baseline monitoring													
					Genetic monitoring						Genetic monitoring		
	Presence survey Habitat monitoring										Presence survey Habitat monitoring		
	Connectivity study												

7. Diagnosis of the current situation and recommended actions

7.1. Conservation of brown bear habitat and ecological connectivity

The Article 6 of the Habitats Directive 92/43/EEC[17] is concerned with site and habitat conservation and protection, whereas Article 12 is concerned with protecting the individuals of the listed species and their breeding sites and resting places[18]. The translation of Article 6 to brown bear habitat conservation means that the ecological requirements of brown bears should be guaranteed, among others (1) the presence of sites, enough large and undisturbed, where reproduction and wintering could be realized, (2) the existence of enough corridors and large unfragmented areas that allow movements, dispersal of young individuals and connectivity among population segments, and (3) enough space and suitable habitat to cover the needs of diverse natural foods.

Brown bear habitat requirements and suitability model in Poland

Brown bears need large suitable habitat that also fulfils their requirements for survival, reproduction and hibernation. Bears generally select connected forest habitats that provide abundant food resources and where human disturbance is minimal. Bears avoid the habitat close to towns and recreational resorts[19]. Roads and human density have a negative effect on bear presence. Winter dens are often built in inaccessible locations, far away from human settlements, roads and trails, and in steeper slopes.

[17] European Commision (EC). 2000. Managing Natura 2000 sites. The provisions of Article 6 of the "Habitats" Directive 92/43/CEE.

[18] European Commission. 2007. Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC.

[19] Nellemann C., Støen O.G., Kindberg J., Swenson J.E., Vistnes I., Ericsson G., Katajisto,J., Kaltenborn B.P., Martin J. & Ordiz A. 2007. Terrain use by an expanding brown bear population in relation to age, recreational resorts and human settlements. Biological Conservation 138: 157-165.

The habitat suitability model for the brown bear in Poland (Fernández et al. in prep.[20], more details in Annex 1) shows that the **human population density and the number of urban settlements had a significant negative impact** on bear presence. The number of urban settlements also affected bear reproduction negatively. Bear presence was more likely in habitats with higher percentage of forest cover. The main conclusion of this study is that the appearance of new urban settlements within the areas of bear distribution is highly detrimental for the species. A special effort should be put in planning the urban development of villages and towns within bear areas. Only constructions located within urban nuclei, and not spread around, inside the forest or in more distant areas from the villages and towns, should be allowed.

The predictive habitat model (Fig. 3) indicates the areas where the habitat is suitable enough and brown bears could potentially inhabit. Roughly, the total amount of habitat with high probability (> 0.5) of bear presence sums to 9,700 km^2. In general, suitable habitats for bear presence coincide with the brown bear distribution; therefore there is no more suitable habitat that bears could occupy in Poland. This highlights the importance to preserve the bear habitat still existing. The linkage area between Tatra and Bieszczady is predicted as suitable habitat; however it seems that the connection between them is very limited.

[20] Fernández N., Selva N., Yuste C., Okarma H. & Jakubiec Z. Brown bears at the edge: identifying habitat constrains at the periphery of the Carpathian population. In preparation.

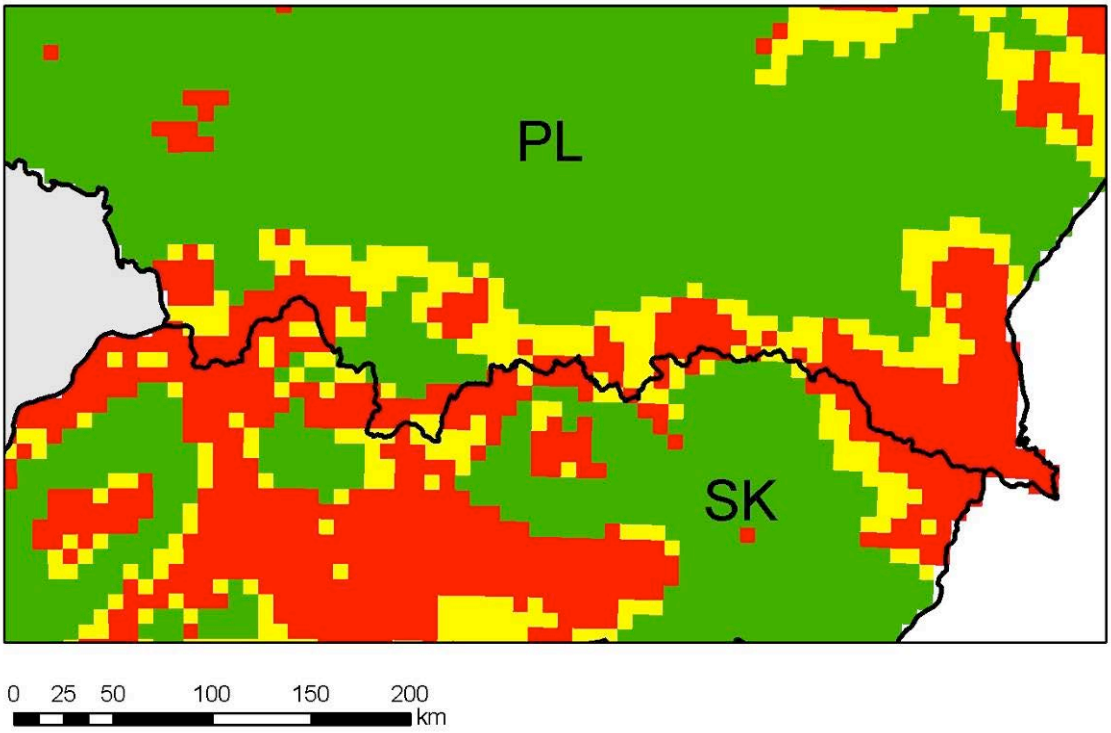

Fig. 3. Predicted model of habitat suitability for the brown bear in Poland and Slovakia (Fernández et al., unpubl.). Green represents habitat with low probability of bear presence, yellow the areas with high probability of bear presence (> 0.5) and red the areas with high probability (>0.5) of bear reproduction.

Habitat loss and fragmentation by transport infrastructures

Habitat fragmentation, together with the facilitated access to bear habitat, have been identified among the main threats for most brown bear populations in Europe, and also in Poland[21,22]. Transport infrastructures, and particularly roads, are important drivers of habitat loss, fragmentation and degradation. Bears, especially adults, are known to avoid areas within 500-800 m of highways and gravel roads. The barrier effect of roads is enhanced by road fencing and increases with traffic volume. At traffic volumes higher than 400 vehicles per hour, bears practically stop crossing roads.

Among the mitigation measures to reduce the barrier effects of roads, wildlife passages have become very popular. Tunnels and viaducts are more effective crossing

[21] Fernández N., Selva N., Yuste C., Okarma H. & Jakubiec Z. *Op. cit*.

[22] Swenson J.E., Gerstl N., Dahle B. & Zedrosser A. 2000. *Op. cit*.

structures for bears than underpasses or bridges. When tunnels are not a feasible option, because of the topography, landscape bridges are preferred over underpasses. In general, the wider the passage, the better. The minimum recommended width for landscape bridges for the brown bear is 80 m, and the width to length ratio should be greater than 0.8. The maximum distance between passages for bears should be 4.4. km and the recommended distance when the road dissect natural bear habitats between 1 and 3 km. One of the key points is to decide the location of the crossing structure; previous knowledge and field investigations of bear movements in the area are highly recommended. The presence of baited hunting towers, old orchards frequented by bears or other attractive points of food should be taken into account when deciding the passage location. Wildlife passages should be appropriately designed and vegetated and subsequently monitored. References and additional technical details in Annex 1.

Compensation measures must be also considered, in spite of mitigation measures taken. Given that bear suitable habitat in Poland is limited, a policy of no net loss of bear suitable habitat should be followed in order to maintain the favourable conservation status of the species. Restorations of equivalent amounts of habitat, for example, at degraded ecological corridors or through decommissioning of roads may be an option.

An important effect of roads is that they facilitate human access into formerly remote areas, thus increasing disturbance of bears. Given the considerable impacts of unpaved roads in natural ecosystems, forest roads are of special concern for brown bear conservation. Forestry and National Park plans should minimize the need of permanent roads or trails and proceed to the closure of temporal roads once logging or the planned activity in the area is finished, as well as to the deactivation of existing, but not really necessary dirt roads. The use of permanent forest roads may be authorized by regulations or limited by physical barriers. Because winter is such sensitive period for bears, only those forest roads needed for logging should be plowed.

The road network in Poland in 2008 covered about 383.3 thousand km. The Polish Government has approved the plan of road development for 2011-15[23]. The strategic impact assessment for the new plan has been consulted. In the period 2005-2010 the traffic volume has increased in 22%; an increase has been observed also in the night traffic. The prognosis for 2015 and 2020 indicates a big increase in traffic volume in the roads in the north along the Carpathians, as well as in several roads crossing bear habitat and going in south direction to Slovakia. The 11 points where the main national roads cut bear habitat are provided in Annex 1. A steady increase of traffic volume in two critical road segments (road no. 9 in Miejsce Piastowe-Dukla-Barwinek, no. 49 from Nowy Targ to the border) has been observed in the last decade. The modernization of the national road no. 9 Dukla-Barwinek has been postponed after 2013. The planned roads in Slovakia, especially the segments R3 and R4 may represent an important obstacle for improving the connectivity between the western and eastern segments of the bear population. Apparently no wildlife passages are built or planned in the Slovakian side. More information in Annex 1.

The lack of urban spatial planning in Poland

Urban sprawl defines the expansion of urban areas into the surrounding agricultural or forested areas in a chaotic and low-density pattern, and is now a common phenomenon throughout Europe. The social, economical, and also the environmental costs of urban sprawl are considerable, and the urban pressure on Natura 2000 sites and other protected areas is increasing[24]. This issue is of high concern in Poland, lacking urban spatial plans in most of its territory and where roads are inevitably followed along by buildings, creating often impassable ecological barriers. In fact, urban sprawl is the main cause of disruption the ecological corridors in the Polish Carpathians and has become an important threat for the conservation of brown bear habitat.

In 1995, the obligation to prepare new urban spatial plans was derogated in Poland; moreover, the still existing plans were also derogated in 2003 with the Act of 27 March

[23] http://www.mi.gov.pl/files/0/1793721/SKMBTC55011020913080.pdf

[24] European Environment Agency. 2006. Urban sprawl in Europe. The ignored challenge. EEA, Copenhagen, Denmark.

2003 on spatial planning and development. Urban spatial plans are not obligatory by law for the municipalities, towns and cities, and they are expensive and should be financed by the own municipality. As a result, only one fourth of the country has urban spatial plans. The rest undergoes a completely unplanned and chaotic growing. Among the Voivodships within the bear range of distribution, the situation is especially bad in the Podkarpackie Voivodship, with only 7.5% of the territory covered by urban plans.

In the case of spatial plans affecting protected areas and their surroundings, the plans require the **agreement** of the Director in the case of National Parks area and of the Regional Directorate for Environmental Protection in the case of nature reserves, landscape parks and Natura 2000 sites. Unfortunately, spatial plans cover smaller areas each time, thus being very difficult to properly assess the environmental effects (sometimes the assessments are done for a single house). In areas without spatial plans, the only requirement is a **building permit** given by the municipal administration, which also requires an environmental permit by the Regional Directorate for Environmental Protection or National Park director. The pressure for building in bear areas is growing; just in 2010 the Regional Directorate for Environmental Protection in Rzeszów handled about 3,600 applications for building permits. In practice, the required permits are given in most cases; only about 4% of the applications are denied More details in Annex 1.

Development of winter sport infrastructures

The lack of urban spatial planning also applies to the developments of large touristic resorts, which are built without any strategy at the national level. In the Carpathian range, they mainly relate to the construction of new ski resorts, often in Natura 2000 sites and not always following the required legal procedures. Winter sports and outdoor activities represent an important new threat for wildlife, affecting their use of habitat and increasing physiological stress of animals. Being winter the reproductive and most sensitive period for bears, snowshoeing, snowmobiles, skiing and free-riding winter sports may significantly affect denning bears.

Currently, more than one hundred ski lifts operate in the areas of brown bear distribution in the Polish Carpathians. Several ski investments are planned to be constructed or upgraded to increase their capacity in the close future. The description of the most critical planned ski investments for the brown bear population in Poland are provided in Annex 1. Building and modernisation of ski lifts require an environmental assessment before permits are issued. Planning of those investments, already quite numerous in the Polish Carpathians, should be done at a national or regional (Carpathian) level in coordination with urban spatial plans, and following a Strategic Environmental Assessment.

Ecological corridors. Critical points to maintain habitat connectivity in the Polish Carpathians

Ecological corridors are continuous belts of natural habitats, such as forest, marshes or shrublands connecting large forest complexes. They reduce isolation and facilitate gene flow among habitat patches, while reducing mortality, especially of young animals. Since in Poland brown bear migration outside of the Carpathian Range is practically impossible (strong and spread urbanization and low forest cover in the Carpathian foothills), actions to protect the connectivity of bear habitat should focus on the so-called Carpathian corridor, with particular attention to river valleys and transboundary connections with Slovakia, Czech Republic and Ukraine. The main problem for maintaining the ecological connectivity within the Polish Carpathians is the high density of people and urban settlements, especially in the river valleys. A second problem is the network of national roads with heavy traffic dissecting the Carpathian corridor, mainly road no. 7 (Gdańsk-Krakow-Rabka-Chyżne, S7 on some sections), road no. 47 (Rabka-Zakopane) and road no. 9 (Radom-Rzeszów-Barwinek). The ecological connectivity of the Polish Carpathians is disrupted in several places called “critical points”. The location of the **critical points** is shown in Figure 4. Annex 1 includes a list of the critical points, both existing and potential, along with a description, detailed map and proposed solutions.

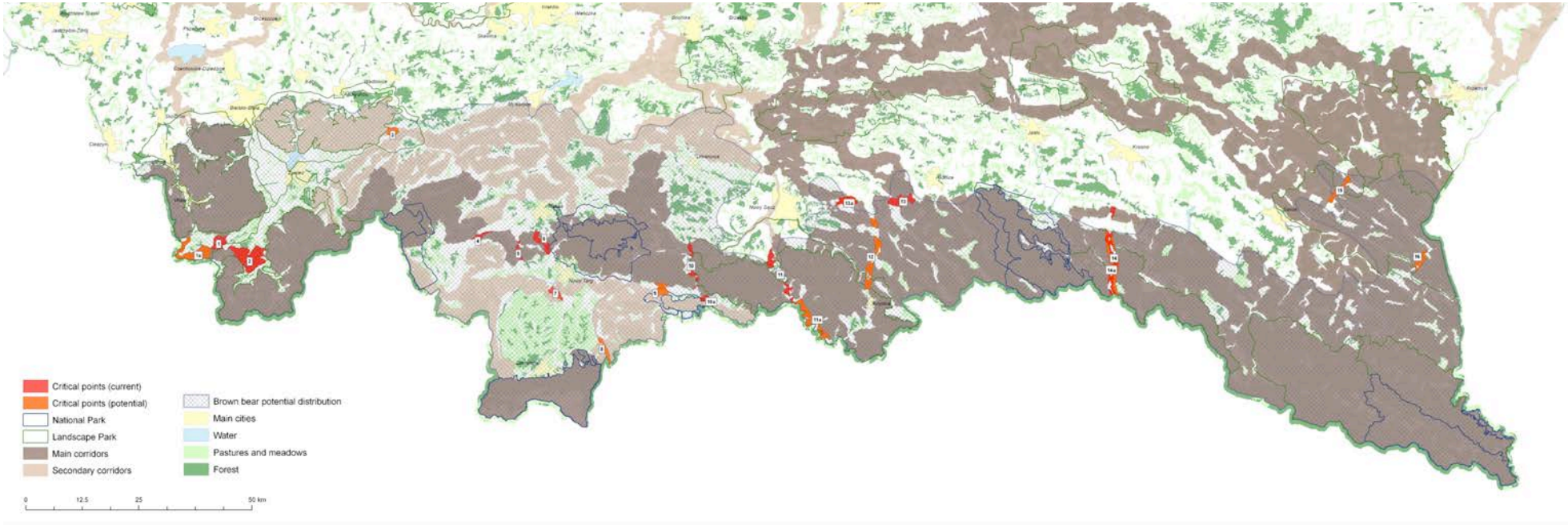

Fig. 4. Ecological corridors and critical points (current and potential) in the Polish Carpathians.

Importance of keeping large unfragmented areas in bear habitat

Large unfragmented patches of natural habitat are a rare element in the European landscape. However, their importance for biodiversity conservation and for maintaining ecological connectivity is being increasingly recognised at the scientific and policy arena[25]. They play a key role in sustaining the ability of species to move, especially of those with large spatial requirements and sensitive to human disturbance, like the brown bear. Some brown bear management plans specifically identify security areas for bears, defined as areas more than 0.5 km from a motorized route, as important areas for their survival and reproduction.

For the present management plan, an analysis of habitat fragmentation in the Polish Carpathians was conducted with the main goal of identifying the large unfragmented areas still existing. The criteria to identify large unfragmented areas or bear "**secure habitat areas**" was to be more than 500 m from any road or trail and to be larger than 4 km^2, based on previous studies and experiences. See methodological details, maps and references in Annex 1. A total of 14 secure habitat areas were identified, all of them in the Bieszczady Mountains (Fig. 5). Only one area is larger than 20 km^2. Several are located at the border and shared with Slovakia and/or Ukraine, thus representing an important future field for cooperation and common policies.

This habitat criterion must be monitored and, as a general rule, these secure habitat areas should not be further fragmented. Building new roads, tourist trails and houses is not recommended. Motorized access in "secure habitat areas" should not be allowed and human activities (e.g. antler gathering, trekking, skiing) should not take place in the bear denning period (1 November to 30 April). In other bear areas, an effort to decrease fragmentation should be made.

[25] Selva N., Kreft S., Kati V., Schluck M., Jonsson B.-G., Mihok B., Okarma H. & Ibisch P.L. Roadless and low-traffic areas as conservation targets in Europe. Environmental Management. 48: 865-877.

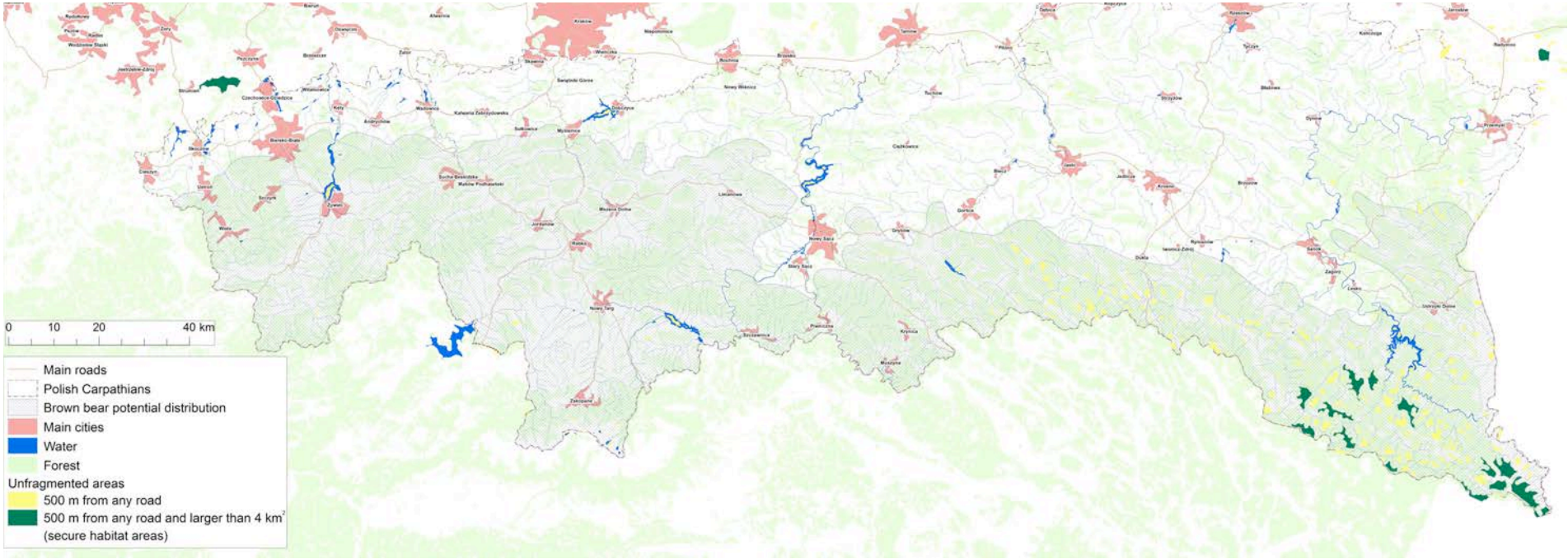

Fig. 5. Unfragmented areas in the Polish Carpathians, identified as those further than 500 m from the closest road or trail. The unfragmented areas smaller than 4 km^2 are marked in yellow; the "secure habitat areas" for brown bears, larger than 4 km^2, are marked in green.

Recommended actions

Habitat degradation in a wide sense is nowadays the main problem for bear conservation in Poland. Taking into account that the bear population is small and that bears occupy all suitable habitat, most efforts should be directed to preserve the habitat. The measures proposed to preserve and maintain the quality of bear habitat should be integrated in the management plans of Natura 2000 sites, National and Landscape Parks, Forest Management Plans, and urban spatial plans. In summary, the measures proposed include:

- In Natura 2000 sites with bear presence, avoiding further fragmentation and increasing the size of the unfragmented areas should be a priority.

- Develop urgently urban spatial plans with their corresponding environmental impact assessment in the Carpathian area, especially in those municipalities which are inside or close to Natura 2000 sites. The adoption of urban spatial plans in Natura 2000 sites (and in other protected areas) should be mandatory. Building in these areas based on building permits should be excluded.

- Management plans for Natura 2000 sites should be developed and adopted as soon as possible.

- In Natura 2000 sites and areas of bear presence it is recommended to adopt a special rule for land use planning: avoid the appearance of new urban settlements within the area of bear distribution and allow buildings only within or relatively close to urban nuclei. Buildings far away from villages, in remote areas or spread in bear habitat, even if following roads, should not received building permit.

- Given that the highly suitable habitat for the brown bear is limited in Poland, a policy of no net loss of bear suitable habitat should be followed and considered in the compensation measures.

- The secure habitat areas identified in the present document should not be further fragmented, and plans and projects in these areas better will have a proper

environmental impact assessment. Motorized activities should not be allowed in these areas. Other activities should be avoided in the brown bear denning period (1 November to 30 April).

- Improve the connectivity between the reproductive nuclei in Tatra and Bieszczady. A detailed study on this linkage area is recommended (see ad-hoc monitoring).

- Restore the ecological corridors in the critical points following the suggested measures in Table 7.1.4 in Annex 1.

- Provide enough wildlife passages (tunnels and green bridges) of adequate parameters to minimize the barrier effect of the modernisation of the road S-19 in the segment Dukla-Barwinek.

- Forest roads are a key element for preserving bear habitat. The State Forest Administration and National Parks should avoid building new permanent forest roads and trails and consider the closing of temporal and unnecessary roads. In winter, plowing of gravel roads should be done only when really needed.

- Monitoring the quality and quantity of bear habitat as recommended in the present document.

7.2. Reduction of brown bear mortality and disturbance caused by humans

In the past, the main cause of brown bear mortality was the intentional and official killing by people. Since the brown bear became a protected species, the cases of legal culling and trapping aiming to eliminate individual bears have been extremely rare in Poland. However, the main causes of bear mortality in Poland seems to be still of human origin. The cases of illegal killing or poaching are suspected to be still relatively common nowadays. The lack of the proper implementation of the existing law (see chapter 8) together with the lack of a detailed procedure and protocol to be followed each time a bear is found dead makes difficult to assess the situation and to take

actions to improve it. In the last one-year period four deaths of bears were recorded: an adult female, presumed natural death, in Tatra (October 2010); a subadult male poached in a snare in Rybotycze (Bieszczady region; November 2010); a cub dead after being abandoned due to human disturbance of the denning female in Rabe (Bieszczady; January 2011), and an adult bear, presumably male, found near Ustrzyki Dolne in October 2011 (Bieszczady; cause and date of death unknown).

Human disturbance is becoming an increasingly important cause of bear mortality. The increased access and disturbance of forest areas inhabited by bears due to forestry and hunting, antler gathering, tourism, recreation and sport, mainly winter sports, together with the shortage of areas free of disturbance where the animals could find refuge, is an important problem. Activities like picking forest fruits, especially bilberries, not only disturb bears, but also reduce their food resources. A relevant cause of cub mortality is den abandonment by the female due to human disturbance. In the last decades several such cases were recorded in Beskid Żywiecki and Bieszczady region. Den abandonment was mainly caused by gathering of red deer antlers, but also by forestry works and hunting. Traffic accidents are still of less importance in Poland, but an increase may be expected in the close future. Given the limited numbers of brown bears in Poland, each mortality event most probably represents a **significant loss for the population**.

The bear population in Poland is transboundary and, thus, it status depends to a great extent on bear management in Slovakia. The goals of the protection and regulatory bear culling in Slovakia are the elimination of problem bears and the control of the bear population, respectively. In the last years (2000-2009), in Slovakia 277 bears were harvested under the regulatory culling and 44 under the protection culling[26]. Culling represents 70% of the bear mortality in Slovakia. Evidence shows that it may affect bears living in the Polish territory and therefore, also the conservation status of the population in Poland. We propose a close cooperation between Slovakia and Poland in this issue to commonly design the border areas where bear culling should not be

[26] Adamec M. & Antal V. 2011. Ochrana a aktívny manažment medveďa hnedého na Slovensku. Polsko-słowacka konferencja „Zasady gospodarownia populacjami wilka, niedźwiedzia i kormorana w regionie transgranicznym". Generalna Dyrekcja Ochrony Środowiska, Kraków.

allowed, with special attention to the potential reconnection of the western and eastern segments of the population.

Recommended actions:

- Mandatory registration of all cases of dead bears following the standard protocols and procedures recommended in the monitoring program.
- Increasing of the penalty for killing a bear, better law enforcement. Introduction of penal sanctions for chasing a bear away from the winter den.
- Better implementation of the species protection law.
- Establishment of “secure habitat areas” free of disturbance in winter together with the full restriction of free access to these areas during the bear denning period.
- Intensification of the vigilance by national park staff on activities that requires spread access to national park areas, especially deer antler gatherers and berry pickers, and better control of the other regulations (e.g. prohibition of disturbance by noise over established limits).
- Undertaking of joint Polish-Slovak studies on the influence of culling on the status of the bear population. A mutual agreement is indispensable for the designation of areas where bear culling should be stopped in order not to withhold the potential reconnection of the western and eastern segments of the bear population in the northern Carpathians. After achieving common agreement, it is recommended that the Polish authorities will officially apply to the Slovakian authorities to stop bear culling in the designed areas.

7.3. Prevention and reduction of brown bear damages

The procedures for damage assessment and payment of compensation are regulated by the Nature Conservation Act and differ slightly among regions. Currently, according to the Article 126 of this Act, the compensation for damages is not granted in case the injured party does not agree with the installation (by the Regional Directorate for Environmental Protection or Director of the national park) of prevention devices. At the moment the Ministry of Environment is working on a new Regulation on the assessment of damages caused by certain protected species. The proposal was submitted for public consultation in August 2011 and should be completed by the end of 2011.

The damages caused by brown bears in Poland are not very numerous, and significantly lower than those produced by other protected species. Whereas the number of bear damages is low and stable in Śląskie and Małopolskie Voivodships (compensation costs of about few thousand PLN), in the Podkarpackie Voivodship the number of damages has been increasing in the last decade and damage compensations reached 250,000 PLN in 2010 (Table 6). Most bear damages concern apiaries.

According to data from the Central Statistical Office, the number of bee-keepers and apiaries in Poland has kept at similar levels in the last years. In the Podkarpackie Voivodship most apiaries (67%, with and without protection, data from the Regional Directorate for Environmental Protection in Rzeszów) are located inside the forest, often far from human settlements, thus with more possibilities of being visited by bears. Moreover, in the Podkarpackie Voivodeship bears cause damages in apiaries during all the year, including winter. This may be related to so-called „winter insomnia", which is more and more frequently observed in Bieszczady and may be related to supplemental feeding and milder winters. Apiaries at the border of the bear distribution range seem to be more exposed to damages (Fig. 2); this may also be related to apiary owners being more unaware of bears in periphery areas. Bears may visit and damage the same apiary several times. Preliminary results from the genetic analysis conducted for the present plan suggests that the same individuals are repeatedly carrying out damages. More details in Annex 1.

Table 6. Compensation costs (PLN) paid annually for damages caused by brown bears in the areas of brown bear occurrence in the period 2003 - 2010 (data from the Regional Directorates for Environmental Protection in Katowice, Kraków and Rzeszów).

Year	Śląskie Voivodship	Małopolskie Voivodship	Podkarpackie Voivodship
2003	4,150	7,630	7,526
2004	3,234	-	45,557
2005	5,000	8,500	17,865
2006	-	-	-
2007	-	2,933	26,704
2008	1,250	5,290	72,807
2009	-	6,475	123,544
2010	-	2,240	251,368

The most efficient method to prevent bear damages are **electric fences** around apiaries. Conventional fences made from wire or wood are rather useless. Beehives can also be placed on special platforms 2m high in a way the bear cannot reach them. The costs of electric fencing depends on several factors (e.g. length and type); it ranges from several hundred to several thousand PLN, the average cost is about 1,000-1,500 PLN. More information on preventive measures in Annex 1.

Recommended actions

- Preparation of information campaigns, especially in the Podkarpackie Voivodeship, on existing methods and costs of preventing bear damages in apiaries.
- The Regional Directorates for Environmental Protection will benefit from purchasing electric fences to be installed, if not all, at least in the most frequently damaged apiaries. National and European funds could be applied in this case (see Annex 1). It is very important to train owners and assure the proper installation of fences.

Regular inspections of the preventive devices by staff of the Regional Directorates for Environmental Protection should be conducted.

- Introduce the obligation to properly protect the apiaries may be considered. Placing apiaries in remote bear areas has the risk to make bears used to anthropogenic food. The apiaries located in such areas should be especially well protected, and intensively controlled by staff of the Regional Directorates for Environmental Protection. In case of no or inadequate prevention measures, compensations should not be paid.

- In general, it is also recommended not to place apiaries deep inside the forest, far from human settlements, in known bear wintering areas, especially in the beginning of spring (April-May), when natural food resources are scarce.

- In case other types of bear damages will increase (e.g. attacks to livestock), an intensive monitoring should be conducted and preventive measures applied as soon.

7.4. Avoidance of brown bear habituation and food conditioning

The behavior of a bear is essentially defined by learning processes. **Habituation** is a simple form of learning, in which through repeated contacts with humans and no negative consequences for the bear, bears learn that humans are not dangerous and tolerate human presence at increasingly shorter distances. **Food conditioning** is a more complex and active form of learning. Through artificial feeding, bears learn that when overcoming their fear for humans, they are rewarded with food. As a consequence, they will consistently seek the vicinity of humans or settlements in their search of that food. This can easily lead to dangerous situations. Just few of such successful events are enough for a bear to include food search in human environments in its behavior repertoire. Both processes, habituation and food conditioning, can

develop simultaneously in an individual bear[27]. In Poland, and also in Slovakia, problem bears are usually called "synanthropes". The term "synanthropization" has been misused to refer to these two different aspects of bear behavior, habituation and food conditioning. However, the definitions of the term "synanthropization" found in the literature are sometimes contradictory with its use in the case of bears. This expression is not used in other countries. We propose to slowly spread the use of **"problem bears"** instead of "synanthropes", as a more correct and internationally accepted term. For more information and references, see Annex 1.

Cases of habituation and food conditioning of brown bears are known from all over their wide range, both in areas where bears are subject to strict protection and where the species is hunted. In Poland, this phenomenon is best known in Tatra Mountains, where habituated and more often food conditioned bears appear almost every year since the 80s. The appearance of problem bears in Tatra was mainly due intentional feeding. The magnitude of this problem has been significantly reduced since proper waste management, deterrence and aversive conditioning of bears have been implemented systematically during the last decade of last century.

During recent years, it has been observed an important increase of this phenomenon in the Bieszczady region. In May 2009, bears were often seen near the tourist centers at the Solina lake (Bieszczady region), where people supplied them with artificial food. In March 2011, one bear was observed in the day searching for rubbish in the trash bin in the forestry district of Sokoliki, administrative unit of Stuposiany (see links in Annex 1). In May 2011, another bear regularly jumped through the broken windows of a corn store in the village Zatwarnica. Unfortunately, in this area the problem is not treated seriously, and the lack of an effective system of collecting the information about such cases may prevent a proper assessment of the real situation. In the near future, this can lead to the **intensification of conflicts**. Most bears in Bieszczady are strongly conditioned by supplemental food provided for game (representing 1/3 of the bear

[27] Länderübergreifende Koordinierungsstelle für Bärenfragen. 2005. Managementplan Bär Österreich – überarbeitete Version 2005. WWF Österreich, Wien, Austria.

diet[28]), and their movements seems also to be influenced by the location of the feeding sites. These bears can easily become problem individuals, or even nuisance bears. Intentional luring and feeding of bears, also with wastes of human food and leftovers from slaughterhouses, aiming to create a local tourist attraction, or to help in photo and video recording, is becoming more and more popular in Bieszczady. This activity is beyond any control. At the same time, considering the lack of proper waste management from both local residents and tourists, it is clear that in the short term there may be drastic consequences and problem bears may appear quite soon in Bieszczady, unless measures are taken immediately.

Food conditioning of brown bears is promoted by easy accessibility to anthropogenic food in areas of permanent bear presence. Settlements and facilities, such as restaurants and hotels, where food waste are produced and collected, and which are located in bear areas, must follow a rigorous waste management policy (i.e. using ”bear-proof” containers, regularly emptied, do not compost waste or use electric fences). In the case of issuing permits for building or opening new gastronomy facilities in forested or remote areas inhabited by bears, it should be compulsory that the investor will have to present also a waste management plan.

In the case of bears whose behavior may cause harm or represent a threat to human security, despite the implementation of preventive measures, it may be necessary to take direct intervention against such individual, aiming at counteracting further damages and minimizing risks. These interventions should be adjusted to the situation. Measures for removing the attractant should be taken as a first step. They may be followed by deterring and aversive conditioning. The proper assessment of the effectiveness of these measures can be done only by individually marking the problem bear in question and in close cooperation with Slovakia. For instance, problem bears deterred in Polish Tatra often move to Slovakia, where they may be shot or not being followed-up and deterred with a similar method, thus leaving open the question about the real efficiency of these measures. When these measures prove to be ineffective, it

[28] Bojarska K., Selva N., Śmietana W. & Okarma H. 2011. Optimal foraging in brown bears: the biogeographical and local approach. 20th International Conference on Bear Research and Management, Ottawa, Canada.

may be necessary to catch or shoot the bear that pose a threat or cause permanent damages. More information in Annex 1.

Table 7. The classification of risk assessments based on bear behavior and recommended actions. In brackets, actions that may be also recommended depending on the situation (Austrian Bear Emergency Team 2006, modified).

Situation	Urgency of action	Bear behavior	Recommended action
Normal, not dangerous	no action	Upon an accidental close encounter bear is retreating immediately	no action
		Upon an accidental close encounter bear is rising on its hind legs	no action
		Bear is causing damages in uninhabited areas	damage prevention (e.g. electric fencing)
Critical, needs attention	low	Bear is repeatedly coming close to inhabited houses	intensify monitoring
		Surprised bear feels threatened and starts a false attack	intensify monitoring (deterrence)
		Provoked bear starts a false attack	intensify monitoring (deterrence)
		Bear tolerates observation from a short distance without retreating	intensify monitoring deterrence
		Bear is searching for food or is causing damages close to inhabited houses	intensify monitoring deterrence, damage prevention
Dangerous	urgent	Bear is defending its food by attacking	intensify monitoring (deterrence)
		Bear enters stables close to inhabited houses several times	intensify monitoring deterrence
		Bear is repeatedly intruding residential areas	intensify monitoring deterrence
Very dangerous	very urgent	Dangerous bear cannot be deterred successfully	intensify monitoring removal
		Bear tries to enter inhabited buildings	intensify monitoring deterrence, removal
		Bears is following humans	intensify monitoring (deterrence, removal)
		Bear acts aggressively without being provoked	intensify monitoring removal

A key issue is to assess the extent and magnitude of the threat. To assess the risk that a bear can pose to people, we propose to follow the **hazard classification** used by the Austrian Bear Emergency Team[29] (Table 7). Note that proposed levels of threat in the classification are orientational. Depending on the magnitude, location, and especially on the behavior of people, actions may be necessary even at seemingly low risk, which in normal circumstances would not require any intervention. In high-risk situations, most often immediate intervention is absolutely necessary.

Recommended actions

- Take urgent actions to prevent and be properly prepared for cases of problem bears in the Bieszczady region, which may appear very soon. All such cases must be properly documented and registered. In an emergency case, actions and decisions must be taken in accordance with the recommendations set out in Table 7. The creation of a Bear Emergency Team will address this problem professionally and efficiently.

- Deterrence of problem bears should be conducted in strict cooperation with Slovakia, unifying methods and guaranteeing a proper information flow.

- Do not promote artificial feeding of bears (this also applies to maintaining orchards and planting fruit trees in the forest), as long as there is no evidence on the scarcity of natural food and the potential consequences of feeding measures. Hunters should consider progressively reducing the feeding of ungulates with foods that are used by bears (grain, corn, beetroots) in favor of the traditional dry fodder. The issue of supplemental feeding deserves deeper investigation and a general scientific assessment of its consequences.

- Feeding bears should be done only with permission of the corresponding Regional Directorate of Environmental Protection. In all cases, bear feeding with processed food should be strictly prohibited.

[29] Austrian Bear Emergency Team. 2006. JJ1 "Bruno" in Austria and Germany 2006. Protocol and Risk Assessment, Vienna, Austria.

- Garbage bins along the hiking trails in bear areas should be removed. They can be placed at the beginning and end of the trail only if they are "bear-proof" containers. Popular hiking routes should be cleaned daily. Gastronomic facilities in bear areas should have a garbage management plan and security system; this should be a precondition to receive the building permit.

- Information and education campaigns aimed at tourists, hunters and local communities, devoted to increasing awareness of the consequences of bear feeding should be conducted (see chapter 7.8). National Park Services and the Forest Administration should devote more attention to this problem. Feeding of bears by tourists in national parks, as well as to other animals, is an offense and therefore, is punishable with a fine.

7.5. Improvements of the welfare of bears in captivity

There are 29 brown bears being kept in captivity in Poland (6 males and 23 females) in 9 institutions (by September 2011). Of these, 17 are living in conditions constraining basic biological needs. The study on captive bears in Poland[30] showed the following **major welfare problems**: (1) insufficient space of enclosures, (2) inappropriate, concrete substrate causing diseases and leading to limb deformations, (3) poor diet, (4) lack of swimming pools and access to drinking water, (5) lack of stimulation causing mental suffering, and (6) inadequate care, including veterinary care. The enclosures do not exceed 600 m^2, only three are of app. 1000 m^2, and only one is of 1.2 ha. Eleven bears are kept in enclosures that are unacceptable small; eight individuals live in cages smaller than 200 m^2 and three in enclosures smaller than the legally required minimum (100 m^2 per pair of bears). Currently, ten brown bears are kept on concrete floor. Sixteen bears have no access to pools of proper size enabling free swimming; some of them have the possibility to cool body only in concrete pits, cribs or bathtubs. In some places, there is no control over the feeding by visitors; this practice should be

[30] Maslak R. & Sergiel A. Captive Bears Welfare Research in Poland 2007-2009. RSPCA & OTOZ Animals, Wrocław.

prohibited, both because of its adverse effects on health, as well as changes in behavior. For detailed information and full references, see Annex 1.

Appropriate keeping conditions are important not only for bear **welfare**, but also for **proper education** about the biological needs of the species. One solution to the problem of many bears being kept in unsuitable conditions and lack of proper places is the building of a bear sanctuary. Bear sanctuaries, where bears are housed in semi-natural enclosures, has been very successful in many European countries. Such facilities are not only maintaining high standards of animal welfare, but also serve for important educational and scientific purposes. In some sanctuaries, the minimum standard size per one individual is set at 0.5 ha. These standards are in agreement with the concept of Large Bear Enclosures (LBE). Keeping bears in such conditions that allow exhibiting **natural behaviours** is the backbone of the concept. In addition to the significant increase of the living space for bears, **environmental enrichment** is being increasingly used. All new facilities for bears should keep along these current trends followed in most European countries.

Recommended actions

- The national regulations on the minimal requirements for bear keeping should be improved and changed in the law. Existing regulations do not only ignore the basic needs of the species but are also unclear as they do not specify a minimal enclosure size for one individual, but only per pair of animals. It is proposed to increase the established minimum size of enclosures from 100 m^2 per pair to 1000 m^2 (see chapter 8).

- Support initiatives for building bear sanctuaries and large enclosures, which could contribute to solve the problem of bears living in unsuitable conditions.

- Promote and support improvements of existing enclosures with environmental enrichment stimulating physical and mental activity.

- Promote the building of new facilities according to the LBE standards.

7.6. Improve cooperation at national and international level

The preservation of the brown bear population in a favourable conservation status requires not only appropriate policies, but over all a good cooperation at the national and international level. Our knowledge about the bear population is the joint outcome of research, exchange of information and cooperation between researchers, NGOs, administration and nature protection units within Poland and with other countries. In this respect, the cooperation at the national level should be improved. The information on the bear population in Poland is dispersed, fragmented and registered unsystematically in at least several institutions or even privately. The use of these data, even if collected with public funds and for management or conservation purposes, is most often restricted. As a result, nature managers often lack accurate scientific information and the best available picture of the situation, and thus need to base exclusively on expert opinion. The creation of the Bear Working Group and Bear Data Bank will promote cooperation, information flow and data availability.

International cooperation in the management of large carnivore populations, although very necessary, especially in transboundary regions, it is a very difficult task almost everywhere. This is due to countries' differences in bear numbers, protection regimes and legislation, and perception of bears, together with differences in tradition, language, history and culture. Several seminars and workshops have been organised in the last years on transboundary cooperation and management of large carnivore populations, also for the Carpathian region (more information in Annex 1). The cooperation between Polish and Slovakian nature protection and environmental administration (e.g. national parks in the Tatra Mountains) is slowly consolidating. During official meetings, the will of cooperation is mutually declared, however it is still difficult to reach a consensus and agreement on the bear management policies in the border zone. Difficulties in the cooperation with Ukraine are of different nature - mainly economical reasons and few resources available for research and monitoring. The creation of a **Polish-Slovakian Committee**, if possible with **Ukraine**, on large carnivores that would meet regularly and deal with transboundary issues is highly recommended.

An effort to establish an authentic and effective cooperation with Slovakia and Ukraine should be made. This transboundary cooperation should be established in the following fields: monitoring, prevention of damages caused by bears, unification of management measures in the border zones, unification of sampling methods and protocols, establishment of bear emergency teams, scientific research and information exchange. Two most urgent tasks to achieve are: (1) a joint or common monitoring within management units, and, 2) improvement of the connectivity between the western and the eastern population segments. Transboundary population management with Slovakia should be based on **management units**, e.g. national parks in Tatra or in Bieszczady (Poland) and Poloniny (Slovakia) national parks. In the Tatra Mountains both national parks have already undertaken a joint population genetic monitoring in 2011, which is very promising.

The international cooperation beyond the Carpathians is almost restricted to researchers. Polish scientists closely collaborate with research groups from all over the world and most of the recent projects concerning bears have had collaborators from foreign research centres. Thanks to scientific cooperation with Croatian and Scandinavian experts, the protocols for immobilisation and sampling presented in the plan were elaborated. Additionally, several trainings of Polish researchers and wildlife managers in 2010 and 2011 by Croatian and Scandinavian experts have been an important milestone. Such cooperation significantly contributes to improve the knowledge on bears as research and management quality in Poland and should be strengthened.

Recommended actions

- Encourage the permanent representation of Slovakia and Ukraine in the Bear Working Group.

- Establishment of the Polish-Slovakian-Ukrainian Committee on transboundary management of large carnivore populations which will meet regularly. The goal of the committee would be to exchange information on current brown bear population and habitats status, condition of the ecological corridors, planned

investments.

- Reach an agreement between the institutions responsible for brown bear management in Poland and in Slovakia in order to unify policies in the border zones. It is recommended that decisions on bear culling in the border zones will be taken in close cooperation between the Polish and Slovakian administration and after consultation, among others, with the Bear Working Group or the Polish-Slovakian Committee. A future task for the Bear Working Group and/or the Polish-Slovakian Committee would be to study and analyse which regions should be excluded from bear culling (centres of reproduction and/or segments essential for reconnecting the western and eastern segments of the population).

- Organize and promote international meetings of all interested groups, namely bear researchers, nature protection services, administration and non-governmental organizations every two-three years in order to exchange information and discuss current bear population and habitats protection issues, with special focus in the Carpathians.

- Promote a close cooperation between Poland and Slovakia in the *ad hoc* monitoring proposed for 2013-2014 and in the improvement of the connectivity between the western and eastern segments. This task could be done as joint Polish-Slovakian monitoring project.

- Promotion (also through Bear Working Group) of common scientific research or actions aimed at bear conservation in the Carpathians, financed by national or European funds.

7.7. Promote scientific and applied research

The brown bear has not been so deeply and long studied as other large carnivores in Poland. As a consequence, there are still many gaps in the scientific knowledge regarding the biology and ecology of the species in Poland. Telemetry studies on bears were conducted for the first time in Tatra in 2001. Since then, a total of 12 bears have

been equipped with transmitters in Poland, but the results have not been yet summarized or published. On the other hand, applied research has never been strong and research studies on brown bear within the discipline of conservation biology have just started. Traditionally, bear management has been based on expert's opinions, and rarely based on data, or enough documented with literature or justified with experiences from other countries. Fortunately, the situation is changing and several ongoing research and management projects are just starting to provide good data for an evidence-based conservation. More information on previous and ongoing research is provided in Annex 1.

It is highly desirable to **put more science into policy and management decisions** in future. It is important to promote high-quality and applied science simultaneously by four main players:

(1) **Environmental administration** by requesting and supporting concrete studies to answer urgent questions, facilitating permits to conduct research or conservation activities, analyzing critically the research proposals to make sure that the same study has not already been conducted or that bear trapping will be done properly, and facilitating data and information related to brown bears.

(2) **Foundations and programs** for biodiversity conservation and **NGOs** by being effective, maximizing the outputs of the little money devoted to conservation, and making sure that the conservation measures proposed are appropriate, necessary, and science-based.

(3) **Scientists** can "guide" the direction of bear conservation and management in Poland by using science to provide answers to conservation problems, work on timely and needed issues and making their results available through scientific publications, congresses, popular articles and internet. Scientists need also to interact with the public and inform policy makers more frequently.

(4) **Bear Working Group** will have a key role in promoting applied science through the coordination of research activities, promotion of networking, putting science into management, promoting the use of the Bear Data Bank, making available to the public

new scientific findings and annual reports through the website and improving the cooperation with other countries.

Recommended actions

- Environmental authorities should make an effort in improving the procedure for issuing permits for research and conservation activities, in terms of time and guaranteeing the quality of the proposals.
- Scientists, conservation NGOs, persons responsible for funding programs and the Bear Working Group should promote conservation based on science and of high quality.
- The creation of the Bear Data Bank and bear website together with the availability of data will significantly contribute to achieve scientific findings and trigger applied research.

7.8. Promote education and raise public awareness

The brown bear is a charismatic species, raising much public interest in Poland, as reflected by the frequent news and information in media. Regular informative and educational campaigns are also held by the national parks, in areas of brown bear presence. Some non-governmental organisations help to popularize knowledge about bears (e.g. WWF Poland). The great interest in bear-related issues has been also proved by the number of participants in the workshops organised during the preparation of this document, and by the high numbers of visitors in websites[31] on bears. The public acceptance in areas of brown bear occurrence in Poland is generally high. Research on attitudes of beekeepers and tourists in Bieszczady and Tatra National Parks toward bears showed that the majority is positive. However, some sectors lack proper knowledge about the species, especially about the mechanisms leading to habituation and food conditioning[32].

[31] www.carpathianbear.pl, www.bearproject.org

[32] A. Spalona, unpublished data

Bears in captivity have an important role in education; however in Poland this potential is not really exploited. Education programs in institutions where animals are kept in proper conditions are especially successful and may refer to a wide range of issues important for bear conservation, both *in situ* and *ex situ*, for example bears' biological needs, the bad conditions and life of circus bears, the issue of problem bears as a "product" of improper human behavior, and the use of preventive measures.

Bear conservation is also an important socio-political issue and it requires making the **information accessible to the public** and to the specific groups, and guaranteeing **proper information flow**. Social acceptance for the brown bear increases by promoting information, dialogue and involvement. It should be maintained by regular educational activities addressed to particular social groups: tourists; hunters and foresters; people collecting antlers and blueberries; owners of apiaries; and, local people in brown bear areas. A very important element in bear conservation is good knowledge about species among decision-makers and people responsible for nature conservation in general.

Informing the public and target groups should not be limited to leaflets or press conferences, but should also create opportunities for critical discussion. Instruments that should be used in the promotion of education and public awareness could be: websites; workshops and informative meetings; printed materials - leaflets and brochures, newsletters, books, calendars and posters-; media; or, educational materials for schools. Scientific findings should be popularized and communicated to the public. For the purpose of the present management plan and monitoring program, an **official bear website** will be created, providing information on conservation measures, results of monitoring programs, status of the Bear Data Bank, or how to participate in the monitoring program.

The publication of the **annual report of the Bear Working Group** will contribute to promote education and raise public awareness. The implementation of the Bear Emergency Team will have a particular role in building confidence to the authorities responsible for bear management, and also in increasing acceptance and understanding. The aim of its creation is to achieve quick and professional solution to **conflict situations** and to avoid panic and negative attitudes towards bears. In such

situations, providing clear, reliable and up-to-date information to media is very important. Equally important is explaining to the public the causes of the crisis and the measures undertaken to resolve it. In such cases, the Bear Working Group and the Bear Emergency Team would play a key role.

Recommended actions

- Promote education and raise public awareness through the activities of the Bear Working Group.

- Build confidence in the authorities responsible for brown bear management and to increase acceptance of bears and understanding of conservation measures by professional managing of crisis situations by the Bear Emergency Team.

- Facilitate regular information flow between society and interest groups directly involved in bear conservation and management through the Bear Working Group and the bear website.

- Conduct workshops, information meetings and educational campaigns to answer the needs of specific social sectors and to disseminate scientific knowledge on bears' biology and ecology to authorities responsible for brown bear management, involved sectors and the public.

- The administration (namely the General Directorate for Environmental Protection) and the Bear Working Group should support initiatives related to ecological education, especially among inhabitants of the areas of bear presence.

- Promote public involvement in the bear monitoring program.

- Raise public awareness about the needs and problems of captive bears and develop the education potential of bears in captivity.

8. Legal requirements and changes proposed in the law

8.1. Legal provisions

The brown bear is under **strict protection** in Poland since 1952. Currently, the species and its habitat are protected by the international and national laws and agreements listed below that have been ratified by Poland. Detailed information on the legal provisions and documents concerning brown bear management and related aspects is provided in Annex 1.

International legislation

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (**CITES**, 1963)

  Brown bear in Annex II, potentially endangered species.

- **Bern Convention** on the Conservation of European Wildlife and Natural Habitat (1979)

  Brown bear in Annex II, strictly protected species (and its habitat).

- **Convention on Biological Diversity** on the conservation and sustainable use of biological diversity (1992)

- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (**Habitats Directive**, 1992)

  Brown bear in Annex II (priority species), species of Community interest whose conservation requires the designation of special areas of conservation (Natura 2000 sites) and Annex IV, species of Community interest in need of strict protection. Classified as a priority species.

- European Community (EC) Regulation No. 338/97 of 9 December on the protection of species of wild fauna and flora by regulating trade

- **Carpathian Convention** on the protection and sustainable development of the Carpathians (2003)

- Other related European legislation:

-Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage.

- Council Directive 1999/22/EC of 29 March 1999 relating to the keeping of wild animals in zoos.

National legislation

- **Species protection**

  The brown bear in Poland is subject to strict protection, on the basis of the Regulation of the Minister of Environment dated 28 September 2004 on the species of wild animals under protection issued under the Nature Conservation Act of 16 April 2004.

- **Criminal law**

The penal provisions for crimes and offenses against protected species are described in chapter 11 of the Nature Conservation Act of 16 April 2004. The crimes against the environment are also determined in chapter 22 of the Act of June 6, 1997 Criminal Code.

- **Regulation on dangerous species**

The brown bear is included in the list of species affected by the Regulation of the Minister of Environment of 3 August 2011 on animal species dangerous to human life and health.

- **Nature monitoring**

The Nature Conservation Act envisages the need for biodiversity monitoring (Article 112). The Chief Inspectorate of Environmental Protection is responsible for the national monitoring program of species and habitats, with special focus on Natura 2000 sites.

• **Compensation of damages** caused by brown bears

All damages caused by bears are covered by the State Treasury. The procedures for damage inspection and compensation are led by the Regional Directorates for Environmental Protection and, inside national parks, by the park directors (Nature Conservation Act, Civil Code).

• **Research and experiments** on animals

This is regulated, among others, by the Act of 21 January 2005 on experiments on animals and the Regulation of the Minister of Science of 29 July 2005 on individual competences for carrying experiments on animals. The principles for marking animals are regulated by the Resolution No. 8/2006 of the National Ethical Committee for experiments on animals.

• Provisions regulating the **trade and commercial use** (including registration)

These provisions are included in the Nature Conservation Act of 16 April 2004 and refer to alive animals as well as to specimens in collections. The managing authority in this case is the Minister of Environment and the advisory body is the State Council for Nature Conservation.

• Other related provisions:

- Act of 21 August 1997 on animal protection.
- Act of 13 April 2007 on the prevention and remediation of damages to the environment.
- Keeping captive bears: Nature Conservation Act of 16 April 2004, Regulation of the Minister of Environment of 20 December 2004 on the conditions for breeding and keeping certain species of animals in zoos and Regulation of the Minister of Environment of 20 January 2004 on the minimum conditions for the maintenance of species in captivity.

- Regulations for using special weapons during brown bear interventions: Act of 21 May 1999 on firearms and ammunition.

- Veterinary provisions: Act of 11 March 2004 on the protection of animal health and control of animal infectious diseases, Act of 27 April 2001 on waste disposal.

8.2. Proposed changes in legislation

Criminal law

There is a large disparity between the criminal provisions in the Nature Conservation Act and hunting laws. Whereas the poaching of game is a crime, the illegal killing of a protected species (including the brown bear) is only an offense. Additionally, in the case of protected species, it has to be demonstrated that the killing of the animal represents a **"significant" damage or loss for the population**. As a result, in practice it is impossible to legally punish somebody for illegal bear killing. The sanctions for illegal killing of a bear must be at least as stringent as for poaching game animals. There are several solutions; some can be implemented together:

- Increase the penalties in the Nature Conservation Act, for example taking into account of the provisions of Article 127a related to the killing of protected species and destruction of their habitat.

- Introduce *lex specialis* in the Nature Conservation Act, extending the definition of poaching of protected species.

- Extend the definition of poaching to protected species in the hunting law.

- Include in the Nature Conservation Act a clear definition of "significant damage", together with the statement that it applies also in relation to the provisions of the Criminal Code.

Protection of winter denning areas

The winter dens of brown bears have a protection zone covering a radius of 500 m from the den from November 1 to 30 April. Den destruction and disturbance are prohibited. The proposals include:

- Change the obligation to mark the winter den protection zones in the field for the possibility to do so if necessary. Establish clearly who is responsible for marking the zone.

- Add a definition of "disturbance" of animals in the Article 5 of the Nature Conservation Act, adapting them to the requirements of the Habitats Directive.

- Regulate the collection of deer antlers, for example, by introducing a temporal license issued by the Forestry District. This regulation would bring the possibility to prohibit antler picking in areas of known bear winter denning, at least till the end of April. Another alternative might be to extend the power of the head of the Forestry District in the Article 26 paragraph 3 of the Forest Act to restrict access to the selected forest areas also for reasons related to nature conservation. Systematically restricting the access in winter to the identified “secure habitat areas” may be another option.

Supplemental feeding

There are no regulations by law about supplemental feeding of brown bears, an activity becoming very popular and **out of any control**. Due to the inherent risks from bear feeding (see chapter 7.4), in the Article 52 paragraph 1 of the Nature Conservation Act should be added the possibility of introducing the prohibition of supplemental feeding of certain protected species, like the brown bear. After the appropriate modification of Article 56, the General Director of Environmental Protection could give permit for bear feeding. The use of processed food to feed the bears should be absolutely prohibited.

Conditions for keeping bears in captivity

In the Regulations of the Minister of Environment of 20 December 2004 on the conditions for breeding and keeping particular species of animals in the zoo, the minimum conditions of space established for the brown bear are 100 m^2 for a pair plus 40% for each individual added to the cage for outside enclosures, and 5 m^2 for spaces inside buildings. The proposal includes:

- Change the minimum surface for external enclosure to 1000 m^2 for one or two individuals, plus an additional 50% for each new bear in the enclosure. This should apply to all new enclosures to be built. A period for the existing enclosures to adapt to the new regulations should be determined.

- Specify additional requirements to fulfill the biological needs of bears, in particular: (1) provide natural substrate on external enclosures and platforms, and bedding in the internal enclosure; (2) provide a water pool that allows free swimming and cooling.

- Clear statement and regulation that the internal room serves only for short-term keeping (e.g. closing for the night or during veterinary treatment periods) and cannot function as a permanent and exclusive bear keeping area.

9. Validity and revisions of the management plan. Schedule for implementation

The contents of the management plan for the brown bear in Poland should be considered by the national legislation in general, and in particular by the legislation on environmental impact assessment, by sector projects or programs (e.g. agriculture, tourism) and by any other instruments of spatial or land-use planning. The recommendations of the present document should be taken into account by (1) plans for developing the national transport infrastructure, (2) urban spatial plans, (3) conservation plans of the National Parks, (4) management plans of the State Forestry, and (5) management plans for Natura 2000 sites. For a description of these plans and how the recommendations of the present plan should be included, see Annex 1. This management plan, once approved by the Ministry of Environment, will become an officially binding document. **In practical terms, the implementation will be responsibility of the General Directorate of Environmental Protection through the Regional Directorates, Chief Inspectorate of Environmental Protection, the Bear Working Group and the Bear Emergency Team**.

This management plan should come **into force in 2012**. The validity of the brown bear management plan is **indefinite** and **at least every 6 years a deep revision** and update should be conducted, to coincide with the reporting year to the European Commission. The next revision will be due in 2019, unless some specific need will arise before that. Revisions of the plan should be subject to public consultation. The annual reports by the Bear Working Group will inform about the degree of implementation of the plan. The annual report should also include an **Action Plan** (or list of main actions to be taken) for the following year. The present management plan has been conceived as a flexible document that should adapt to the rapid changes going on in the Polish society and natural environment, and that should follow the growing scientific knowledge on bear ecology and conservation.

The main actions that need to be taken **immediately** are:

(1) Legal adoption of the management plan

(2) Legal establishment of the Bear Working Group and Data Bank

(3) Approval of the brown bear monitoring program and standard protocols

The proposed changes in the law should be conducted within a 3-year period. Other actions, like the creation of a Bear Emergency Team, prevention of damages and human conflicts or prevention of bear habituation are to be taken in a continuous manner. The detail schedule of the actions needed is show in Table 8. A list of potential sources of funding for the implementation of the actions recommended in the management plan is provided in Annex 1.

Table 8. Schedule for the implementation of the recommended actions.

2012	2013	2014	2015	2016	2017	2018	2019
Plan into force							Revision of the plan
Integration of the plan in the national legislation, sectorial projects and programs and other instruments of land use and territorial planning							
Proposed changes in the law							
ACTION 1. COORDINATION AND IMPLEMENTATION OF THE MANAGEMENT PLAN							
Establishment of the Bear Working Group						Establishment of the new Bear Working Group	
	Creation and establishment of the Bear Emergency Team						
Fund-raising	Training		Establishment	Periodical trainings			
Creation of the Bear Data Bank & Implementation of standard protocols							
Creation of the Bear Website							
ACTION 2. IMPLEMENTATION OF THE MONITORING PROGRAM							
	Monitoring report to EC						Monitoring report to EC

Baseline monitoring					
	Presence surveys & monitoring *ad hoc*			Genetic monitoring	
ACTION 3. CONSERVATION OF THE BROWN BEAR HABITAT AND ITS CONNECTIVITY					
Management plans for Natura 2000 sites in areas of bear distribution. Plans include measures to diminish fragmentation and set certain conditions for building					
Implementation of urban spatial plans with appropriate environmental impact assessment in the three Carpathian Voivodships					
Restoration of ecological corridors in the critical points					
Improvement of the connectivity between the western and eastern segments					
State Forestry and National Parks try to reduce fragmentation by forest roads and trails and restrict access to the “secure habitat areas” during the bear denning period					
ACTION 4. REDUCTION OF BROWN BEAR MORTALITY AND DISTURBANCE CAUSED BY HUMANS					
Better enforcement of the existing law (e.g. penalty for killing a bear)					
Register all cases of bear mortality according to the Standard Protocols					
Increase the vigilance by national park staff on activities that can disturb bears (winter sports, antler gathering, hunting with dogs)					
ACTION 5. PREVENTION AND REDUCTION OF BROWN BEAR DAMAGES					
Damage prevention program					
Fund-raising Installation of electric fences and other					

preventive measures						
ACTION 6. AVOIDANCE OF BROWN BEAR HABITUATION AND FOOD CONDITIONING						
Regulation of brown bear feeding						
Prevention campaign in Bieszczady (waste management policy, information)						
Vigilance of proper waste management linked to periodical informative campaigns						
ACTION 7. IMPROVEMENT OF THE CONDITIONS OF BEARS IN CAPTIVITY						
Changes in the law concerning minimum conditions to keep bears in captivity						
Building bear sanctuary and new large enclosures, general improvement of conditions						
ACTION 8. IMPROVE COOPERATION AT NATIONAL AND INTERNATIONAL LEVEL						
Creation of a Polish-Slovakian-Ukrainian Committee	Meeting of the transboundary Committee	Meeting of the transboundary Committee	Meeting of the transboundary Committee	Meeting of the transboundary Committee	Meeting of the transboundary Committee	Meeting of the transboundary Committee
Unification of management policies in the border zone with Slovakia (damages, bear culling)						
		International meeting			International meeting	
	Joint monitoring *ad hoc* with Slovakia			Joint genetic monitoring with Slovakia in		

				the management units		
ACTION 9. PROMOTE SCIENTIFIC AND APPLIED RESEARCH						
Availability of the Bear Data Bank for research						
	Research on connectivity between the western and eastern segments					
ACTION 10. PROMOTE EDUCATION AND RAISE PUBLIC AWARENESS						
	Public involvement in the monitoring program					
Permanent update of information through the bear website, organization of workshops, information meetings and educational campaigns						

10. Annex

Annex 1. Status, ecology and management of the brown bear in Poland (“full version” of the brown bear management plan for Poland).

Annex 2. List of participants in the workshops for the preparation of the brown bear management plan conducted in Kraków in 8-9 November 2010, 27-28 January 2011 and 20-22 February 2011.

Annex 3. Program of the I and II workshops devoted to the preparation of the management plan for the brown bear in Poland "Monitoring and solving conflicts".

Annex 4. Program of the I and II workshops devoted to the preparation of the management plan for the brown bear in Poland "Protecting brown bear habitat”.

Annex 5. Program of I International Workshop devoted to the preparation of the management plan for the brown bear and other large carnivores in Poland “Managing transboundary populations of brown bear and other large carnivores in the Carpathians”.

Annex 6. Protocols for brown bear immobilization and sampling.

Annex 7. Protocols for sampling dead brown bears.

Annex 8. Proposed monitoring protocol for the questionnaire surveys.

Annex 9. Network of potential respondents to the questionnaire surveys.