The Republic of Croatia

Brown Bear Management Plan for The Republic of Croatia

Ministry of Agriculture, Forestry and Water Management
Department for Hunting

Ministry of Culture
Department for Nature Protection

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PREFACE

The Brown Bear Management Plan for The Republic of Croatia is the first comprehensive document to systematically offer fundamental guidelines for brown bear management in Croatia. This plan is based on scientific and ecological knowledge, which is placed within the legislative, administrative, cultural, economic and social frameworks that are present in Croatia. It is also based on the accepted and ratified international conventions, plans and recommendations related to brown bear conservation and protection worldwide, in Europe and especially in the Alps-Dinara-Pindus region.

The brown bear in Croatia is a wildlife species which inhabits an ecologically conserved area of more than 10 000 km^2. The area is part of the wider Alps-Dinara-Pindus region, which is home to a strong brown bear population. The development and implementation of the management plan also needs to be coordinated on this greater level.

In concordance with the responsibilities originating from the international conventions, directives, plans and recommendations, the Ministry of Agriculture and Forestry and the Ministry of Environmental Protection and Physical Planning have appointed an expert committee for the elaboration of The Brown Bear Management Plan for Croatia in the year 2002. The eight members of the committee are all distinguished experts and scientists. They were chosen so as to ensure that the different institutions are represented in the committee in a balanced way.

It must be emphasized that activities for brown bear conservation in Croatia started much earlier, as described in Chapters 4.1. and 4.2. Starting in 1997, with a goal of achieving integral management and conservation of bears in Croatia, a series of consultation workshops with different interest groups were held (Lividraga 1997, Gerovo 1999, Gerovo 1999). Besides that, veterinary and forestry researchers, as well as hunters, have studied bears and their biology over the past decades. The product of their research is valuable expert and scientific knowledge and literature on bear biology.

This management plan tries to encompass the current knowledge related to brown bear management; however, it must also promote modern, ecologically-based wildlife management that includes protection and conservation of biological and ecological balance in natural habitats, as well as their sustainable use.

The plan has been envisioned as an active document to be expanded upon as needed. It will provide the basis for changes and improvements to the existing legal provisions regulating hunting, protection of biodiversity and landscape diversity, as well as other sectors. Yearly action plans for bear management and monitoring and reports to the competent authorities will be based on the plan.

In that sense, the plan is to be a fundamental document to which reports on special studies (sociology, economy, biology, ecology, etc.) alongside with Action plans for each year are appended.

The Republic of Croatia is currently experiencing great changes in various domains. These changes can have considerable effects on the brown bear population. The effects are

expected to be mostly negative. Therefore it is important to identify, evaluate and mitigate the negative effects. This management plan will be an axis around which the protection and conservation of bears in Croatia will take place in the upcoming period.

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INTRODUCTION

Geographically, Croatia is both a central and south-eastern European country. Its innermost area is formed by the Dinara Mountain Range. The eastern slopes of the Alps and the Dinara Mountain Range make up a region of hills and mountains which the brown bear has inhabited for thousands of years. This region represents an extensive, biologically and ecologically conserved habitat for the largest of the European large carnivores. The integrity of this habitat is also confirmed by the presence of the two other large carnivores: the wolf and the lynx, as well as numerous other animal species that have disappeared in other parts of Europe.

The brown bear in Croatia is a wildlife species, as well as a game species, which deserves the utmost care and attention and which undeniably has the right to exist. In this respect, the brown bear is one of the most valuable elements of biodiversity, and plays an important role in biodiversity maintenance. When compared to other animal species, the brown bear is at the top of the food web and is directly threatened only by humans and their activities. Since bears and humans inhabit the same areas, it is apparent that there is a need to ensure their coexistence, which is the final goal that the various measures defined in this plan aim to accomplish. Where coexistence is lacking, the natural habitats for bears get destroyed and the bears disappear.

Implementation of the measures for conservation and protection of biological and ecological balance in the natural habitats of bears or, in other words, for enabling the coexistence of bears and humans, has to be developed on the basis of modern ecological knowledge, suitably normatively regulated, and there has to be a general agreement on the key issues among the different interest groups. The measures cannot be applied according to a person's own will or on the basis of individual cases, but must be regulated with an official document. In this case, the document is the Brown Bear Management Plan for Croatia.

The purpose of this management plan is to define a management goal within a framework defined by international and domestic regulations, to define measures to be implemented for conservation of the natural habitats and the bear population, as well as measures aiming towards achieving the coexistence of humans and bears. Besides this, the plan should be transparent to the equivalent plans of neighbouring countries who manage conserved bear populations, as well as to appropriate action plans of the European institutions.

To that extent, the plan encompasses the following basic sections: Part I – The General Overview, Part II – The Situation in Croatia and Part III – Bear Management. Each of these sections is elaborated under different subsections, depending on the issues and measures in question.

Part I – The General Overview

1. THE PURPOSE OF THE PLAN

With all of its biological characteristics, its important place in the human mind, and the considerable amount of international interest for its conservation, the management of large carnivores such as bears is very challenging. With the management plan we expect to bring together different interests such as ecological, aesthetical and economic, as well as care for the safety of people and their properties.

It should also ensure conditions for the long-term survival of the brown bear, the species listed as an endangered species in different international regulations, in a way that preserves its game-species status in Croatia. Careful evaluation of the actions affecting the population size represents the most critical part of this plan. Those actions should ensure the size of the bear population within the social capacity of the habitat. In other words, the density of bears should be one that is acceptable to people. In this way, possible conflicts with people will be minimized, whilst the long-term viability of the population will be ensured. In order to achieve this goal, a series of other actions and measures related to the bears' habitat and human activities in the habitat (e.g. highway construction and so on), the feeding of bears by humans, the prevention of problematic bear occurrences and the scientific monitoring of all changes in the population have to be regulated. The implementation of the plan is, for the most part, a task of the hunting management experts, however, representatives of all other interest groups should also be actively involved in it. Finally, the plan should undergo occasional revision, which should take place more often than is the case for some other management plans. In large carnivore management, and especially in bear management, there are no final and universal solutions. Each change in the number of bears, the areas of their presence or behaviour, requires new decisions. The plan should offer guidelines for the decision-making process, and in the case of new, permanent circumstances, it should be adjusted through revision processes.

Croatian citizens, citizens of neighbouring countries, as well as Europe and the world, expect that Croatia, with its Brown Bear Management Plan, is ensuring the long-term existence of as many bears as possible in its habitats, with as few negative effects as possible.

2. STARTING POINTS FOR THE DEVELOPMENT OF THE PLAN

The key starting points for the development of the management plan are the bear population itself and its sizeable natural habitat (greater than 10 000 km^2), the already-achieved level of understanding among different interests and the society as a whole about the need for conservation and the improvement of coexistence between humans and bears, as well as legal provisions and international agreements and conventions related to brown bear conservation.

Other important starting points are the results of scientific studies, individuals' rich experience in bear management, good expert knowledge, skilled people and suitably organized managers.

3. LEGAL PROVISIONS CONCERNING BEAR MANAGEMENT

3.1. International Legal Provisions

- Convention on Biological Diversity, (Official Gazette of the Republic of Croatia, "Međunarodni ugovori" [International Treaties] – 1/6/96)
- Convention on the conservation of European wildlife and natural habitats (Bern Convention) (Official Gazette of the Republic of Croatia, "Međunarodni ugovori" [International Treaties] – 3/5/00)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Official Gazette of the Republic of Croatia, "Međunarodni ugovori" [International Treaties] Dec. 99)
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitat Directive)
- European Community (EC) Regulation No. 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade

The Republic of Croatia has ratified all of the relevant international treaties concerning nature protection and in so doing has joined the international community in efforts to protect nature globally. One of the fundamental provisions is the Convention on Biological Diversity, which our country ratified in April 1996 (Official Gazette of the Republic of Croatia, "Međunarodni ugovori" [International Treaties] – 1/6/96). The main objectives of this convention are conservation and improving the existing biological diversity and sustainable use of its components.

The Convention on the conservation of European wildlife and natural habitats (Bern Convention) was ratified in Croatia in the year 2000 (Official Gazette of the Republic of Croatia, "Međunarodni ugovori" [International Treaties] – 3/5/00). This convention defines the requisite measures which European countries have to adapt in order to maintain the populations of wild flora and fauna and their habitats, in particular measures for the species listed in the Appendices to the convention. The brown bear (*Ursus arctos*) is listed in Appendix II of the Bern Convention, in which strictly protected fauna species are specified. For these species all forms of deliberate capture, keeping or killing, deliberate disturbance of the individuals and deliberate destruction of their habitats are prohibited. Since the bear population in Croatia is not endangered and does not require strict protection, the Republic of Croatia has, in accordance with Article 9 of the Convention, made an exception so that bears in Croatia are treated as species listed in Appendix III of the Convention. The Large Carnivore Initiative for Europe (LCIE) has, in relation to the Bern Convention, developed the Action Plan for the Conservation of the Brown Bear (*Ursus arctos*) in Europe. The Action Plan offers recommendations for brown bear conservation in Croatia. Based on the aforementioned, the brown bear in Croatia has the status of a species that can be utilized, however, this utilization has to be regulated through legal provisions. In order to ensure the conservation of bear habitats the contracting parties have obliged to include the areas

inhabited by bears in the network of Areas of Special Conservation Interest – ASCI (Emerald Network). In ASCI areas, implementation of the measures for conservation of their natural heritage is obligatory.

The Republic of Croatia is a contracting party in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Official Gazette of the Republic of Croatia, "Međunarodni ugovori" [International Treaties] Dec. 99, and is therefore obliged to control the international trade of endangered species through a system of import and export permits and re-export certificates. The brown bear is listed in Appendix II of the Convention as a potentially endangered species. International trade of Appendix II species has to be strictly controlled. Therefore, the import, export and re-export of these species is possible only with special permits and certificates.

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitat Directive) is one of the basic regulations related to nature protection in the European Union countries. Member countries of the European Union must harmonize their national legal provisions according to this Directive. As a candidate country, Croatia also has that obligation. The brown bear is listed in Annex II of the Directive. The annex includes wild fauna and flora species of Community interest, the conservation of which requires the establishment of Special Areas of Conservation – SAC – within an ecological network, Natura 2000. It is also listed in Annex IV as one of the species of Community interest that need to be strictly protected (capturing, killing and disturbing are prohibited). The bear populations in Sweden and Finland are omitted in both Annexes. According to Article 16 of the Directive, the countries can deviate from the abovementioned provisions under special conditions. The keeping, transport and sale or exchange of specimens of Annex IV species taken in the wild is prohibited, except in the interest of preventing serious damage, in particular to livestock, in the interests of public health and safety, for the purpose of research and education and for the purposes of repopulating and re-introducing these species.

Trade is also prohibited with the European Community (EC) Regulation No. 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade. This act regulates the trade of protected wild fauna and flora species within the European Union and is a legal base for implementation of the CITES convention. The brown bear is listed in Annex A of

the Regulation, which includes threatened, extinct and rare species – trade of which would endanger their survival.

The European Parliament ratified a Resolution on 17 February 1989, in which the European Commission was invited to encourage programmes for bear conservation in Europe and to continue already-existing programmes. The European Parliament Resolution from 22 April 1994 invited the European Commission not to support land use programmes which could have negative impacts on bear populations. Such spatial planning has to be avoided, with the identification of appropriate protected areas and corridors.

In accepting the abovementioned international legal provisions, our country has an obligation to carry out all necessary legal and administrative measures on the national, as well as the international level, in order to ensure the protection of bears and their habitats. A viable population of bears is also a reservoir of genetic material and, as such, is a potential source for the reintroduction of the species in suitable habitats in other European countries in which the species is extinct.

3.2. National legal provisions and documents

The national legal provisions and documents which regulate bear management and conservation are: the Hunting Act, the Rules on Closed Hunting Season, the Rules on Hunting Firearms and Hunting Ammunition, the Rules on Contents and Methods of Development and Approval of Hunting Management Programmes, Programmes for Game Breeding and Programmes for Game Protection, the Rules on Game Warden Service, the Rules on the Expert Service for the Implementation of the Hunting Management Programmes, the Rules on the Breeds and Numbers of Hunting Dogs, the Rules on Hunting Trophies, Hunting Management Programmes and Programmes for Game Breeding, Forests Act, the Law on Nature Protection, the Animal Welfare Act, the Veterinary Service Act, the Rules on Handling of Animal Carcasses and Waste Products of Animal Origin and their Disposal, the National Strategy and Action Plan for the Protection of Biological and Landscape Diversity – NSAP, Recommendations of the Bern Convention for the Bear Conservation Action Plan for Croatia, the Management Plan developing bodies, and public participation in development of the management plan.

The brown bear is listed in the Red List of endangered flora and fauna species of Croatia (2004).

3.2.1. The Hunting Act (Official Gazette, 10/94, 29/99, 76/99, 14/01. 10/94, 29/99, 76/99, 14/01 and 4/02)

The Hunting Act was approved by the Parliament of the Republic of Croatia in 1994. The main difference from the previous Act, which had been in force since 1945, and according to which the state had exclusive hunting rights regardless of land ownership, is that the new Act is based on a leasing system in which hunting rights are related to land ownership. In this way, the Hunting Act was brought in line with those of other European countries.

The Hunting Act is in accord with the legal system of the Republic of Croatia and embraces the main guidelines approved by the International Council for Game and Wildlife Conservation (CIC), especially its sections on nature protection, conservation of biological and ecological balance in natural game habitats, conservation of game and other wildlife species, as well as guidelines on the conservation of game and other wildlife species and their habitats from the ratified international conventions.

According to the Hunting Act, the brown bear is a game species in Croatia. The Act regulates the conservation of the species. The following Articles are related to conservation and care of the listed game, including the brown bear:

- Article 4. Game is of special interest for the Republic of Croatia and therefore enjoys its particular protection;
- Article 11. Hunting unit leaseholders are obliged to enable scientific and academic institutions to carry out their work in their hunting units;
- Article 48. Game management includes all measures and activities regulated with hunting management programmes as well as the care for other species and their habitats;
- Article 50.
  - a closed hunting season is prescribed for each game species;
  - hunting of a game species may be temporarily prohibited;
  - size, sex ratio and age structure of a game population must be maintained,
  - conditions for breeding and raising of offspring must be ensured,
  - preventative, diagnostic, therapeutic and sanitary measures must be ensured,
  - adequate quantities of food and drinking water must be ensured.
- Article 51. Hunting of mammal game females is prohibited in late gravidity and during the nursing of young offspring.
- Article 63. It is prohibited to harvest game by means that could cause mass mortality or at times when game is threatened with floods, snowfall, frost or fire; it is prohibited to use traps or snares (except for scientific purposes); running over with vehicles is prohibited; as well as the use of crossbows and bows, and narcotics;
- Article 65. Game can only be harvested with hunting weapons and suitable ammunition, large game can only be hunted using bullets fired from a weapon with a rifled barrel, hunting using automatic weapons is prohibited;
- Article 67. Only a person that has successfully attended a hunting course and examinations can hunt.

- Article 73. Game animals and their parts can be kept, transported or traded only with a certificate containing information about its origin.
- Articles 95 – 102. criminal matters and sanctions.

The Hunting Act gives principal guidelines, which are, for each of the procedures, described in detail in the implementing regulations – rules. The Rules are approved by the Minister of Agriculture, Forestry and Water Management in a manner regulated by the Hunting Act and the State Administration Act.

In order to enable implementation of the Bern Convention, this plan, as well as the Bear Management Action Plan for the year 2004, the provisions amending and supplementing the Hunting Act and its implementing regulations are in the process of being prepared.

The following are the implementing regulations of the Hunting Act.

3.2.1.1. Rules on the Closed Hunting Season (Official Gazette, 123/99 and 65/01)

Bears cannot be hunted in the period from 16 May until 30 September.

3.2.1.2. Rules on Hunting Firearms and Hunting Ammunition (Official Gazette, 123/99)

Bears can only be hunted with hunting ammunition that has a kinetic energy greater than 3,500 joule per 100m, and the bullet must be heavier than 11.50 grams. The maximum allowed shooting distance is 100 metres.

3.2.1.3. Rules on Contents and Methods of Development and Approval of Hunting Management Programmes, Programmes for Game Breeding and Programmes for Bear Protection (Official Gazette, 53/95)

3.2.1.4. Rules on the Game Warden Service (Official Gazette, 48/96 and 87/01)

3.2.1.5. Rules on the Expert Service for the Implementation of Hunting Management Programmes (Official Gazette, 48/96 and 87/01)

3.2.1.6. Rules on Breeds and Numbers of Hunting Dogs (Official Gazette, 87/02)

3.2.1.7. Rules on Hunting Trophies (Official Gazette, 123/99)

3.2.1.8. Hunting Management Programmes and Programmes for Game Protection

Provisions of these regulations are presented in Chapter 4.7, Current Management.

3.2.2. Forests Act (Official Gazette, 52/90, 9/91, 61/91, 26/93, 76/93, 29/94, 76/99, 8/00 and 13/02)

The Forests Act is only partly related to wildlife management. The most significant part is the provision stating that forest wildlife should be managed in numbers which do not jeopardize forest management. The basic guidelines on the acceptable numbers of wildlife per measure of a hunting unit area are regulated.

Other important provisions for bear management and conservation are the natural restoration of forest elements, the sustainable use of forests, and the maintenance of natural ratios of tree species. It is prohibited, except in a few specific situations, to light fires or construct objects in forests. Timber harvesting times and methods are regulated, as well as mining, waste disposal, use of forest roads and so on.

3.2.3. Law on Nature Protection (Official Gazette, 162/03)

The Law on nature protection orders the elaboration of implementing regulations which will define measures for the protection of wild species. It encompasses provisions of the international treaties signed or ratified by Croatia.

The Law, following the Bern Convention provisions, defines two categories of protected species, namely, strictly protected species and protected species.

The category of strictly protected species includes wild species which are in danger of extinction in the Republic of Croatia. Exploitation of these species is prohibited or strictly controlled. Protected species are those which enjoy legal protection with the possibility of controlled exploitation of the population as regulated by the legal provisions. During the adoption of the Bern Convention, the Republic of Croatia asked for an exception on the status of the brown bear as a strictly protected species. The exception was granted, so the brown bear population in Croatia has the status of protected species as well as that of a game species.

The Law on Nature Protection also includes nature protection provisions related to the exploitation of natural resources. Namely, Article 14 of the Law requires that physical planning documents and natural resources management plans include measures and conditions which will ensure the conservation of biological and landscape diversity. The Law also defines nature protection measures. Prior to development of the management plans, proponents are obliged to acquire guidelines for nature protection from the competent agency, that is, the Nature Protection Department. The guidelines are based on expert valuations by the State Institute for Nature Protection.

There are also provisions related directly to the protection of wild fauna species' habitats, including the migration corridors. Specifically, as regulated by the Bern Convention (Emerald Network) and the EU Habitat Directive (NATURA 2000), an ecological network with a system of ecologically important areas and corridors is being defined. Ecologically important areas are, among other things, also the habitats of species which are endangered globally, on the European or on the national level, the animal migration corridor areas and areas which can assist with the

genetic connectedness of the populations (ecological corridors). It is important to note that any intervention in these areas has to undergo an environmental impact assessment. The competent Ministry acts upon the proposal of the State Institute for Nature Protection.

Finally, it should be mentioned that the Institute for Nature Protection is currently in the process of implementing the LIFE project for identification of the national ecological network. Completion of this process will enable the full application of all the abovementioned provisions. The project is due to be completed in summer of 2005.

3.2.4. Animal Welfare Act (Official Gazette, 19/99)

The Ministry of Agriculture, Forestry and Water Management is the competent body for the implementation of this Act. This Act regulates animal welfare related to the keeping of animals, nutrition and general conduct with the animals. It also regulates the act of killing an animal, as well as the protection of wild animals. The taking of wild animals from nature and the killing of wild animals in a way that causes lasting suffering is prohibited, apart from when it is extremely necessary for scientific purposes or in order to help the population of wild animals. Article 25 prohibits the use of bears in shows, particularly constrained animals (for example, dancing bears).

3.2.5. Veterinary Service Act (Official Gazette, 70/97 and 105/01)

This Act regulates, among others, issues regarding animal health, public health, zoonoses, the inspection of products of animal origin and veterinary protection of the environment.

In the Veterinary Service Act the word "animal" also includes wild fauna.

The bear, like other animal species, is subject to infectious diseases. Measures for the detection and prevention of the infectious diseases, as regulated by this Act, are defined each year for the upcoming year according to the epidemiological situation, by the Ministry of Agriculture, Forestry and Water Management. In addition to the measures, with the aim of detecting and preventing infectious diseases, all animals and animal products must be inspected during the production and during tradings. Each harvested bear is therefore checked for rabies and trichinellosis.

Game meat processing facilities and other animal product processing facilities, as well as facilities for the storage and trade of such products, must be in accordance with the veterinary service and public health regulations.

3.2.5.1. Rules on the Handling and Disposal of Animal Carcasses and Waste Products of Animal Origin (Official Gazette, 24/03)

These Rules regulate the handling of animal carcasses and of waste products of animal origin, as well as the veterinary and sanitary conditions of the facilities for receiving, storing and

disposing of carcasses and waste products. There are also provisions on the sanitary conditions of the vehicles that collect and transport animal carcasses and waste products of animal origin.

Article 16 of the Rules permits the feeding of game in hunting units with slaughter by-products, only with special permission by the Ministry of Agriculture, Forestry and Water Management.

3.2.6. National Strategy and Action Plan for the Protection of Biological and Landscape Diversity – NSAP (Official Gazette 81/99)

The Croatian parliament approved the National Strategy and Action Plan for the Protection of Biological and Landscape Diversity – NSAP in June 1999. Bear protection and the development of a national bear management plan are one of the action plans in the Strategy.

3.2.7. Recommendations of the Bern Convention for the Brown Bear Conservation Action Plan in Croatia

The Large Carnivore Initiative for Europe was founded in 1995 with the goal of maintaining and restoring, in co-existence with people, viable populations of large carnivores (i.e. brown bears, wolves, wolverines, Eurasian and Iberian lynxes) as an integral part of ecosystems and landscapes across Europe. This group of experts has prepared Action plans for the conservation of large carnivores, which were accepted by the Council of Europe at a Bern Convention meeting in November 2000. One of the prepared action plans is the Action plan for the conservation of the brown bear in Europe. In Recommendation No. 74 (2000) the Council of Europe hastens governments to include recommendations from the Action plan for the conservation of the brown bear in Europe in the national management plans.

Recommendations for Croatia:

4.1.1. Adoption of Action Plan by Bern Convention.

4.1.2. Establishment of national brown bear management groups and management plans (countries sharing populations produce management plans co-operatively).

4.1.4. Protection of brown bear by law and game species only where viability is proven and hunting is used to reach population goals identified by management plans.

4.1.5. Intensification of law enforcement and appropriate penalties in populations where poaching is a limiting factor.

4.3.1. Classification of areas within present and possible bear range according to their suitability and importance as habitat for bear management.

4.3.2. Identification and maintenance or recreation of linkage zones in fragmented populations.

4.3.3. Evaluation of impact of existing and planned infrastructure on bear habitat and mitigation of negative impact.

4.3.4. Control or prohibition of human activities detrimental in bear core areas and linkage zones.

4.4.1. Establishment of compensation systems.

4.4.2. Link of compensation system to individual farmer's use of preventative measures.

4.4.3. Inaccessibility of garbage dumps and human waste for brown bears.

4.4.4. Abandon artificial feeding that may create food- or human-habituated bears.

4.5.1. Minimise the creation of problem bears through Actions 4.4.1, 4.4.5, and 4.7.1.

4.5.2. Removal of problem bears in viable populations if preventative efforts have failed.

4.5.3. Evaluation of costs and benefits before removing problem bears in threatened populations.

4.6.1. Identification and involvement of public opinion leaders and stakeholders in brown bear management.

4.6.2. Establishment of permanent consultation protocol with locals about their needs and necessary management actions.

4.7.1. Initiate information campaigns designed for different target groups.

4.8.1. Co-ordinated scientific research on brown bears in Europe.

4.8.2. Co-ordination of gathering necessary data to monitor management and biological conditions of brown bears in European countries.

3.2.8. Management Plan Developing Bodies

An expert committee of eight members has developed the Brown Bear Management Plan. Four members of the committee were appointed by the Ministry of Agriculture and Forestry and the other four were appointed by the Ministry of Environmental Protection and Physical Planning. In the process of developing the plan the expert committee cooperated with other, external experts. The draft version of the plan was reviewed by the two ministries and after final negotiations the plan was accepted by both the Ministry of Agriculture, Forestry and Water Management and the Ministry of Culture (Nature Protection Department).

3.2.9. Public Participation

The competent ministries – the Ministry of Agriculture, Forestry and Water Management and the Ministry of Culture are aware of the importance of public participation in the development of management plans, and especially of the effects such an approach can cause to the implementation of planned activities.

Representatives of the public were included in the development of this plan through workshops. One workshop was held at the beginning of the process (when the main principles were agreed upon) and another one at the end of the process (when the draft version was reviewed).

The expert committee has taken into consideration the results of a human dimensions study on public attitudes towards bears and bear management in Croatia, which was conducted in

2003 (Majić, 2003). Some of those results can be found in the "Bears and Humans" chapter of this plan.

Part II – The Situation in Croatia

4. BASIC INFORMATION FOR DEVELOPMENT AND UNDERSTANDING OF THE PLAN

4.1. Overview of the History

At the Pleistocene archaeological site "Medvjeđa špilja" [Bear Cave] on the island of Lošinj, fossil remains of a brown bear were found together with fossil remains of a cave bear (*Ursus spelaeus*). Bears lived there until approximately 10 000 years ago, that is, until the end of the last Ice Age. Fossil findings of both bear species are numerous and scattered over the entire territory of the Republic of Croatia.

Over time, with the increase in human population, the size of the bear habitat in Croatia has become smaller. Bears were treated as competitors in hunting, later they were considered to be pests and dangerous beasts. Today, however, bears are a valued game species. Moreover, they are almost at the maximum level which Croatia's habitat conditions can support.

The oldest written evidence that bears have existed on a geographically larger area than today's dates back to the end of the 18th and the beginning of the 19th century. At that time the bear had a reputation as "a hideous enemy of our useful wildlife and livestock and a menace to people". Bears were killed "by chance" or "out of necessity" by foresters and farmers willing to enjoy "both glory and bounty". Since there was no monitoring of bear numbers, it is difficult to talk of the size of the population at that time. However, it is known that the regions of Gorski Kotar and Lika were considered "par excellence" for bear hunting in the 19th and at the beginning of the 20th century. According to data from the Chamber of Traders and Handicrafts Workers' reports, in the period from 1887 to 1889 in Croatia and Slavonia 50 bears were killed. All of the bears were killed in two counties: the Modruš-Rijeka county and the Lika-Krbava county. However, these numbers could easily be doubled, says an article from the same time, since many of the killed bears were not officially registered.

Several different methods were used for the hunting and killing of bears. For the most part it was hunting by waiting (in front of a den), tracking, leg-hold traps, snares and poisoning with poisoned baits. At the beginning of the 20th century, the status of bears did not change. Bears were still pests and unprotected beasts for whose heads bounties were paid. According to the proclamation of the government of Croatia, Slavonia and Dalmatia on 27 May 1915, for each adult bear a bounty of 20 crowns was paid from the country's budget. The bounty for a killed cub was 4 crowns. While there was a closed season for "useful game" (red deer, roe deer and others), "black" wildlife, wolves, bears and other predators could be killed year round.

Since the 1950s, bears in Croatia have been hunted almost exclusively by waiting on high shooting stands near a bait. The main reason for this was the Hunting Act of 1947, which improved the status of bears. After World War II enforcement of the laws was tightened while, on the other hand, many old bear hunters died during the war without passing on their skills to the younger generations (Z. Car 1952). At that time, the demand for bear hunting increased, especially with regard to foreign hunter/tourists. Starting with the establishment of forest management units in 1960, foreign hunters have become their constant clients.

In mountainous Croatia, even before 1947 and the Hunting Act, there were areas in which bears enjoyed some level of protection, that is to say that hunting was controlled and limited. The spacious forests of Gorski Kotar and Kapela have mostly belonged to the state as a public treasure, or to wealthy municipalities and some wealthy families. In those forests the hunting of bears was, at least in principle, prohibited. For example, in the large hunting unit (30 700 acres) in the Čabar estate, which was owned by the wealthy Ghyczy family, the hunting of bears was prohibited during the last decade of the 19th century. Similar rules were practiced in adjacent estates, owned by the Schonburg, Auersperg and Windischgratz families in neighbouring Kranjska, as well as in the Grobnik estate (Thurn Taxisa). The state forest management units also had similar regulations, but in 1902 it was noted that foresters still freely hunted the bears.

With the aim of stopping the uncontrolled hunting of bears, the population of which was deemed to be dying out at the end of the 1920s, legal provisions related to the control of bear hunting were introduced at the national level. The hunting of bears was allowed only with a permit from the national authorities. The Croatian Hunting Act at the end of 1949 included bears in the list of Game Species, group A. Mammal Game. The implementing regulation, named the Rules on Protected and Unprotected Game and Closed Seasons of 7 November 1949, included bears amongst the game species, protected with a closed hunting season from 1 January to 31 October. Article IV of the regulation defined the methods for bear hunting: bears can be shot only with bullets and only with a special permit from the (then) Ministry of Forestry.

At the time, the Department for Nature Protection considered listing bears among the endangered species, in order to better conserve the population. Special reserves were created (Velebit, Velika Kapela, Mala Kapela and Risnjak and the Snježnik Mountains) and the poisoning of wolves and foxes was banned during the periods when bears came out of their dens. In the 15-year period from 1946 to 1960, most of the bear mortality was due to poisoned baits (meant for decreasing the numbers of wolves). During that period 21 (57%) bears were poisoned, out of a total recorded mortality of 37. On average, two to three poisoned bears were found in state forests each spring during those years.

A positive development for the better conservation of bears in Croatia was the formation of forest management units in 1960, as they gained competency over bear management. Active conservation measures such as the prevention of illegal killing of bears, selective use of poisoned baits for decreasing the numbers of wolves and foxes (in 1973 poisoning was completely banned) and additional feeding of bears, soon gave the first positive outcomes.

In 1960 in the hunting units of the Delnice Forest Management Unit, there were approximately 30 bears. In 1970 the number of bears in just one of the Delnice hunting units (52

300 hectares) was 55 individuals. The estimate was based on counting bears at feeding sites from the high stands, and by counting females with their cubs during the springtime. Ten years later the number of bears in the same hunting units had doubled. Parallel to the increase in bear numbers was an increase in bear harvesting. In the period from 1960 to 1970, when hunting tourism had just begun, 26 bears were shot in the hunting units of the Delnice Forest Management Unit. In just nine years (1970-1979) after this period, 68% to 72% of the aforementioned twenty-year harvest was documented.

Bears in Croatia in the 19th century inhabited more or less the same areas until the 1950s. In the second half of the 19th century, bears could be found well beyond their current distribution. Around 1860, in the time of Vojna Krajina, one bear was shot in the forested area called Miletive in Dvor na Uni administrative unit, which was under the competence of the Rujevac Forestry Office. In the same area, between two villages – Majdan and Komora – sightings of bear tracks in snow were documented during the winter of 1946/47. Official data about the last bear that was killed far outside its current distribution in Croatia, was found in the Forestry Chronicles of the Karlovac Forestry Office. It was recorded that a bear was shot in 1895, in the Okićki Lug forest, which was owned by the Rauch family. The site is close to today's ornithological reserve, Crna Mlaka.

In the second half of the 20th century the bears in the mountainous regions of Croatia enjoyed another act of care – the size and distribution of the population were systematically monitored. The largest densities of bears were found in Velebit, Velika Kapela, Mala Kapela, Lička Plješivica and in Gorski Kotar. Similar to today's situation, bears were occasionally present in Lika's plains and in Resnik. Already back then, there were no conflicts with farmers and livestock breeders.

With the termination of the forest management units and the formation of a public corporation "Hrvatske šume" [Croatian Forests] with the local forestry offices (1991) and especially with the new Hunting Act (1994), the number of hunting unit leaseholders and bear managers has increased manyfold. Since the commercial hunting of bears was very profitable, the up-to-then stable yearly quota of approximately 40 bears was considerably enlarged.

Based on an evaluation of the bears' status in the past, the trends of the estimated numbers, as well as harvests and the many other studies that were carried out, it is possible to conclude that the legal hunting of bears has not threatened our bear population. Possible threats in the future could come from changes in bears' habitat and from increased appetites for the hunting of bears. The fact remains that the current method of bear management in Croatia is not satisfactory, since it is not well coordinated and in some mountainous counties there is a lack of control over bear management. This Plan proposes appropriate solutions to the threats identified.

4.2. Biology and Ecology

4.2.1. Classification and Origin

The bear living in Croatia is a mammal from the order of carnivores (Carnivora), bear family (Ursidae), genus bear (Ursus) and brown bear species (*Ursus arctos*).

Today, there are eight species of bear family present in the world. These are: the brown bear (*U. arctos*) in Eurasia and North America, the white or polar bear (*U. maritimus*) around the Arctic, the American black bear (*U. americanus*) in North America, the Asian black bear (*U. thibetanus*) in Asia, the sun bear (*Helarctos malayanus*) in Southeast Asia, the spectacled bear (*Tremarctos ornatus*) in South America, the sloth bear (*Melursus ursinus*) in Asia the and giant panda (*Ailuropoda melanoleuca*), also in Asia. They have all evolved from a common predatory ancestor, Miacid, approximately 25 million years ago.

As recently as fifty years ago, different authors described the several species and the 70 to 150 subspecies of brown bears. Recent biological findings, supported by genetic research, have shown them to be just ecological variants of the same species. Thus, the North American grizzly is of the same species as the Eurasian brown bear. Depending on the population of their origin, there can be significant differences between the bears. The bear has, to a greater extent than most species, an immense capacity to adapt to its habitat conditions, through its size and external appearance. This is how in Alaska and the Kamchatka Peninsula, during the long winters and with a protein-rich diet of salmon (which they catch in the rapids of shallow rivers during their spawning migration), some adult males can attain weights of up to 1000 kg. Contrary to that, the brown bears from the southern parts of Europe (e.g. Italy, Spain) weigh in at almost 10 times less. They all, however, belong to the same species as the bears in Croatia.

4.2.2. Distribution, numbers and status

The brown bear used to inhabit the entire area of Eurasia and North America. In Europe, the only places where it was never present are Iceland and the Mediterranean islands Corsica, Sardinia and Cyprus. Today the bear is practically extinct in Western Europe. The remaining populations are small, separated and undergoing extinction (figure 2). The largest of those are in Cantabria in Spain, numbering 70 to 80 bears, separated into two groups, and in the Apennines in

Italy, where 40 to 50 bears live in and around the Abruzzo national park. Very small groups of bears still survive in the Italian Alps (Trento), where 3 or 4 bears remain, and in the western Pyrenees, also with 3 to 4 remaining bears. The last bears in the central Pyrenees became extinct during the 1980s; however, the species was reintroduced in 1996 and 1997 with three bears from Slovenia. A similar reintroduction was carried out in Austria, where three bears from Croatia and Slovenia were added to the last remaining bear there from 1989 until 1993. Today, approximately 25 bears live in Austria. Another 10 bears from Slovenia were added between 1999 and 2002 to the Trento area, and several bears from Croatia are planned for translocation to the western Pyrenees over the next few years.

The only stable population, numbering approximately 1000 bears, lives in the north-west of Europe, in Scandinavia. In Central and Eastern Europe, excluding Russia, only two significant populations survived the end of the previous century. Today it is estimated that approximately 8100 bears live in the Carpathians, and about 2800 more in the Dinaric mountains (table 1).

The bears living in Croatia are part of the Dinaric population, the second largest population in Europe. The bears in Croatia, together with those in neighbouring Slovenia, are a western-most, genetically perfectly related stable population, and represent the last available source for the salvation of bears in Western Europe. Genetic studies comparing base pairs of the same genes between bears from different populations provide, on the basis of different numbers of base pairs, a tree of their genetic relatedness. Thus the bears from Croatia, same as those from Slovenia and Bosnia and Herzegovina, are genetically identical to the remaining bears from the Alps, and differ insignificantly from the bears from the Pyrenees. The bears from the Romanian Carpathians, Russia and Northern Scandinavia, on the other hand, differ significantly and as such are not suitable for reintroduction in place of the extinct populations in Western Europe. All this puts the brown bear at the top of Croatia's most valuable natural heritages.

The limited size of the available habitat and the large area every bear requires for living inhibit any significant further population growth, causing the bear to attain, in the biological sense, the status of a rare species.

4.2.3. Description

Bears are the largest land carnivores. In Croatia, the average weight of adult females is 100 kg and males 150 kg, however some individuals can attain weights of more than 300 kg. In the course of a year the weight of the same adult individual can vary by more than one third: it is largest before denning in the late autumn, and lowest in the beginning of spring or at the end of the mating season.

The body is covered with long guard hair and thick ground hair. The ground hair is much thicker during the winter than during the summer. The hair colour is mostly brown, and is often darker or even black over the back. However, the tips of the longer hair can be light grey. Some individuals are evenly brown, with a colour similar to chocolate. Considering the range of pelt colouring of brown bears, with the brown colour being predominant, the use of the name "smeđi medvjed" (brown bear) is advocated for this species. This species is known around the world as

"brown bear", where one word of a two-word name is the adjective that denotes the brown colour in the respective language: English **brown** bear, Italian orso **bruno**, French l'ours **brun**, German **Braun**bär, Slovenian **rjavi** medved, Serbian **mrki** medved.

Similarly to humans, bears touch the ground with the entire surface of their feet while walking. This way they leave tracks that are unlike the tracks of any other species living in our habitats. The fingers are tipped with claws, which are particularly long (approximately 5 to 6 cm) and strong on the forefeet. A bear uses them to dig at soil, rotten tree-stumps and anthills, turn rocks, and to kill and tear apart prey. Unlike cats, a bear cannot retract its claws into paws.

The bear's teeth have all the characteristics of carnivore teeth, with characteristic incisors, canines and carnassials (figures 7 and 8). The tooth formula is I 3/3, C 1/1, P 4/4, M 2/3, which adds up to 42 teeth. However, in most individuals some and in certain individuals all of the first three upper and lower premolars are missing, with the ones that do remain being small and serving no function in chewing. The chewing surfaces of molars are somewhat flatter than those of other carnivores, which is an adaptation to the grinding of plant foods. The digestive tract is short and simple, similar to that of other carnivores, with a simple stomach, long small intestine, short cecum and short large intestine.

Scats vary a lot in shape, consistence and colour, depending on the food eaten. Still, they can be easily distinguished from scats of other animal species by their size and often aromatic smell. Sometimes, a soft scat of a wild boar can look similar to a bear scat; however the boar scat does not contain bits of undigested food and lacks the recognizable smell.

4.2.4. Diet

Although their physical appearance is that of a true carnivore, bears satisfy approximately 95% of their dietary needs with plant foods. The animal protein they do consume originates mainly from invertebrates and carcasses of larger animals. The plant foods in spring and summer are mostly green plants and grasses, which are supplemented in the summer with soft fruits, and in the autumn with beechnuts – which serves as the main food for the accumulation of winter stores of subcutaneous fat. Because of the short and simple digestive tract, a significant part of the consumed plant food passes through it badly digested or not digested at all. This forces the bear to consume as much food as it can. On the other hand, because of this incomplete decomposition during digestion, the bear aids the spreading of plant species, the seeds of which it can carry over large distances.

The plant foods it finds in the forest during spring are wild garlic (*Allium ursinum* L.) and cuckoo pint (*Arum maculatum* L.). In forest meadows it feeds on grasses (*Graminae* sp.), clover (*Trifolium* sp.) and docks (*Rumex* sp.).

During the summer it most often feeds on wild angelica (*Angelica silvestris* L.), *Aposeris foetida* L. and strawberries (*Fragaria sp.*), and in late summer on raspberries (*Rubus idaeus* L.), blackberry (*R. fructicosus* L.), common buckthorn (*Rhamnus cathartica* L.) and blueberries (*Vaccinium myrtillus* L.). In the autumn, the beechnuts (*Fagus syilvatica* L.) are certainly the most important food. At that time it also feeds on crab apples (*Malus sylvestris* Mill.) and the common pear (*Pyrus communis* L.). It also likes to eat hazelnuts (*Corylus uvellana* L.), fruits of the European mountain ash (*Sorbus aucuparia* L.), chestnuts (*Castanea sativa* Mill.), cornelian cherry (*Cornus mas* L.) and acorns of various species of oaks (*Quercus sp.*). In search of nutritious fruits and nuts a bear can often cover great distances, even leaving its homerange.

In fields it feeds on all species of wheat, particularly oats. It also likes to pay a visit to cornfields, especially when the corn is still young. It visits orchards and vineyards, where it eats plums, apples, pears, peaches, cherries, grapes and other fruits. It loves to eat forest honey and bee larvae, so it breaks into beehives. Doing this it causes agricultural damage.

Its most common food of animal origin are carcasses of animals it finds in the forest. It feeds on invertebrates, especially larvae of ants and other insects, and young wild animals. From domestic animals it most often attacks sheep, and occasionally cows, donkeys and horses. From game animals it attacks only young, wounded and sick animals that it is able to catch.

4.2.5. Life cycle

Bears mate from the end of May until the middle of July. The males cover great distances at that time, and fight among themselves if they come close to the same female. Every male tries to fertilize several females. A female can also copulate with several males during the same mating season, so it can happen that cubs from the same litter originate from different fathers. The embryo in the uterus has delayed implantation, with the greatest part of its development taking place during the last three months of gestation, which is altogether seven months long. The cubs are born when no other animal species has litters, in the middle of winter during denning.

A bear spends the winter in a specifically selected and prepared den without taking any food or liquid. In our parts most dens are located in small hollows in rocks, which the bear adapts to its needs by digging. Only around 10% of dens are located between roots of large trees, and just as many out in the open or beneath the crowns of coniferous trees. Inside a den, a bear prepares a comfortable bed using dry grass, leaves or twigs. Still, some individuals remain active through the whole winter. If a bear is disturbed and chased out of a den, it has a shortage of body energy and has a difficult time to survive until spring unless it has a thick layer of subcutaneous fat. The young two-year-old bears are usually badly prepared for the winter, when they have to survive winter by themselves for the first time without their mother. This is also caused by the climate in Croatia, where there are often warmer periods during the winter, or the snow cover, at least in part of the habitat, is not permanent. It is still not clear if and how additional feeding at feeding sites affects the winter activity of bears.

The longest is the winter sleep of gravid females, who usually in the first half of January give birth to 1 to 4 cubs weighing approximately 350g. They are born blind and hairless. Their lives depend on direct contact with the body of their mother, who keeps them warm and feeds them with concentrated milk. Bear milk has around 22% fat and 12% protein, and can be compared only to the milk of seals. The gravest danger to the newborn bears is inside the den in the depths of winter. If the mother is disturbed and forced to abandon the den, the cubs inevitably die since they are not able to follow her. Attempts by mothers to carry at least one cub in their teeth have been recorded in such situations; however, since they cannot carry the cub very far in this manner nor prepare a new den in the middle of winter, there are no chances for its survival. It is known that almost every winter a certain number of bear litters suffer because a den is disturbed. We thus know that during the winter of 1987/88, just in the Gorski Kotar region, there were at least ten bear cubs abandoned without their mother's care. Fed by the nutritious mother's milk, by the beginning of April the bear cubs are big enough to leave the den and follow their mother in search of food. They stay with their mother their entire first year of life and through the next winter in the den, and separate from her at the age of one and a half years, when during May and June their mother mates again. Sometimes after mating a mother would permit the cubs of the previous year to follow her until autumn, when she finally retires to a private den where she gives birth to a new litter. Bears that live in the more northern parts of our planet stay with their mothers for 2.5 or even 3.5 years, which makes the number of births per female in these places significantly lower.

Our bears reach sexual maturity at the age of 3 to 4 years, and can survive in nature until the age of 10 to 20 years. The average age in our population, managed by hunting, is around 5 years.

4.2.6. Habitat.

For all its biological needs the brown bear has distinct requirements for different habitat qualities. Sometimes the bears also lived in lowland forests, floodplains and natural meadows. With the spread of the human species they were pushed into areas that were the least suitable for human habitation, and can only be found today in mountainous, forested areas. In lowlands they are found only in taigas in the far north. For a habitat to satisfy the requirements of a bear it must consist of different forest types, with the crucial role being that of the deciduous trees that bear large seeds (i.e. beech, chestnut, oak). The presence of thickets and meadows is also important for shelter and pasture. It is particularly important that the bears have the option to move in all directions, including zones of different elevation above sea level. Peace and quiet in the habitat is of extreme importance during the winter because of the newborn bear cubs in the dens.

A bear searches for food every night, usually in areas of lower elevation and with more open space (which means closer to humans) and retreats to quiet and densely vegetated areas during the day, where it makes a so-called "day bed". The average daily movement of a bear is 1.6 km, while the maximum is over 10 km. Furthermore, with regard to the season, a bear needs lower areas with earlier vegetation and protein-rich food during the spring. During the mating season (May – June) the males move over large areas in search of females on heat. In autumn, bears require access to mature forests with large quantities of nutritious nuts (e.g. beechnuts, chestnuts, acorns). In winter they retreat to inaccessible, quiet areas to den and for females also to give birth. If an obstacle prevents bears from accessing any critical part of the habitat or if part of habitat is lost to bears for other reasons, significant disturbances in their life cycle can occur: females will remain unfertilized, cubs will perish in unsuitable dens or because they are underfed,

the animals will be insufficiently prepared for winter, general mortality will increase and commercial damage will rise since the bears will look for unnatural sources of food to survive. It is considered that during its life a bear in Croatian habitats uses an area of approximately 250 km2.

4.3. Findings of scientific research in Croatia

The modern methods of wildlife research, and thus also the bear, were discovered and implemented during the 1960s (through use of radiotelemetry) in the United States of America. The first radiotelemetric study of bears in Europe took place during the 1970s in Northern Italy (Trento), where two animals were fitted with radio collars. Our project in Croatia was started in 1981 and was the second in Europe. Here we present a summary of some of the results.

The bears were captured using a leg snare made of steel cable and sprung by a step-on spring. They were baited with slaughterhouse remains or animal carcasses. The captured bears were immobilized with ketamine and xylazine hydrochloride using a dart gun or a blow-pipe. They were marked with ear tags and a radio collar. A rudimentary first premolar was extracted for age determination. The locations of radio-marked bears were determined through triangulation from the ground or from an airplane. The size of the area through which a bear moved was calculated using the minimal convex polygon method.

Altogether 4256 trapping nights resulted in 34 successful captures of bears, three of which were re-captures, and five of the captured bears were not equipped with radio transmitters. All in all, 26 bears were marked and tracked: 14 in Plitvice and 12 in Risnjak. Only six out of the 26 tracked bears were females, one out of fourteen in Plitvice and five out of twelve in Risnjak. Fifteen bears were adults and eleven subadults, with the average age at the time of capture being 4.7 years (range 1 – 13 years). There was no significant age difference between the sexes. In five cases we tracked a family group of bears. Two bear cubs were yearlings accompanied by their mothers and brothers. One female gave birth to at least one, and another to three cubs during the time when they were tracked. One female had two cubs following her at the time of capture. One motherless six-month-old cub was also marked, and it survived on its own for at least 15 months, as long as it was tracked. The average weight of adult females was 103 kg, and of males 153 kg.

The locations of the marked bears were determined on 517 different occasions, with 487 of those on different days. The females were tracked on average for 712 days, and the males for 250 days. Each of the six females was tracked for more than one year (range: 561 – 914 days), while only two out of 23 collars placed on males (including three recaptures) lasted more than 1 year. Fourteen collars were taken off by the bears themselves, five transmitters stopped functioning and two bears were killed. The location of each female was determined 39 times on average (range: 6 – 130), and of each male 13 times (range 1 – 86). Only 58% of the 434 daily searches for male bears were successful, while the females were found in 71% of the 333 daily searches.

Only three out of 14 marked bears in the Plitvice lakes were not recorded leaving the national park. However, these three bears were located only a few times. The other 11 bears were found up to 11.3 km (the average of the largest distances is 4.7 km) outside the park borders. Approximately one half (145 out of 303) of all the locations of bears were outside of the park. The total known area used by all 14 bears was 736 km2. Only two out of seven bears that were

tracked during the winter were denning in the Plitvice lakes national park. One young female crossed the park border at least 25 times in 16 months.

All eight bears from the Risnjak area that were captured in the national park travelled past its borders, in distances of up to 25.6 km (average 10.4 km). These bears were found outside the park for 62% of the time (86 out of 139 locations). Still, four out of six dens of the bears captured in the Risnjak national park were located inside the park.

The largest areas used by individual bears were 224 km2 in 1330 days for a five-year old male and 147 km2 in 840 days for a three-year old female. The size of the used areas was gradually increasing with the increase in number of the determined locations, although after about 40 locations the rate of increase in females slowed down. The average yearly area of activity of a bear was 128 km2 in four male bear years and 58 km2 in five female bear years.

There was no significant difference in size of the area of activity between spring, summer and autumn. The average winter area of activity was significantly smaller than those of the other seasons. The winter average was 4 km2 (range 0—18), while in the other seasons it was 28 km2 (range 1 – 102). The spring and summer movements of males were significantly larger than those of females, in spring 81 km2 compared to 18 km2 and in summer 34 km2 compared to 11 km2. A total of 143 straight-line distances between daily locations were determined. The range was 0.2 to 8.5 km, with a median of 1.5 km. Sixty-seven percent (n = 95) of the daily movements were shorter than 2 km, and only 2% were longer than 7 km. Movements longer than 7 km were recorded only in males; however, the total differences in daily movements between males and females were not significant.

The marked bears did not exhibit territorial behaviour. The bears in Plitvice shared their known homerange with 2 to 11 (average 7.7) known homeranges of other marked individuals. In the Risnjak area the areas of activities of all eight bears captured in the park intersected.

The results of the scientific research of brown bears in Croatia through projects led by Đuro Huber of the Veterinary Faculty in Zagreb were published in 38 scientific papers (23 in journals and 15 in proceedings), 11 chapters of books, 46 professional papers and 69 scientific congress presentations: a total of 164 published bibliographic units. A partial list of these works is included in the list of references of this Plan.

4.3.1. Diseases

Because of their natural resistance and relatively low population density, the natural occurrence of sickness in bears is relatively rare. Rabies was confirmed in a bear in Croatia in only one case that occurred in the year 2000. Most bears have internal parasites, most often Ascarids in the small intestines; however, these invasions are within a stable host-parasite system that does not affect the health of the host. Serological testing of bears' serum found antibodies to a number of pathogens, but this is primarily a sign of resistance being developed because of exposure of the bear to these pathogens and not because of the occurrence of the disease per se.

Table 1: European populations of brown bears, according to 1996 data (from Swenson (editor) 2000)

Bear population	**Number of bears**	**Country**	**Number of bears**	**Distribution area (km^2)**	**Population status**
Northeastern Europe	**37,500**	European Russia	36,000	1,700,000	Increasing?
		Finland	800-900	300,000	Increasing
		Estonia	440-600	15,000	Stable
		Belarus	250 (120?)	60,000	?
		Norway	8-21	5,000	Stable
		Latvia	20-40	10-15,000	Stable?
Carpathian Mtns.	**8,100**	Romania	6,600	38,500	Decreasing
		Ukraine	400 (970?)	11,400	Decreasing
		Slovakia	700	3,000	Increasing
		Poland	100	4,000	Stable
		Czech Republic	2-3	2,000	?
Alps-Dinaric-Pindos	**2,800**	Bosnia & Herzego.	1,200	10,000	Decreasing?
		Serbia and Monte Negro	430	2,000	Decreasing?
		Croatia*	400	9,800	Stable
		Slovenia	300	3,000	Stable
		Greece	95-120	6,200	Decreasing
		FYR Macedonia	90	820	Stable
		Albania	250	3,000	Stable
		Austria	23-28	8,000	Increasing
		Italy	?	?	Increasing
Scandinavia	**1000**	Sweden	1000	250,000	Increasing
		Norway	18-34	60,000	Increasing

Rila-Rhodope Mtns.	**520**	Bulgaria	500	10,000	Decreasing
		Greece	15-25	2,400	Decreasing
Stara Planina Mtns.	**200**	Bulgaria	200	?	Decreasing
W. Cantabrian Mtns.	**50-65**	Spain	50-65	2,600	Decreasing
Apennine Mtns.	**40-80**	Italy	40-80	5,000	?
E. Cantabrian Mtns.	**20**	Spain	20	2,500	Decreasing
Western Pyrenees	**6**	France	3-4	500	Decreasing
		Spain	1-2	500	Decreasing
Central Pyrenees	**5**	France	5	?	?
Southern Alps	**3-4**	Italy	3-4	1,500	Decreasing
EUROPE TOTAL	**-50,000**			-2,500,000	

* The 1999 data for Croatia is 500 bears on 10,200 km^2 and population increasing.

4.4. Natural characteristics of bear habitats in Croatia

4.4.1. Orographic and hydrographic factors

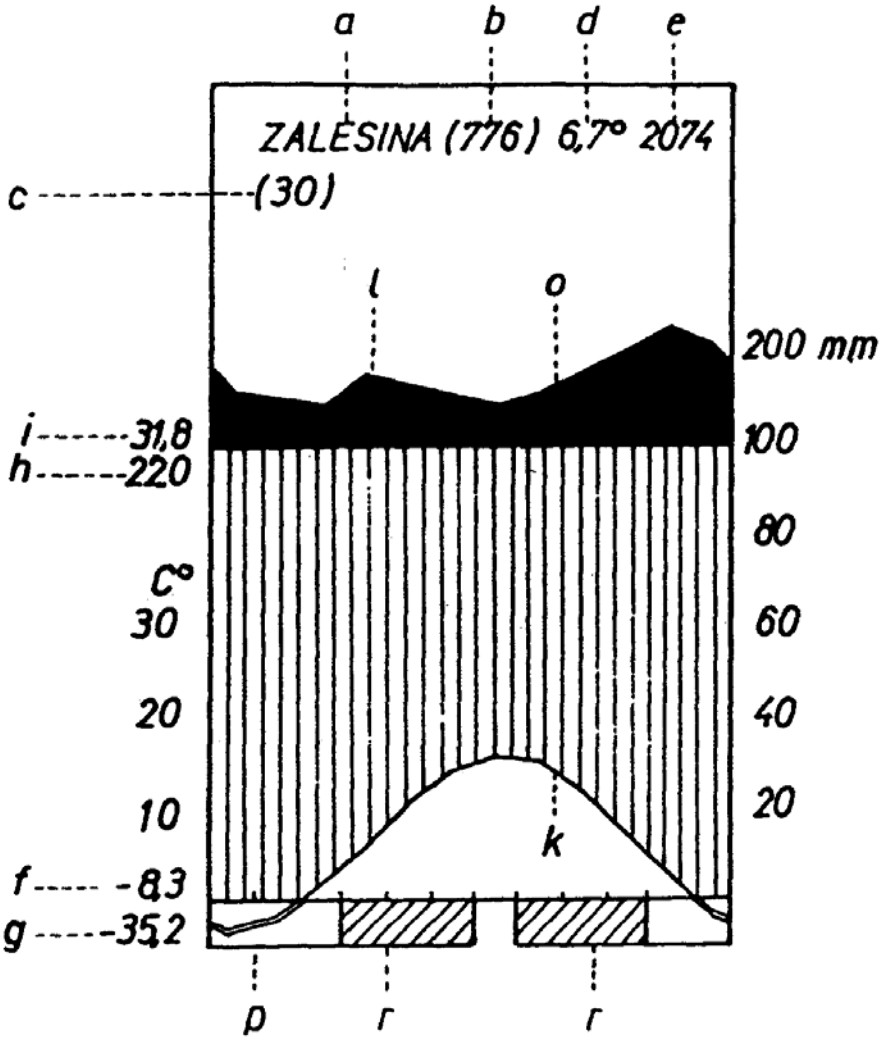
Most of the bear range is located in the area of high karst. This is a broken terrain, with all typical karst elements and phenomena: potholes, sinkholes, dolines, swallets, hums and residual hills. All these elements are mixed and interconnected. Elevations range from 0 m (sea coast) and up to 1750 m on the highest peaks of Velebit. The habitat is preserved to a great extent, so one can find the karst elements in their typical form.

Of large watercourses, the following rivers can be found within the bear range: Rečina, Kupa, Dobra, Mrežnica, Korana, Zrmanja, Krupa, Gacka, Lika, and Una. The following lakes are found there: Lokvarsko lake, Bajer, Lepenice, Sabljaci, Krušičko lake and Plitvice lakes. Besides these watercourses and lakes, bears can also find water in streams, creeks, puddles and forest ponds. Bears, unlike many other species of animals, crawl into caves in search of water.

4.4.2. Climate

The bears' habitats are located in the Central European climate zone, but with a strong influence from the Mediterranean climate. The basic characteristics of the bear range climate are: a long, snowy winter, sudden changes of weather, a short vegetation period, low average annual temperatures, high humidity, early and late freezes and fogs, abundant rainfall and snowfall and strong winds from the north-east (the Bura) and the south-east (the Jugo).

There are more than 120 cold days (temperatures below 0 °C) and more than 40 very cold days (temperatures below -5 °C). The number of freezing days (temperatures below -10 °C) is more than 20. The average number of days with snow cover exceeds 85. Winter starts in November and lasts until mid April. The snow cover can be as much as 2 m thick. Spring starts late and is short with abundant rainfall, interrupted with several revisits of winter. Summer is short and relatively hot. It starts in mid June and lasts until mid September. Autumn is pleasant and longer than spring, but it gets chilly, rainy and foggy towards the end.



a – station
b – elevation above sea level
c – years of monitoring (period)
d – annual temperature in °C (average of several years)
e – annual precipitation in mm (average of several years)
f – average minimal temperature of the coldest month
g – absolute minimal temperature in the monitoring period
h – average maximal temperature of the warmest month
i – absolute maximal temperature in the monitoring period
j – average temperature fluctuation
k – average of several years of air temperatures by months
l – average of several years of precipitation by months
o – humid period
p – months with the average minimal air temperature below °C
p – months with the absolute minimal air temperature below °C

Figure 1 (*Previous page*): Climatograms according to Walter, showing data for meteorological stations typical for the bear range.

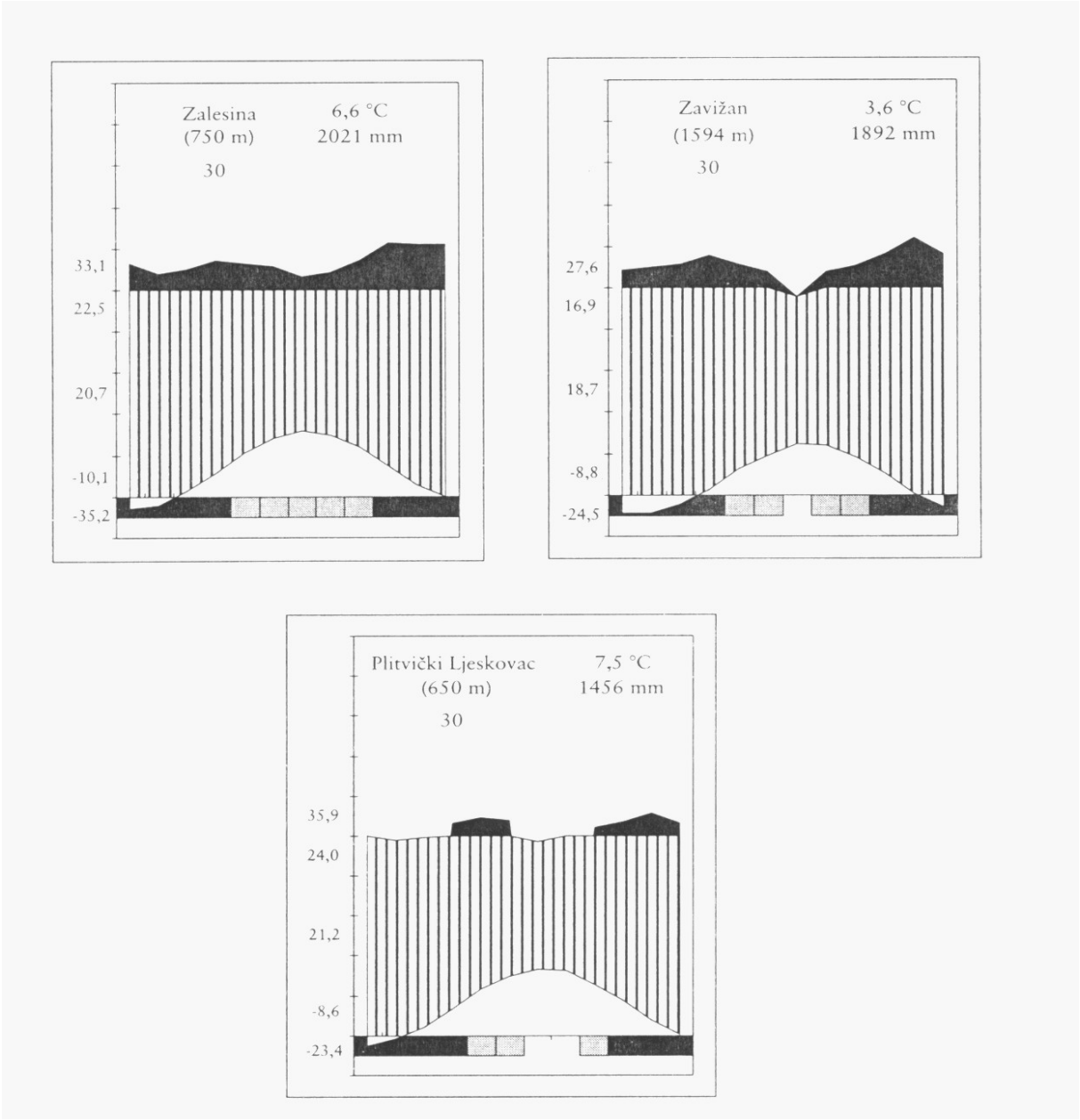


Figure 2: Climatograms for Zalesina, Zavižan and Plitvički Ljeskovac.

4.4.3. Forest communities

Large, uninterrupted forest complexes are crucial to the life of bears. In them they find food, water, peace and quiet, hiding and dens. The bear habitat in Croatia extends over elevations of 0 – 1700 m, so it can be found in the forest communities typical for the mountainous-hilly area of the Dinaric mountain range.

The most important forest communities overlapping with the bear range in Croatia are:

- Lonicero borbasianae - Pinetum mugi/Ht. 1938 (Borh.1963). This community forms the upper border of forest vegetation above 1350 m. It can be found on the highest peaks of Gorski Kotar and Velebit. Temperature inversion causes this community to also appear inside sinkholes at lower elevations.
- Mountain spruce forest (Aremonio-Piceetum Ht.1938). This forest is found in cold mountain vales filled with cold air. It can be found in Gorski Kotar and on Velebit.
- Pre-alpine beech forest with Homogyne sylvestris (Homogyne sylvestris - Fagetum sylvaticae /Ht. 1938/Borh. 1963). It is located at elevations from 1100 to 1500 m, above the beech-fir forests. It can be found in the areas of Gorski Kotar and Lika, and is important as a good source of food for bears (beechnuts).
- Dinaric beech-fir forest (Omphalodo-Fagetum Marinček et al.1992). These forests form the largest and the most important complexes inhabited by bears. They are found through most of Lika and Gorski Kotar. They are very important because of the large areas they cover and because a bear can satisfy the majority of its requirements in them.
- Fir forest with ribbed fern (Blechno-Abietetum Ht. 1950). This community is found in Gorski Kotar on silicate rock and on podzol soil in beech-fir forest.
- Fir forest with feather reed grass (Calamagrostio abietetum Ht. 1956). Located at elevations around 1100 m. This community is found on large boulders, in pre-alpine beech forests and in beech-fir forests. A bear often finds cracks in rock boulders that it uses as a den.
- Illyrian mountain beech forest with dead nettle (Lamio orvale-Fagetum sylvaticae Ht. 1938). This community is found on the continental side of the Dinaric mountain range. The community is important because in it bears feed on beechnuts, and can be found at elevations between 400 and 800 m.
- Beech forest with autumn moor grass (Seslerio - Fagetum sylvaticae Ht.1950 (M.Wraber 1960)). This is a high karst community, found on the sea-oriented slopes of the Dinaric mountain range. It is also important because of the beechnuts.
- Forests of downy oak and hop hornbeam (Ostryo-Quercetum pubescentis HT.1938). This forest community forms the transition from coastal towards continental vegetation. It is found in the coastal region below the thermophilous beech forests and in the areas east of the Zrmanja river. In the coastal region this forest community often forms the border of permanent bear presence.

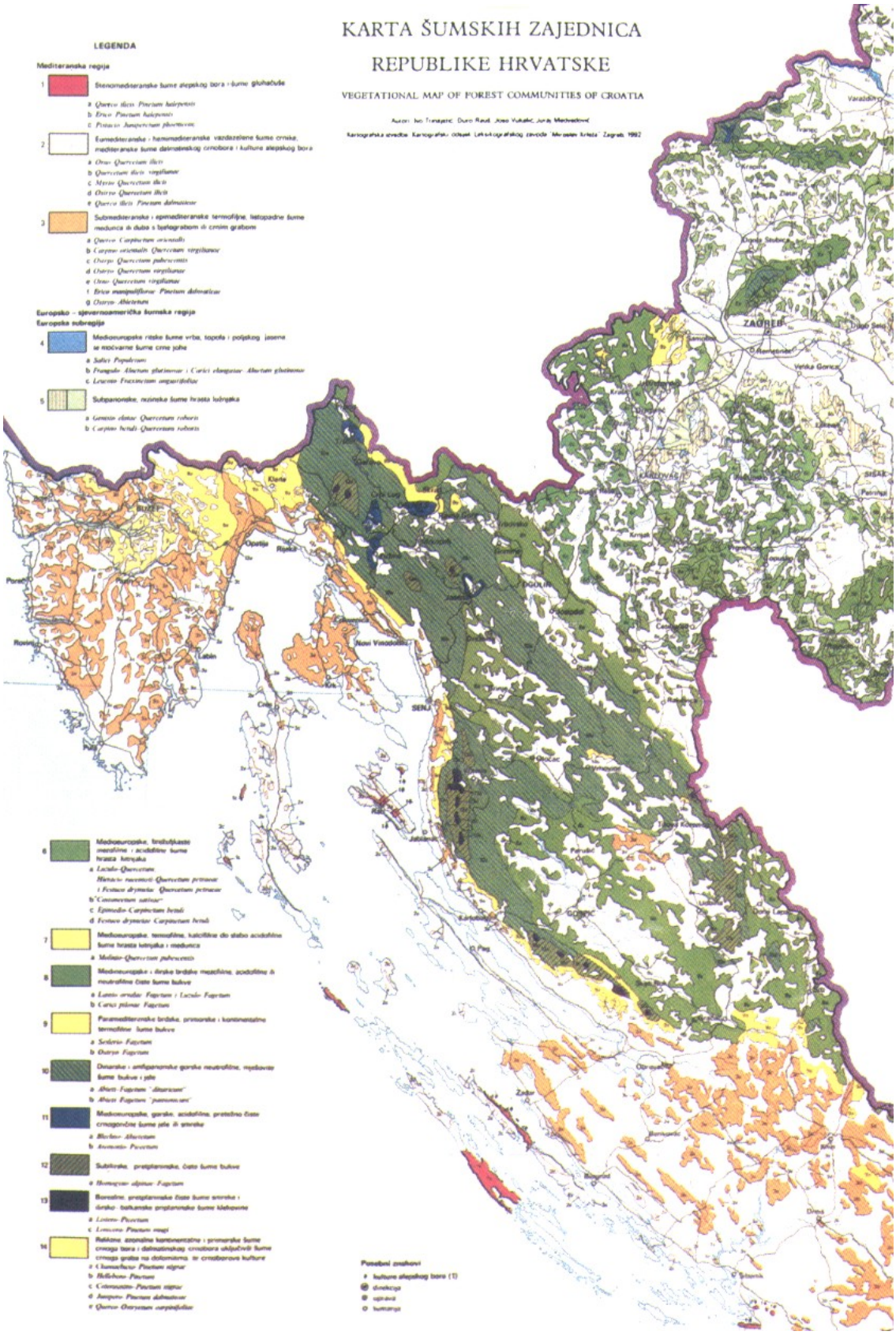


Figure 3: Map of forest communities within the bear range in the Republic of Croatia.

4.5. Bears and Humans

4.5.1. Public Attitudes towards Bears and Bear Management in Croatia

A study on the general public's, foresters' and hunting unit leaseholders' attitudes (n=779) was carried out in 2003 in areas where bears are permanently present (central areas) and in areas where bears are temporarily present (peripheral areas), representing the first study of its kind in Croatia.

Overall, all of the three groups had very positive attitudes towards bears, since the majority of the respondents evaluated their attitudes to bears as favourable or very favourable. The most positive were the hunting unit leaseholders (80% in favour) and the foresters (76% in favour), followed by the general public in Gorski Kotar and Lika (75% in both regions). The least positive respondents were representatives of the general public from the peripheral areas (72%, 71% and 50% in favour of bears in the eastern, western and northern peripheral areas respectively). Correspondingly, most of the respondents, especially from the central bear areas (Gorski Kotar and Lika) felt that the brown bear is a valuable resource. No less than 85% of the respondents from Lika felt that the presence of bears in that region increases tourism in the region.

Most of the respondents felt that bears do not cause a lot of damage to livestock, nor to agricultural crops and orchards. Nevertheless, most of the respondents agreed that the government and/or the hunting unit leaseholders who manage bears should compensate for damages caused by bears and that problem bears (ones which repeatedly cause damage) should be removed.

Many respondents from Gorski Kotar (36%) and Lika (25%) had experienced damage caused by bears. In peripheral areas that percentage was much lower, with 8% of respondents from the western peripheral area, 4.5% from the northern peripheral area and none from the eastern peripheral area having experienced damage caused by bears. Respondents who had experienced damage had considerably less positive attitudes towards bears than the average of the general public respondents.

Representatives of the general public had relatively good knowledge of bear biology. In contrast, their knowledge of the legal status of bears and official estimates of bear population size was very poor. This result indicated a need for better information flow between the public and the managers.

Most of the general public respondents thought that bears in Croatia should be completely protected by law, while foresters and hunting unit leaseholders opposed this idea. Also, there was a considerable amount of support among the general public respondents for controlled hunting of bears, which suggests that their perception of legal protection does not necessarily exclude hunting as a way of utilizing the population. When interpreting these results, one should keep in mind that the general public respondents demonstrated a poor knowledge of the current legal status of bears. According to the majority of the respondents, the quota for bear

hunting should be determined on the national level and each harvested bear should be registered in a central database.

Most of the respondents from all of the areas are willing to tolerate more bears. Respondents from Lika, in particular, wished to see more bears. Although they had the most positive attitudes towards bears, hunting unit leaseholders and foresters were indecisive on the issue of increases in bear numbers.

Detailed results of the study can be found in Majić, 2003 (appended to the Plan).

4.5.2. Damage Caused by Bears and Bear Attacks on Humans

The damage caused by bears is diverse. According to damaged objects, the damage can be divided into:

- damage to agricultural crops and orchards;
- damage to forest components;
- damage to livestock (including bees):
- damage to buildings;
- damage in traffic;
- danger to humans.

Damage to agricultural crops depends on the location of the agricultural field. Since the bear is a wildlife species that inhabits mostly high karst and large forested areas, damage to agricultural crops are relatively rare. The most common form of such damage is grazing on wheat fields during periods of wheat ripening. Bears prefer oats, followed by corn and wheat, and sometimes rye and barley.

Bears damage fruit trees by bending and tearing the branches off during periods of fruit ripening. Bears primarily like plums, apples and pears. Other fruit farms that are interesting for bears (i.e. raspberry, blackberry, strawberry and others) currently do not exist in the Croatian bear range. Along the coast, where bears have permanently been present over the last 20 – 30 years, there are some minor damages to the fruits of that area (i.e. figs, peaches, cherries and others).

The damage to the agricultural crops and orchards caused by bears in Croatia is small, especially in the central part of the bears' habitat, while somewhat bigger in the peripheral part.

Damage to forest components caused by bears has never been recorded in Croatia.

Damage to livestock and bees is fairly frequent and is the main cause of conflicts between people and bears. All of the livestock species are affected. As a result of the decrease in seasonal grazing of livestock in bear habitats, damage was less frequent during the last 20 – 30 years than before. Currently, there is a slight increase in the occurrence of damage to sheep and goats in the areas of Velebit, Dinara, Svilaja and the Kamešnica mountains, where the traditional way of livestock raising still exists. A well-known example of the damage caused by bears is on the island of Krk, where 400 sheep and goats were reported to have been attacked by bears during the last five years. There were a few cases in which an individual bear repeatedly attacked

livestock in the immediate vicinity of a household or even in the stables. In cases where the attacked livestock was grazing in non-permitted grazing areas, compensation will not be paid.

The most frequent damage caused by bears is the damage to beehives. Within the bears' habitat there are numerous plant species important for honey production and some of the bee grazing areas (common heather and pubescent oak) are considered to be the best areas for honey production, which additionally intensifies the development of apiculture in these areas. Moreover, these are ecologically well-conserved areas where the highest quality honey is being produced and where apiculture is, and in the future will be even more, an important part of the regional development programmes. It was estimated that there are more than 70 000 beehives in bear areas in Croatia. Beekeepers have reported that bears destroy several thousand beehives yearly. Beehive damage is a problem that will require much more attention and resources in the future.

Damage to buildings is mostly the damage that bears cause to hunting management structures (e.g. feeding sites, food storages etc.), and rarely to other structures (such as fences, stables and so on). Because bears are a game species, hunting unit leaseholders do not report damage of their hunting management structures. Besides hunting management structures, bears cause damage to an average of 100 – 150 other structures a year in Croatia.

Damage in traffic occurs when vehicles collide with bears. In Croatia there are on average 3 – 10 such traffic accidents a year. Individual cases of such damage can be extremely large (i.e. expensive vehicles, compensations for injuries or even death), and even though the traffic accidents are rare, the total amount of the compensations can be greater than the compensations for all the other bear-related damage put together.

Up till now there has been no obligatory official registration and analysis of the damage caused by bears in Croatia, nor has there been an administrative body in charge of such activities. Only hunting unit leaseholders have been recording data on damage, since they are responsible for compensating the damage caused by all game species, including bears. It is important to note that not all of the damage gets registered, given that also hunters sometimes experience damage, and also because local people are not content with the amount and the criteria (compensation is not paid for livestock that has disappeared) of the compensations. There is no price list for the compensations and the amount of compensation is negotiated between the hunting unit leaseholder and the damaged party.

In the Primorsko-Goranska county, which mostly lies within the central part of the bear distribution area (approximately 20% of the total bear area in Croatia), the following damage was recorded during the year 2002:

- around 20 beehives destroyed (approximately 20 000 kn);
- a number of fruit trees damaged or destroyed – compensation of 13 000 kunas paid;
- damage to agricultural crops (corn, wheat, carrot) was compensated with approximately 14 000 kunas;
- four automatic corn dispensers for additional feeding of other game were destroyed (30 000 kunas);

- on the island of Krk, which is not a typical bear habitat, bears killed several dozen sheep; compensation of 12 000 kunas was paid, even though the real damage was much larger;
- 4 traffic accidents, with over 50 000 kunas worth of damage to the vehicles.

Other damage recorded on the island of Krk during the last 5 years includes: the killing of one horse, three foals, one donkey, three pigs, four goats and over 400 sheep.

An analysis of the damage caused by bears was made by Huber and Morić (1989) in 1987, wherein 247 cases were documented. Of the 13 animals killed by bears, there were 8 cows and 3 sheep. The main agricultural crops damaged by bears were oats (N=107) and corn (N=94).

Danger to humans Due to their well-developed senses, bears can avoid people in time, and unpleasant encounters with bears attacking people are rare.

There has only been one documented case of a fatal attack on a person in Croatia in the last 65 years. The attack occurred in the Plitvice Lakes National Park in March 1988. The man was killed by a female bear with cubs.

Out of the seven documented conflict encounters between people and bears in the Primorsko-Goranska county over the last 35 years, in which people were attacked and injured, five cases were encounters with males and two cases were encounters with females with cubs. In one case a female with cubs attacked a harvester. He encountered the bear on his way to a hay-harvesting field. While defending her cubs, the female charged and knocked down the man with her paw. A detailed analysis of all the circumstances surrounding another "attack" from a female bear on a forest worker revealed that the bear did not attack the man at all. The unfortunate man got cuts on his torso and legs while running down a rocky slope in panic. He lost his balance and fell several times whilst holding a chain saw in his hands!

Incidental encounters with solitary, usually young bears are almost exclusively due to irresponsible behaviour of humans in the bear areas. That is, in four out of the five attacks the bears were taken by surprise, usually close to human settlements where they explored illegal garbage dumps and not in deep forests. Because they felt threatened, the bears attacked picnickers, mushroom pickers and others. All of them sustained injuries on their arms and body. Three people needed medical help. In one case, an incident between a bear and a hunter was caused by a hunting dog. The barking dog disturbed the bear and while trying to run away from the bear, brought it to its master (the media presented the story as the faithful dog saving its master's life).

It is possible that there have been similar, yet undocumented situations in other parts of Croatia. However there have been no other fatal attacks.

4.6. Status of the Bear

In the current Hunting Act the bear is a large game species.

Because of the biological characteristics of bears (e.g. the dynamics of growth, dispersion, breeding) and ecological conditions of its habitat, the Rules on the Closed Hunting Season (Official Gazette, 123/99 and 65/01) prohibit the hunting of bears between 16 May and 30 September (3.5 months). Therefore, the open season for bears in Croatia starts on 1 October and

lasts until 15 May of the next year (7.5 months). During the closed season, only sick or wounded bears may be shot.

With the purpose of translocating bears to other hunting units, the capturing of live bears is permitted under these conditions: males whole-year round and females in periods when they are not in late gravidity nor with cubs. The competent Ministry of Agriculture, Forestry and Water Management may approve the hunting of a bear during the closed season when this measure is required for science, the protection of people or livestock, or for other reasons.

4.7. Current Management

As defined by the legal provisions, bear management in Croatia is regulated by the hunting management programmes for each hunting unit. The hunting management programmes are basic planning documents which are developed for each hunting unit and which regulate all management of the hunting unit and its game for a period of 10 years. Hunting management programmes must be developed in coordination with the forest management programmes, local land use conditions, water management, spatial planning, ratified international conventions and agreements related to hunting and nature protection.

Bear hunting, as with other game hunting, is not permitted without hunting management programmes. For each game species, hunting management guidelines provide information on the habitat capacity and the optimum number of animals for the hunting unit. As with the other large game species, the number of bears is estimated by viewing, tracking and counting the bears during the hunting season in the hunting unit, and is expressed as a number of individuals by sex and age structure. Therefore, the hunting management programmes plan bear management for a 10-year period, and at the same time, based on the monitoring of bear numbers, regulate the management for each hunting season.

According to the Rules on Contents and Methods of Development and Approval of Hunting Management Programmes, the Programmes for Game Breeding and Programmes for Game Protection, bears can be categorized into five age groups: cubs, yearlings, young subadults, subadults and adults, depending on the optimum economic harvest age.

Hunting management programmes define the parts of the hunting units surfaces that are productive for game breeding (hereon referred to as hunting productive surface, HPS) and the category of habitat quality for bears. Based on these assumptions, the maximum number of bears that can be tolerated in the hunting unit is calculated. Classification of the hunting productive surfaces and categories of habitat quality in a hunting unit are regulated by the Expert Guidelines of the Ministry of Agriculture, Forestry and Water Management (of 25 June 1994). The recommendations for bears are:

- the category of the habitat quality should be defined for all mountainous habitats such as Velebit, Velika Kapela, Mala Kapela, Lička Plješivica, the Risnjak-Snježnik area and others, and not just for individual hunting units.

- Croatian habitats for this game species can tolerate a density of 1-2 bears per 10 km^2 of forest surface.
- hunting management of bears is possible only if the population has at least 50 individuals.
- hunting productive surfaces of the forested areas which are inhabited by bears make up 60-90% of the total areas, of the large mountain pastures 20% and of the small mountain pastures surrounded by forests up to 80%.
- reproductive increase should be 10-15% of the population, with a condition that sexually mature females make up at least 25% of the population.
- in cases of doubt about the reproductive increase, additional estimates of the population size should be done before the start of the hunting season.
- bear harvesting is planned at the beginning of each hunting year with reference to the estimated population size, age structure, sexual structure of the population and the defined management goals. The mortality of bears besides harvesting (traffic accidents, poaching, natural causes) is included in the total planned quota.
- hunting management programmes also regulate the supplemental feeding of bears, and in particular define: the kind of food, the amount of food, the time period and the number of feeding sites.

As an example of the described process of bear management in the Republic of Croatia, parts of the hunting management programme for the state hunting unit VII/2 – "BJELOLASICA" are shown below. The data are presented in the official forms: HMP-2, HMP-3, HMP-5 and HMP-6.

GUIDELINES FOR FUTURE MANAGEMENT	
SPECIES	BROWN BEAR
PURPOSE OF THE HUNTING UNIT	Natural breeding, protection, hunting and use of the game species
GOAL OF THE HUNTING MANAGEMENT	Breeding of a healthy population with a high trophy value
METHODS OF BREEDING	natural
SEX RATIO (M:F)	1 : 1
OPTIMAL ECONOMIC HARVEST AGE (only for large game)	12 years
AGE STRUCTURE (only for large game)	Cubs – during 1st and 2nd hunting year – 16% Yearlings – during 3rd hunting year – 16% Young subadults – during 4th hunting year – 16% Subadults – during 5th, 6th, 7th, 8th and 9th hunting year – 40% Adults – 10th and following hunting years – 12%
CATEGORY OF THE HUNTING UNIT QUALITY	Very good (I)
HUNTING PRODUCTIVE SURFACE (HPS)	24 800 ha
NUMBER OF ANIMALS PER 1 000 ha (10 km^2) OF HPS	2 animals per 1 000 ha
REPRODUCTIVE INCREASE COEFFICIENT (per base game stock)	15% of the base game stock

BASE GAME STOCK (estimated on 1 April)	50 animals before reproduction
HUNTING MANAGEMENT CAPACITY OF THE HUNTING UNIT (base game stock + reproductive increase)	58 animals during summer and autumn

GAME SPECIES: **BROWN BEAR**

HUNTING YEAR (period): from 1 April 2002 to 31 March 2003

LARGE GAME STOCK DEVELOPMENT

STOCKS				AGE STRUCTURE										TOTAL (animals)		TOTAL: (animals)
				CUBS (animals)		YEARLINGS (animals)		YOUNG SUBADULTS (animals)		SUBADULTS (animals)		ADULTS (animals)				
				M	F	M	F	M	F	M	F	M	F	M	F	
1	2			3	4	5	6	7	8	9	10	11	12	13	14	15
BASE GAME STOCK (actual numbers)	PLANNED			**4**	**4**	**4**	**4**	**4**	**4**	**10**	**10**	**3**	**3**	**25**	**25**	**50**
	REALIZED			***4***	***4***	***4***	***4***	***3***	***3***	***8***	***8***	***7***	***7***	***26***	***26***	***52***
BASE (parental) STOCK	PLANNED			**--**	**--**	**--**	**--**	**--**	**--**	**10**	**10**	**3**	**3**	**13**	**13**	**26**
	REALIZED			**--**	**--**	**--**	**--**	**--**	**--**	***8***	***8***	***7***	***7***	***15***	***15***	***30***
REPRODUCTIVE INCREASE	PLANNED			**4**	**4**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**4**	**4**	**8**
	REALIZED			***4***	***4***	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	***4***	***4***	***8***
TRANSLOCATIONS (in/out of the hunting unit) OF THE GAME	PLANNED															
	REALIZED															
STOCK BEFORE THE HARVEST	PLANNED			**8**	**8**	**4**	**4**	**4**	**4**	**10**	**10**	**3**	**3**	**29**	**29**	**58**
	REALIZED			***8***	***8***	***4***	***4***	***3***	***3***	***8***	***8***	***7***	***7***	***30***	***30***	***60***
HARVEST	PLANNED	NATURAL BREEDING OF GAME		**--**	**--**	**--**	**--**	**2**	**2**	**--**	**--**	**2**	**2**	**4**	**4**	**8**
		TRANSLOCATED GAME	HARVEST	**--**	**--**	**--**	**--**	***3***	***1***	**--**	**--**	***3***	***1***	***6***	***2***	***8***
			OTHER MORTALITY													
	REALIZED	HARVEST		**--**	**--**	**--**	**--**	***1***	**--**	**--**	**--**	***4***	**--**	***5***	**--**	***5***
		CAPTURE														
		OTHER MORTALITY		**--**	**--**	**--**	***1***	**--**	***2***	**--**	**--**	**--**	**--**	**--**	***3***	***3***
		TOTAL		**--**	**--**	**--**	***1***	***1***	***2***	**--**	**--**	***4***	**--**	***5***	***3***	***8***
	DEVIATIONS	± %														
		EXPLANATION														
STOCK AFTER THE HARVEST (transitional stock)	PLANNED			**8**	**8**	**4**	**4**	**2**	**2**	**10**	**10**	**1**	**1**	**25**	**25**	**50**
	REALIZED			***8***	***8***	***4***	***3***	***2***	***1***	***8***	***8***	***3***	***7***	***25***	***28***	***52***
TRANSITION	PLANNED			**4**	**4**	**4**	**4**	**4**	**4**	**10**	**10**	**3**	**3**	**25**	**25**	**50**
	REALIZED			***4***	***4***	***4***	***4***	***3***	***3***	***8***	***8***	***7***	***7***	***26***	***26***	***52***

Brown Bear

HMP-5

SUPPLEMENTAL FEEDING AND FEEDING OF GAME

HUNTING YEAR (period)	SUPPLEMENTAL FEEDING (kg)					FEEDING (ha)					REMARKS
	KIND OF THE FOOD	PLANNED (kg)	REALIZED (kg)	DEVIATIONS ± %	DEVIATIONS EXPLANATION	KIND OF CROP	PLANNED (ha)	REALIZED (ha)	DEVIATIONS ± %	DEVIATIONS EXPLANATION	
1	2	3	4	5	6	7	8	9	10	11	12
1 April 2002 to 31 March 2003	corn	21 170	*18 500*								
	waste of animal origin	29 000	*15 000*								

HMP-6

HUNTING UNIT MAINTENANCE MEASURES

HUNTING YEAR (period)	HUNTING MANAGEMENT STRUCTURES										REMARKS
			CONSTRUCTION				MAINTENANCE				
	KIND OF THE STRUCTURE	AMOUNT	PLANNED	REALIZED	DEVIATIONS ± %	DEVIATIONS EXPLANATION	PLANNED	REALIZED	DEVIATIONS ± %	DEVIATIONS EXPLANATION	
1	2	3	4	5	6	7	8	9	10	11	12
1 April 2002 to 31 March 2003	High stand with a feeding site	amount					10	*10*			

Bears are hunted individually during moonlit nights by waiting at a high hunting stand near a bait at a feeding site. Only persons who have passed a hunting course and have obtained a written hunting permit from the hunting unit leaseholder can hunt. Bears can only be hunted with rifled-barrel hunting weapons and hunting ammunition which has a kinetic energy greater than 3 500 joules per 100m, the bullet must be heavier than 11.5 grams, while the maximum allowed shooting distance is 100 metres.

Because of the moonlight, the high stand should face west, so that the animal can be observed.

Article 63 of the Hunting Act permits the use of baits to attract bears to hunting sites, except in zones which are up to 300m from a national park, or some other protected area in which hunting is prohibited.

Harvested bears and their parts can be transported, stored or processed only with a special certificate. Hunting unit leaseholders provide the certificates.

Since bear meat can be used as human food, the provisions of the Veterinary Service Act (Official Gazette, 70/1997) define the veterinary inspection and control of the meat. The hunting unit leaseholder has to inform the local veterinary organization about the harvested bear.

In addition, bear meat must be checked for *Trichinella spiralis* larvae; a sample is taken from the diaphragm muscle for analysis.

Bear furs and bear skulls are hunting trophies and regardless of the age or the expected trophy value, they have to be evaluated. A trophy Certificate is issued based on the evaluation. For hunting tourism, the evaluation of the trophy is the basis for calculating the hunting fee. Bear furs and bear skulls are evaluated by the instructions and formulas of the International Council for Game and Wildlife Conservation (CIC). The basic evaluation measures are the length and width of the skull, the length and width of the fur and the symmetry and beauty of the hair.

Bear trophies of the highest quality (trophies with a higher number of points than the best documented trophy – champion of the Republic of Croatia) cannot be exported. In 1996, the CIC decided that bear skulls and furs are not considered official hunting trophies anymore, and therefore cannot compete in national or international trophy competitions.

The hunting unit leaseholder must keep a register of all Trophy Certificates issued.

The Hunting Act regulates issues concerning compensation and the prevention of damage caused by game. Measures for the prevention of damage include:

- decreasing the number of game in a hunting unit to a tolerable level;
- providing enough food for game;
- fencing and guarding of crops;
- translocation of the game, and so on.

Both hunting unit leaseholders and land users are obliged to carry out certain measures for the prevention of damage. If damage occurs regardless of preventative measures, the hunting unit leaseholder has to compensate for the damage caused by the bears in his hunting unit. The Hunting Act permits the hunting of game that has caused a lot of damage. In order to put this in

practice, the hunting unit leaseholder has to provide evidence of the damage caused and of compensations paid to the Ministry.

An analysis of the damage caused by bears is presented in Chapter 4.5.2.

The hunting authorized in this way can only be up to the amount of the compensated damage, when measured by the market value of the trophy and the game meat. If the livestock that was attacked by the bear was grazing in an area where grazing is not permitted, compensation will not be paid.

Inspection and surveillance of the implementation of legal provisions and hunting management programmes is performed by the State Inspectorate and the Ministry of Agriculture, Forestry and Water Management.

Penalty provisions (Article 95 – 102, Hunting Act) define the fines for any violation of the regulations.

4.8. Current Status

4.8.1. Distribution Areas

The areas of bear distribution in Croatia can be categorized into areas with a permanent presence of bears and areas with an occasional presence of bears.

The former are areas in which bears satisfy all their needs for food, water, space, tranquility, cover, breeding and denning, and in which bears are present during all four seasons of a year. In those areas, all the prescribed protective measures are carried out in order to ensure the stability of the population. Local inhabitants accept bears as part of their natural environment.

The current area of permanent bear presence in Croatia could be said to be divided by a network of highways in four parts.

Table 2: Areas of permanent bear presence in Croatia.

No.	Location of the habitat:	Size of the area (km^2)
1.	North of the Bosiljevo – Rijeka highway, to the border with the Republic of Slovenia.	1198.18
2.	South of the Bosiljevo-Rijeka highway, to the Bosiljevo – Žuta Lokva highway.	1603.13
3.	South-west of the Žuta Lokva – Sveti Rok highway.	1810.08
4.	East of the Bosiljevo – Sveti Rok highway, to the border with the Republic of Bosnia and Herzegovina.	4642.08
	TOTAL:	**9253.47**

Areas with an occasional presence of bears are areas with a sporadic presence of bears or areas in which the number of bears present does not guarantee the continued existence of the species in those areas. Also, there are no permanent denning activities in these areas. In short, these are habitats to which bears are returning and which are connected to areas which have a permanent presence of bears in Croatia, Slovenia or Bosnia and Herzegovina. Bears occasionally cause damage in these areas. In areas with an occasional presence of bears there are regions where bear presence is acceptable and regions where bear presence is not acceptable. A detailed assessment and justification of these categories can be found in Chapter 9:

Occasional bear habitats are presented in Table 3.

Table 3: Occasional bear habitats: 1-5 denotes an acceptable presence, while presence is not acceptable at 6 and 7.

No.	Location of the habitat:	Size of the area (km^2)
1.	Broader Ćićarija and Učka area.	244.05
2.	Bosiljevo, Mrežnica and Korana areas, south of the Karlovac - Bosiljevo highway	339.88
3.	Zdihovo, Vukove Gorice and Lipnik areas, north of the Karlovac – Bosiljevo highway	90.13
4.	The Kamešnica, Mosor and Biokovo mountains and the areas between those mountains	950.49
5.	The Žumberak mountains	168.05
	TOTAL of the acceptable occasional presence of bears	**1793.60**
6.	Coastal part, from Bakar to Maslenica	517.97
7.	Northern and central part of the island of Krk	260.29
	TOTAL of the unacceptable occasional presence of bears	**778.26**
	TOTAL:	**2571.86**

The total area of bear distribution in Croatia is 11 824.33 km^2 in size. Out of this, the area with a permanent bear presence is 9 253.47 km^2, while 2 570.86 km^2 has an occasional bear presence. The data was acquired through on-site drawing of the habitat into 1:100 000 maps. These habitat borders were then digitized and the areas calculated using ArcView software.

Bears are distributed over the entire Gorski Kotar and Lika regions, the western and southern part of the Karlovac county, the Učka and Ćićarija mountains in Istria, the central and northern part of the island of Krk, the Žumberak mountains, the coastal part from Bakar to Maslenica and the area defined by the Kamešnica, Mosor and Biokovo mountains.

Of the permanent bear presence area, 94.2% represents hunting units, while 5.8% represents national parks. Bears are permanently protected in national parks (Table 4).

Table 4: Sizes of the national parks in bear habitats.

National Park	Size of the area (km^2)
Risnjak	64.00
North Velebit	109.00
Plitvice Lakes	295.00
Paklenica (partly)	67.00
Total:	**535.00**

Table 5: Hunting unit and national park portions of the permanent bear presence area in Croatia.

Permanent bear habitat	km^2	%
Hunting units	8718.47	94.2
National Parks	535.00	5.8
Total:	**9253.47**	**100**

4.8.1.1. Areas along the borders with Slovenia and Bosnia and Herzegovina

The area along the border with Slovenia in which bears are permanently or occasionally present is shown in Figure 4, while the length of the border can be found in the table accompanying the map. It can be concluded that bears do not have any natural or artificial obstacles to crossing the border in either direction. That situation is favourable and should be preserved; however, it also accentuates the importance of coordinated bear management between the two countries.

Also in the areas bordering the Republic of Bosnia and Herzegovina, bears do not have any natural or artificial obstacles to crossing the border.

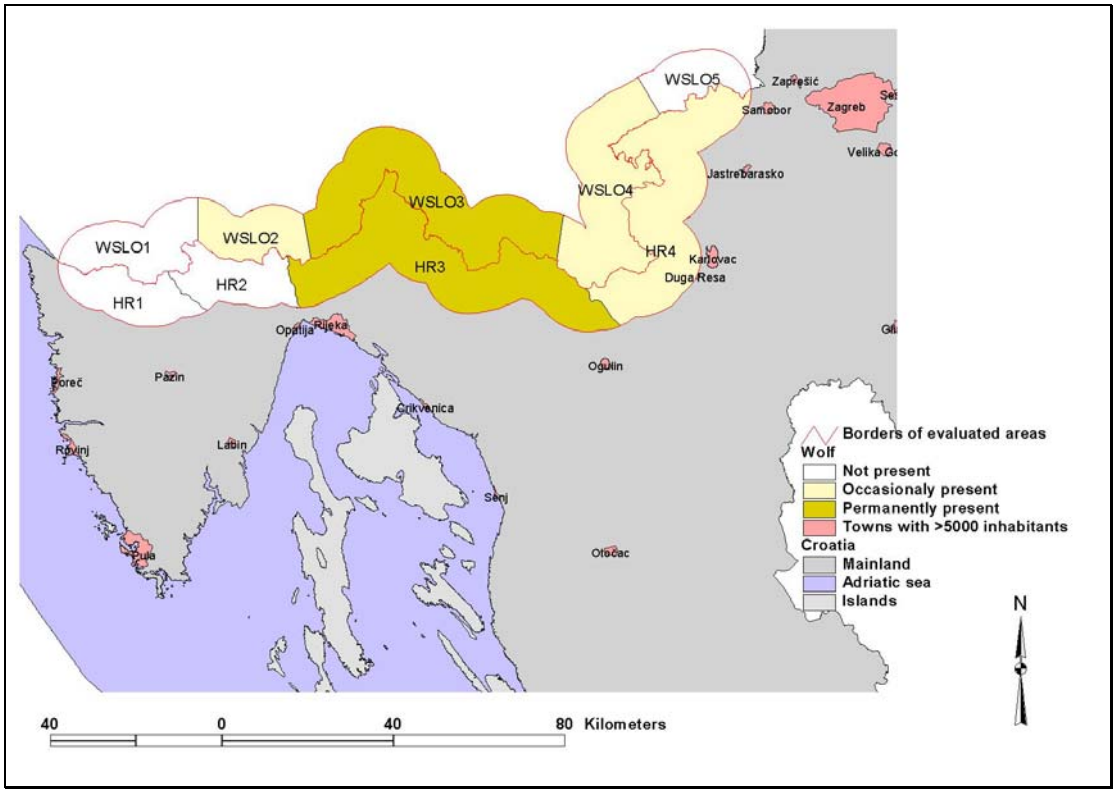


Figure 4: Areas bordering with Slovenia in which bears are permanent or occasional inhabitants.

Table accompanying Figure 4: **Length of the border (km) between Croatia and Slovenia where bears, wolves and lynx are permanently or occasionally present.**

Present	Bear	Wolf	Lynx
Permanently	131	112	112
Occasionally	196	120	120

4.8.2. Mortality by causes and regions – effects on the population status

A systematic monitoring of bear mortality by its causes was not carried out until 2000, except in the region of Gorski Kotar, where the quality of bear management is the highest. With the implementation of the Hunting Act, the leasing of newly-formed hunting units (at the end of 2000), and the application of the hunting management programmes, the monitoring of bear mortality and other information on bears could be collected and analyzed.

Table 6: Bear mortality in Gorski Kotar and Hrvatsko Primorje from 1990 to 1999 by years and causes (From Frković et al. 2000).

Cause	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Hunting	17	12	11	11	12	9	12	21	16	17	138

Poaching	3	4	4	4	1	1	3	3	0	3	26
Road traffic accident	2	1	2	0	1	0	2	2	3	7	20
Railway traffic accident	3	6	1	1	2	2	2	3	3	2	25
Unknown	0	4	2	0	0	1	2	0	1	0	10
Others	4	1	1	0	5	0	1	2	1	2	17
Mines*	0	11	7	3	5	4	6	0	1	0	37
Total:	26	28	17	14	20	13	19	24	17	23	273

*** Includes entire mortality related to the war: mine fields, shells, shooting at the combat frontline, traffic, deliberate illegal killings (Frković, 1999)**

A total mortality of 273 bears was documented during the period from 1990 to 1999, or 27.3 bears per year on average (Table 2), representing 4.4% of the estimated population yearly. Because of the lack of good coordination this number could be bigger in reality. The most important cause of death was shooting (60.1%), of which 50.1% was legal hunting and 9.5% poaching. This was followed by traffic accidents (16.5%), with 9.2% being contributed by railway accidents and 7.3% by road accidents. The mortality of at least 37 bears, or 13.5% of bear mortality in the analyzed period, was directly related to warfare activities (i.e. minefields, shells, shooting in combat, traffic, deliberate illegal killings).

Table 7: Bear mortality in Croatia from 2000 to 2002 by years and causes.

Cause of death	Gender	2000		2001		2002		TOTAL
		Young	Adult	Young	Adult	Young	Adult	
Hunting	M		31	2	55	1	51	**140**
	F		7		9		10	**26**
Poaching	M				1			**1**
	F						2	**2**
Road traffic	M	1		2	2	4		**9**
	F	1			1		1	**3**
Railway traffic	M	1		2		2		**5**
	F	2	1		1	3	1	**8**
Unknown	M	1		1	1		3	**6**
	F				1	1	2	**4**
Other causes: self-defence, disease, caused damages and other	M		1			1		**2**
	F	2	1	2				**5**
TOTAL		**8**	**41**	**9**	**71**	**12**	**70**	**211**

Prior to analysing and interpreting the data presented in Tables 6 and 7 one should note:

Table 6 shows data on bear mortality by causes for the Gorski Kotar and Hrvatsko Primorje regions, which comprise approximately 25% of the total bear range in Croatia. The reasons for the partial collection of the mortality data were the temporary occupation of large portions of the bear range and warfare activities, meaning that collection of data from the entire area of bear distribution was impossible. With the end of the war in those areas (1996), the Hunting Act was implemented, hunting units were formed and leased, hunting management programmes were developed and approved for each of the hunting units and systematic hunting management was started. The process of forming and leasing the hunting units lasted from 1996 to 2001, when the last hunting units were formed and leased. This is why bear mortality data for the total bear range in Croatia exists starting only with 2000.

Some conclusions may be drawn from an analysis of the data presented in Table 7:

- poaching, in conditions in which all the hunting units have their master, and when hunting units are managed according to the hunting management programmes, is relatively small and does not represent a serious threat to the bear population,

- poisoning has completely disappeared as a cause of bear mortality,

- mortality caused by road and railway traffic is considerable and it is expected that it will remain at a significant level in the future, since road and railway traffic is constantly increasing in the bear areas of Croatia (tourism is one of the most important economic activities in Croatia, as well as the transport of goods from the north to the south of Europe through Croatia);

- there is a new cause of mortality – mortality due to remaining land mines. The size of these land mine areas and the intensity of the removal of the mines suggest that the problem will remain for at least another 6 years.

- bear mortality related to diseases or lack of food or water was not recorded.

Although the analyzed period (2000 – 2002) is relatively short and one should interpret the results and make conclusions with caution, the analysis indicates that the main cause of bear mortality is hunting (around 80%), while all other causes make up 20% of the total bear mortality. This relation has to be considered when making decisions about the hunting quotas in bear management action plans in Croatia.

The data presented in Table 7 show:

- the total bear mortality in Croatia in 2000 was 49 bears, in 2001 it was 80 bears and in 2002 it was 82 bears. The presented data leads one believe that the mortality of bears has increased considerably in 2001 in relation to 2000, however, one should know that in 2000, in some of the hunting units the hunting of bears was not planned – because those units were not leased and the hunting management programmes had not been completed.

- also it should be noted that the planned hunting quota for 2000 was 87 bears, while the total actual mortality was 49 bears. In 2001, the planned hunting quota was 114, while the total actual mortality was 80 bears. Similarly, in 2002, the planned hunting quota was 121, and the total actual mortality was 82 bears. The main reasons for not completing the planned quotas were

unfavourable meteorological conditions, difficulties in achieving good bear hunting fees, less interest from foreign hunters, complications with the export and import of bear trophies, poor coordination of some hunting unit leaseholders and so on.

Tables containing detailed data on bear mortality (harvest and other mortality) from all hunting units in which bears were managed according to the hunting management programmes in Croatia for the period 2000 – 2003 can be found in the Appendix to the Plan.

4.8.3. Number of bears and capacity

The estimation of the size of the bear population is regulated by the provisions of the Hunting Act and by the provisions of the Rules on Contents and Methods of Development and Approval of Hunting Management Programmes, Programmes for Game Breeding and Programmes for Game Protection. Hunting unit leaseholders are obliged to provide yearly estimates of bear numbers, before 31 March. According to the aforementioned provisions, the number of bears is estimated based on viewing, tracking and counting of bears during a hunting year in a hunting unit's forested areas. The number is expressed by sex and age structure. The number of bears can also be estimated through other methods accepted by experts:

- aerial photography, radars, radiotelemetry, marking and others;
- the Lincoln method – partial marking;
- the identification and counting of tracks method;
- the retrograde calculation method – based on harvest data from several years, with control of reproductive increase;
- other methods.

Considering the characteristics of the bear habitat in Croatia (mountainous forested areas) and biological characteristics of the species (need for large living space, migration, denning and so on), most of the aforementioned methods for the estimation of bear numbers are not applicable and the results provided by those methods would not be useful. For that reason, the number of bears in Croatia up till now (also for the purposes of development of this management plan) has been estimated by the viewing, tracking and counting of bears during a hunting year in the hunting unit's forested areas by the hunting unit leaseholder for each hunting unit in areas where bears are present. This method has its advantages and disadvantages. The large number of hunting unit leaseholders, providing good coverage of the bear range, monitors bear numbers and migrations, is relatively cheap and for the most part excludes the possibility of systematic errors. These are all advantages of this method.

On the other hand, there are also disadvantages: the method requires a large number of well educated individuals (difficult to achieve in real life); often there is the subjective effect of the hunting unit leaseholders; and the biggest disadvantage – because of the large territories and seasonal migrations of the bears, there is the possibility that several leaseholders could count the same bear. Because of this, the number of bears counted must be adjusted with a correction index. The establishment of the correction index is often a procedure done on voluntary basis, which can again lead to systematic errors. All this shows that the estimation of bear numbers in Croatian bear habitats is a difficult and complex task. Therefore, it is no surprise that bear numbers in this document and many other similar documents are expressed as a range.

Starting with 2003, samples for genetic analysis are being collected, and starting with 2004, the number of bears in Croatia will be estimated using DNA (deoxyribonucleic acid) analysis, for determination of individual gene markers for an individual bear. Samples are taken from the fresh bear scats in the bear habitat. They are conserved in ethanol with a note on the place and time of sampling. In a laboratory, bear DNA is then isolated from the epithelial cells of the intestines, which can be found in scats. In the isolated DNA, the sequence of the nuclein base pairs is analyzed (gene code) in a number of gene segments large enough to identify each individual bear. A large enough sample offers the possibility of calculating by statistical techniques the number of bears in the sampled area with relatively high reliability. With a larger sample there is less risk for errors, and the expected accuracy is over 90%. This accuracy can be achieved when approximately one third of the individuals in the local (sampled) population are sampled.

The bears in Croatia inhabit an area of 12 000 km^2, in which a diversity of different habitat characteristics is present. Consequently, the densities of bears are different in different areas, starting from 0.5 up to 2, and in some smaller areas and shorter periods even more bears per 10 km^2. The best habitats in Gorski Kotar, Velika Kapela, Mala Kapela and Velebit, have an average density of 1 or more bears per 10 km^2. With this population density, a dispersion of younger and weaker males to the peripheral areas of the bear range (Učka, Ćićarija, Pokuplje, Priobalje etc.) is present. This indicates that, in general, one should not attempt to further increase the number of bears and, in so doing, further increase migration to the peripheral areas. In those areas, the densities of people are much higher, while their activities are more diverse and more intensive, resulting in greater conflicts between people and bears.

Currently, bear management in Croatia is regulated with hunting management programmes and the Rules on the Contents and Methods of Development and Approval of Hunting Management Programmes, Programmes for Game Breeding and Programmes for Game Protection. In bear management and in hunting management programmes in general, there are three key concepts: base game stock (BGS), reproductive increase (RI) and economic capacity of a hunting unit (ECHU). Base game stock is the number of animals present in the hunting unit before breeding. For all other game species apart from bears (breeding starts earlier, in December and January), base game stock is the number of animals on 1 April. Reproductive increase includes offspring that have survived the first year of their life, in other words – yearlings. Cubs are born during December and January in dens. They are called yearlings during the second year of their life. Base game stock (BGS) is the parental part of the population and ensures reproductive increase (RI). The sum of the two categories gives the economic capacity of a hunting unit (ECHU) (BGS+RI=ECHU). The planned reproductive increase for bears, according to the hunting management programmes, is 15% of the base game stock.

The possible base game stock was defined in the hunting management programmes as the possible number of animals per 1 000 ha (10 km^2) of the hunting productive surface (with the category of the habitat quality taken into account). In the hunting management programmes, the density of the animals (the number of animals per 1 000 ha) was 0.5 to 2.5, depending on the category of the habitat quality in each hunting unit. In this way, the possible base game stocks were calculated for 85 Croatian hunting units in which bears are managed as a game species. The 85 hunting units make up a total of 660 000 ha (6 000 km^2) in size, which is approximately 85% of the areas with a permanent presence of bears.

Based on this procedure, the total possible base game stock for bears in the 85 hunting units is 808 bears. The capacity of the habitats in which bears are present, or could be present, but in which bears are not managed and hunted, should be added to this. That includes over 500 km2 of national parks and most of the 2 570 km2 of the area described in the previous chapter in which bears are not permanently present. If we assume that bear density in the national parks is 1 bear per 10 km2 (50 bears) and in areas with occasional presence of bears 0.5 per 10 km2 (128 bears), the total base stock capacity for bears in Croatia would be 986 bears. With the expected reproductive increase of 15% (148) for the year, the total capacity could be 1134 bears.

Another approach for calculating the total habitat capacity for bears is the estimation of the portions of areas with different possible densities of bears. An analysis of the habitat quality shows that approximately 20% of the entire bear range is in the category with the highest possible density of bears – 1.5 per 10 km2 (i.e. 1 530 km2, or 90% of the central 1 700 km2 of Gorski Kotar and another 870 km2 of the central part of Kapela and a part of Velebit). In this area of 2 400 km2, 360 bears could live. Approximately 50% of the habitat is in the category with a possible density of 1 bear per 10 km2. This 6 300 km2 could support 600 bears. The remaining 30% of the habitat has possible densities of 0.1 to 0.9 (0.5 on average) bears per 10 km2, which makes a capacity of another 180 bears. The sum gives the total possible capacity in Croatia at 1140 bears. The results of this calculation are not that different from the results of the ECHU calculation. It may be concluded that approximately 1 100 bears can live in Croatia.

A separate issue is the likely difference between this biological capacity of the habitat and the so-called "wildlife acceptance capacity" (how many bears are local inhabitants ready to tolerate?). For all large carnivores, including bears, the wildlife acceptance capacity is lower than the biological capacity of the habitat. The general goal for the Croatian bear population is to keep it as close as possible to the biological capacity of the habitat, while at the same time keeping bear–human conflict to a minimum.

Currently, there are different estimates of bear numbers in Croatia, although none of the estimates were made using strict scientific criteria. Similar population size estimation methods are also being used in other countries.

When the data provided by hunting unit leaseholders in the hunting management programmes were added together, the estimated base game stock for bears for the hunting year 2002/2003 was 848 bears. The same method of calculation was used for the previous two hunting years: in 2000/01 it was 813 bears, in 2001/02 it was 854 bears.

These are the only official data. It is in the hunting unit leaseholders' interest that the estimated number of bears in their hunting unit is as close as possible to the actual situation, since the hunting unit leasing fee is dependent on the number of bears (the more bears – the higher the fee), so there is no profit in overestimating the number of bears. If a hunting unit leaseholder does not complete the planned harvest or exceeds the planned number of harvested bears, he must be sanctioned. Also, it should be pointed out that a hunting unit leaseholder has to keep the hunting unit and its game stock in the condition defined in the hunting management programmes throughout the leasing contract.

In 1997 and 1999 there were additional attempts to estimate the number of bears in Croatia. Estimates and data were collected from local experts in hunting management and bear biologists for different parts of the bear range. The estimate in 1997 was around 378 (340 to 415) bears in Croatia. This estimate was made after the war (1991-1995), during which parts of the

Croatian bear range were occupied and unavailable to Croatian hunting management experts and biologists. The conclusion at the time was that there was a 10% decrease in bear population size caused by the war and war related activities, and that the survival of the population was not in question.

Similar methods were used to estimate bear numbers in 1999. The resulting number was 623 bears, without corrections. Because of the possibility of double counting some of the bears, the estimate was corrected to the range of 400 – 600 bears. The conclusion was that the loss relating to the war had been compensated and that the trend showed population size increasing.

It should be stated that at present the precise number of bears in Croatia is unknown; however, all of the attempts at estimating bear numbers have recorded increasing trends. Current estimates conclude that bear numbers are between 600 and 1000 bears. The lower number (600) of this range is the upper limit of the 1999 estimate, with the expected positive trend. The upper limit (1000) comes from the hunting management programmes (850 bears) plus around 50 bears in the National Parks and at least 100 bears in areas where bears are not managed with hunting. Moreover, the belief is that the trend is still in a slight increase. It should also be noted that there are opinions that bear numbers are much lower than the numbers given in the hunting management programmes and that the trend is negative. On the other hand, there are also opinions that there are more bears than has been officially declared. Conditions in the field indicate that a slight decrease in bear numbers is possible only in the western part of bear habitat near the border with the Republic of Slovenia, especially after the considerable increase in bear hunting quotas over the previous two years in Slovenia. DNA analysis of scat samples is currently being implemented and the first results should be available in 2004. The estimates presented here will subsequently be narrowed down and the results will be statistically confirmed and scientifically based.

With additional feeding, poorer quality habitats can sustain higher densities of bears, while good quality habitats can sustain densities of 2 or even more bears per 10 km^2.

As a comparison, in the subarctic forest regions of Scandinavia, Siberia and Canada the normal density of bears is 0.1 per 10 km^2.– is this better? It is interesting to note that today the largest populations of bears live in these habitats. Other populations in southern and more productive areas are mostly small, endangered and with poor reproduction potential (The Apennines and the Italian Alps, the Cantabrian Mountains and the Pyrenees in France and Spain). The success of the current and future reproduction and survival of bears in Croatia depends largely on conserving the size and quality of bear habitats.

In the Appendix to the Plan are tables with detailed data on base game stock and harvesting plans from all hunting units in which bears are managed according to hunting management programmes in Croatia for the period 2000 – 2003.

4.8.4. Trends and Reproductive Increase

The counting of female bears with cubs was carried out over a 6-year period (Table 8). Counting was carried out during autumn (when the cubs were 9-10 months old) and during spring (yearlings, aged 14-15 months). The bears were counted at the feeding sites from the high stands (Majnarić, 2002).

Table 8: Number of observed females with cubs.

Year	Number of observed females	Number of cubs / yearlings	Number of cubs or yearlings/number of females
1996/1997	27	57	2.11
1997/1998	32	65	2.03
1998/1999	36	76	2.11
1999/2000	29	67	2.31
2000/2001	34	74	2.18
2001/2002	33	71	2.15
Total:	**191**	**410**	**2.15**

Table 9: Distribution of females with N cubs / yearlings (1996/1997-2001/2002).

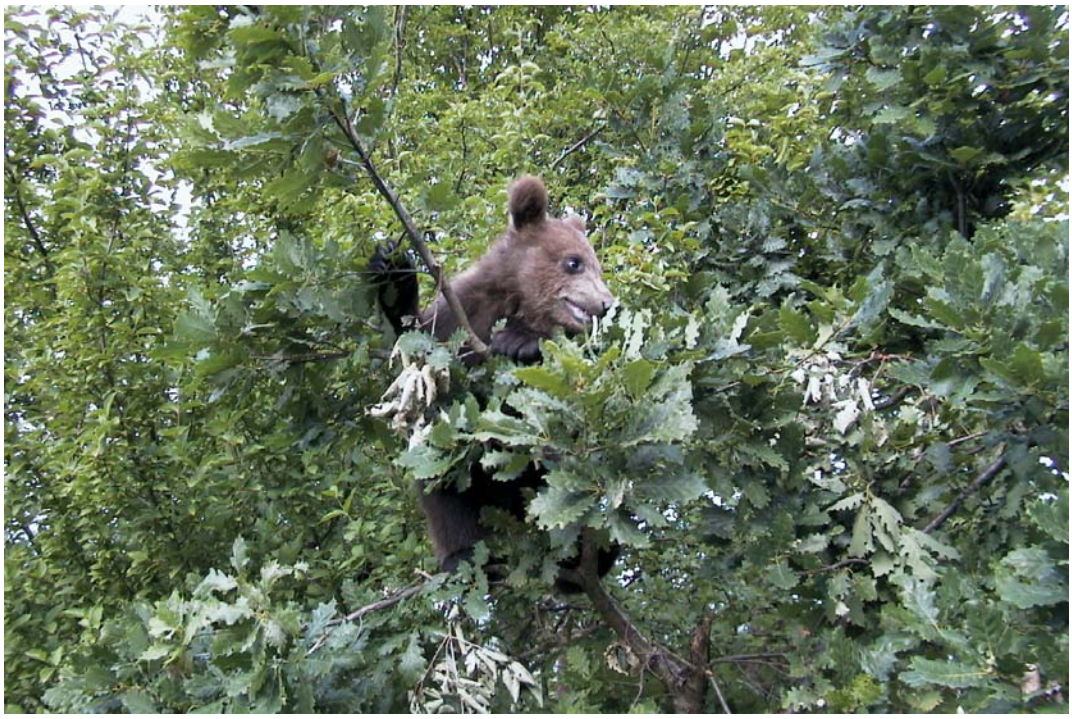
Female with 1 cub	Female with 2 cubs	Female with 3 cubs	Female with 4 cubs	Total:
28 (14.7%)	104 (54.4%)	57 (29.8%)	2 (1.0%)	**191(100%)**

The tables show that the average number of cubs or yearlings per female was 2.15. Since adult females usually give birth every second year, the average reproductive increase per year is 2.15/2 or 1.075 per adult female.

More than 50% of females had two cubs, there were twice as many females with three cubs than with one cub, and females with four cubs were rare (Table 9).

From a published scientific article on the same subject "Brown bear litter sizes in Croatia", Frković et al. (2000) (abstract):

Mean litter sizes and maximum survival of cubs of brown bears (Ursus arctos) in Croatia were calculated based on 116 observations of 106 brown bear family groups. In addition to the number of cubs, each record contained the date, age of cubs (cubs-of-the-year [COY] or yearlings), and location (feeding stations or other places). The mean litter size was 2.39 (n = 56, range 1–4) for COY and 1.96 (n = 50, range 1–4) for yearlings. The difference of 0.43 (18%) was significant (statistics). No significant difference in COY and yearling litter sizes was found between spring and fall of the same year. Significantly larger litters of all ages were observed with mothers away from feeding stations ($\bar{X}$ = 2.36, n = 47), than at feeding stations ($\bar{X}$ = 2.05, n = 59). This suggests that feeding bears in Croatia for management purposes has not influenced bear reproduction.



The high reproductive increase of bears can be attributed to the following factors:

- Favourable climatic conditions lasting for most of the year. Bears stay in their dens during the unfavourable part of the year. A radiotelemetry study of 6 bears documented extremely variable denning periods – from 6 to 189 days, or 86 days on average.
- Bears are finding enough food in nature (beech nuts are an especially important source). Most of the forests in the bear range are mixed coniferous and deciduous forests.
- For almost all of the bear range, the bears are additionally fed as a game species. However, studies have not confirmed the positive effects of supplemental feeding on reproduction.
- The current activities of people in the bear range do not disturb the bears in such a way that results in negative impacts on the bear population.

It is expected that the sex ratio is natural, i.e. 1:1. Females reach sexual maturity in 3-4 years. The ratio of sexually mature (4-20 years of age) and sexually immature (1-3 years of age) is such that sexually mature females make up over 50% of base game stock. The decrease in litter size from the first to the second years of cubs' lives was on average around 18%. This percentage was calculated from litters where at least one cub survived to the second year of its life. The number of litters that were lost completely is unknown, which means that the cubs' survival rate is also lower. A significant portion of cub mortality comes from the intraspecific killing of cubs by adult males. Also, the survival rate of yearlings after they leave their mothers and until they reach adulthood is not known. It is known that intraspecific killing and cannibalism exist during this period of bears' lives. Therefore, it is difficult to estimate the total possible reproductive increase. Theoretically, the reproductive increase could be as much as 25% of the total base

stock of bears (older than 1 year), if the possible reproductive increase is approximately 1 cub per sexually mature female. However, it is not known how many of the cubs make it to sexual maturity and participate in the reproduction cycle. In any case, before further scientific research, we can say that the total reproduction of a bear population is big enough if it successfully compensates yearly losses up to 15%.

4.8.5. Infrastructure and other human impacts

4.8.5.1. Roads

4.8.5.1.1. Motorways

It can be considered that the Karlovac – Rijeka and Bosiljevo – Split network of motorways divides the bear habitat into four parts. These roads have an impact on the habitat quality and on the ability of animals to move. However, since there are great numbers and lengths of structures on the motorways allowing the animals to cross, it is considered that sufficient permeability has been ensured.

The entire bear area of Croatia, according to above, can be presented in this way:

1. The part of Gorski Kotar and Karlovac county north of the Bosiljevo – Rijeka motorway, to the border with the Republic of Slovenia.
2. The part of Gorski Kotar and Lika south of the Bosiljevo – Rijeka motorway. The eastern and southern border is formed by the Bosiljevo – Žuta Lokva – Vratnik motorway and the highway to Senj. The western border is made by the coastal belt.
3. The western parts of Lika and the higher parts of the coastal area south of the Bosiljevo – Žuta Lokva – Vratnik motorway and the Vratnik – Senj highway. Eastern and southern border is the Žuta Lokva – Sv. Rok motorway, while the coastline makes up the western border.
4. Some parts of Kordun and the larger part of Lika, east and south of the Bosiljevo – Sv. Rok motorway and west of the state border with Bosnia and Herzegovina.

The only possible crossings between these areas for bears are habitats above tunnels and under bridges and viaducts. On the Rijeka – Zagreb motorway and the Bosiljevo – Sv. Rok motorway tunnel, bears can cross at the following points (only objects longer than 80m are shown):

Table 10: Rijeka – Karlovac Motorway.

Structure	Length (m)
Viaduct Severinske drage	700
Viaduct Osojnik	354
Viaduct Veliki Gložac	1146
Viaduct Zečeve drage	1103
Viaduct Hambarište	103
Viaduct Dobra	225
Viaduct Kamačnik	225
Viaduct Jablan II	228
Viaduct Jablan I	105
Tunnel Čardak	566
Viaduct Stara Sušica	390
Tunnel Pod Vugleš	564
Tunnel Bajt	249
Tunnel Javorova Kosa	876
Viaduct Zalesina	461
Tunnel Vršek	868
Green bridge Dedin	100
Tunnel Lučice	576
Tunnel Sopač	752
Viaduct Golubinjak	569
Tunnel Sleme	835
Tunnel Vrata	257
Bridge Bajer	485
Tunnel Tuhobić	2140
Viaduct Hreljin	535
Viaduct Bukovo	395
Viaduct Melnik	140
Viaduct Mali svib	215
Viaduct Veliki svib	385
Viaduct Čićave	300
Total:	**15847**

Data were collected from construction project documentations and directly on the sites.

Table 11: Bosiljevo – Tunnel Sv. Rok Motorway

Structure	Length (m)
Green bridge Ivačeno brdo	120
Bridge Dobra	171
Bridge Bistrica	171

Green bridge Rasnica	120
Bridge Mrežnica	92
Viaduct Krajine	386
Bridge Miljanica	476
Bridge Bjelobrajdić	276
Viaduct Modruš I	516
Viaduct Modruš II	276
Viaduct Modruš III	156
Tunnel Mala Kapela	5760
Viaduct Mokro polje	600
Viaduct Jezerane	640
Viaduct Zeleni most	131
Viaduct Borici	476
Tunnel Brinje	1625
Viaduct Babica bridge	253
Viaduct Grubori	144
Viaduct Oreškovići	340
Tunnel Kompolje	440
Tunnel Brezik	618
Bridge Gacka	443
Viaduct Obilje	251
Viaduct Vrsci	338
Tunnel Plasina	2300
Viaduct Pećine	340
Tunnel Grič	1220
Viaduct Duman	120
Green bridge Medina gora	120
Green bridge Varošina	120
Viaduct Lički Osik	81
Bridge Lika	120
Viaduct Vučjak	345
Bridge Suvaja	81
Bridge Grabara	114
Viaduct Krpani	350
Tunnel Krpani	150
Tunnel Sveti Rok	5670
Total:	**25950**

The data are from a 1:25 000 map.

The length of the Karlovac – Rijeka motorway in the bear habitat is 63.809 km.

The length of all the crossings on the same motorway is 15.847 km, or 24.8% of the length of the motorway in the bear habitat.

The length of the Bosiljevo – Sv. Rok motorway in the bear habitat is 160.648 km. The length of all the crossings on the same motorway is 25.950 km, or 16.2% of the length of the motorway in the bear habitat.

As stated earlier, the bear habitat in Croatia is to some extent fragmented by motorways with entire accompanying infrastructure, thus making communication between the fragments somewhat difficult. Results from scientific studies show that the daily and seasonal movements of bears are irregular. Also, the mobility of individual bears is related to their age and gender and to various factors in the habitat. Because of that and because of safety standards on the fast motorways in the bear habitat, it is in the general interest to achieve as much permeability through natural and artificial passages, tunnels, viaducts and also structures erected specifically for this purpose, as possible. Proportional to the need for high permeability of the motorways is also the need to secure the actual motorways with fences, thus making it impossible for animals to enter onto the motorways.

In Croatia this issue has been (and is still being) explored, including the designing of special crossings for animals, a study entitled "The Permeability of Roads for Wildlife (Proposed Guidelines for Designing)" IGH 2002, and the monitoring of effectiveness of the selected sites based on the frequency of their use by wildlife.

4.8.5.1.2. Other roads

Other public roads, either of national, county or local importance, also have important effects on the bear population. Namely, each year traffic accidents involving vehicles hitting bears happen on these roads.

Of special importance – both negative and positive – are forest roads, which are used for forest management (e.g. transport of wood, machines and forest workers, fire protection and so on).

Since vehicles move relatively slowly, the danger of hitting a bear is small. It is sure that most of the time these roads are not used on a regular basis, even though many of the forest roads are now open to the public. On the other hand, these roads can be used for poaching, for different activities such as fruit and mushroom picking, tourism, and also for illegal waste dumping. In addition, the total surface of the forest roads decreases the total surface of the forest cover.

The forest roads found in large forest complexes also have positive effects, since they represent sunny strips that make secondary forest edges and offer additional feeding possibilities. A prerequisite for this function are certain limitations on public access to the forest roads.

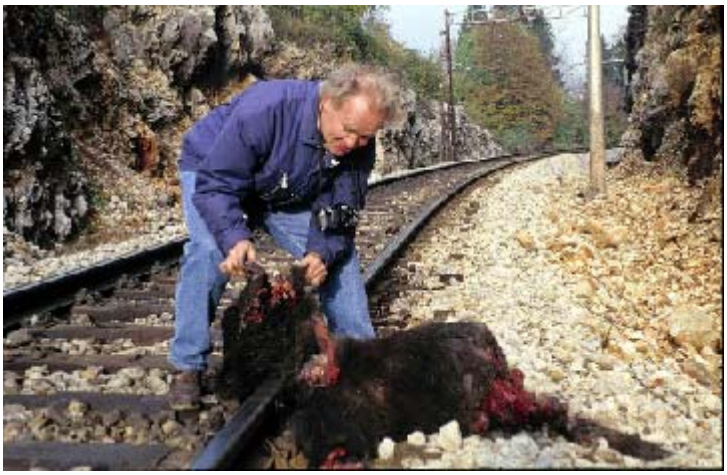
The average density of public roads (i.e. main, regional and local) in Gorski Kotar is 0.83 km/km^2, ranging from 0.59 km/km^2 in the Čabar area and 0.72 km/km^2 in the Delnice and Vrbovsko areas to 1.31 km/km^2 in the coastal areas. Together with forest roads, the total average is 1.91 km/km^2.

The area managed by the Delnice Forest Administration, covering most of Gorski Kotar (state and privately owned forests), has 18 km of forest roads per 10 km^2. The Gospić Forest Administration area has 8 km of forest roads per 10 km^2.

The current density of forest roads does not have any notably negative impacts on the bear population in Croatia.

4.8.5.2. Railway Lines

There are two railway lines in the bear range of Croatia: the line from Karlovac to Rijeka has 143.4 km in the bear habitat and the Lika railway line from Oštarije to Knin has 213.3 km in the bear habitat. The railways themselves are not an obstacle to bears, however, a large number of bears gets killed on railways in traffic accidents: 70% of all traffic caused mortality (Huber et al. 1996). Especially dangerous are tunnel openings and places where the railway is set in a gully.



4.8.5.3. Garbage

Garbage is an inevitable by-product of the progress of technology and civilization. The waste from larger towns and communities is mostly managed in an adequate way, albeit at questionable locations, inherited from the times when waste management was not considered to be an important issue.

Garbage dumps which are not organized in a satisfactory way and illegal garbage dumps located at easily accessible sites of relatively small visibility represent a potential danger in bear areas or close to bear areas.

The danger for bears is indirect and with long-lasting significant effects. Adult and subadult bears – instinctively following the easiest way of getting food – are regular visitors of these locations. These bears lose their instinct for constant food searches over large areas, they gradually also lose their innate fear of people's scents, and finally they become potentially dangerous to people. Whole families of young subadults with mothers who have grown up near the garbage dumps represent an even bigger danger. The chances that fatal incidents will occur when a man encounters such a bear are much larger and can result in negative changes in public attitudes (which were formed over a long period of time and which are currently positive).

The following is based on a report by the nature protection inspection of the Ministry of Environmental Protection and Physical Planning (the Delnice Forest Administration has provided a detailed report on illegal garbage dumps in the Primorsko-goranska county).

THE KARLOVAC COUNTY

There are three garbage dumps (Pavlovac – Slunj, Kvaternik – Slunj and Sodol – Ogulin) in which garbage is deposited on a regular basis. The garbage dumps are in poor condition and should be restored and closed.

THE LIKA-SENJ COUNTY

There are eight garbage dumps in this county (Poljica – Kosmačevo, Vidovac – Karlobag, Rakitovac – Počuča brdo, Korenica – Plitvička jezera, Klanac – Prokike – Brinje, Dugi dol – Bajino brdo – Vrhovine, Bare – Donji Lapac, Razbojište – Kvarte). The garbage dumps Poljica – Kosmačevo, Vidovac – Karlobag, Rakitovac – Počuča brdo and Korenica – Plitvička jezera have satisfactory conditions, while all the others should be restored and closed.

THE PRIMORSKO-GORANSKA COUNTY

In this county, the inspection registered and examined three garbage dumps (Peterkov laz – Čabar, Sović laz – Delnice, Cetin – Vrbovsko). In the Sović laz garbage dump the first phase of the restoration has been finished, Cetin Vrbovsko needs to be improved, while Peterkov laz should be restored and closed.

4.8.5.4. Mines

Along the entire eastern border of the Croatian bear range with the Republic of Bosnia and Herzegovina there is, in some places narrow and in some places very wide, a belt with land mines –remnants from the war (1991-1995).

There are areas with a confirmed presence of mines (minefields) and areas in which the presence of mines is suspected. Minefield areas are relatively small. They make up 50 km^2 of the entire bear range (11 800 km^2). The areas in which the presence of mines is suspected are considerably larger and make up at least 500 km^2 of the bear range. These areas have to be examined and the assumed presence of mines has to be either confirmed or refuted in times to come.

Demining of the confirmed minefields and the examination of the suspected minefields is extremely costly and the Republic of Croatia cannot ensure the necessary resources in a short period of time. In view of this fact, a long-term strategy for demining was adopted, followed by short-term plans. The entire demining project will not be possible to carry out in less than 10 years.

With regard to bear management, it is important to note that bear habitats (large forest complexes) come last on the demining priority lists.

Therefore, the problem of landmines in bear habitats will be present for quite some time.

Part III – Bear Management

5. GOALS

The general goal of this Plan is to conserve a stable brown bear population in Croatia in numbers that will ensure its viability and coexistence with humans.

Special objectives for achieving the general goal include (not in order of priority):

- 1. Conservation of the habitat
- 2. Application of international regulations
- 3. Avoiding the danger for humans and their property
- 4. Defining and subsequently achieving the desirable bear numbers
- 5. Realization of economic profit for local inhabitants through tourism and hunting
- 6. Increase in public awareness and involvement of the interest groups in decision-making related to bear management.

6. DESIRABLE NUMBERS (CAPACITY)

6.1. Capacity

A comprehensive analysis of the bear habitat in Croatia (12 000 km^2) indicates that the possible size of the bear population (biological capacity) is around 1 100 bears. The desirable capacity (social capacity, opinions of the public) for bears in Croatia is around 900 bears. This number is based on current knowledge, however, it is possible that new monitoring results (DNA analysis) and future experiences in bear-human coexistence will change the desirable capacity for bear population in Croatia.

With additional feeding of bears, habitats of poorer quality could also sustain higher densities of bears, while good quality habitats could sustain densities of 2 or even more bears per 10 km^2.

7. ZONING (AND OPPORTUNITIES FOR EXPANSION)

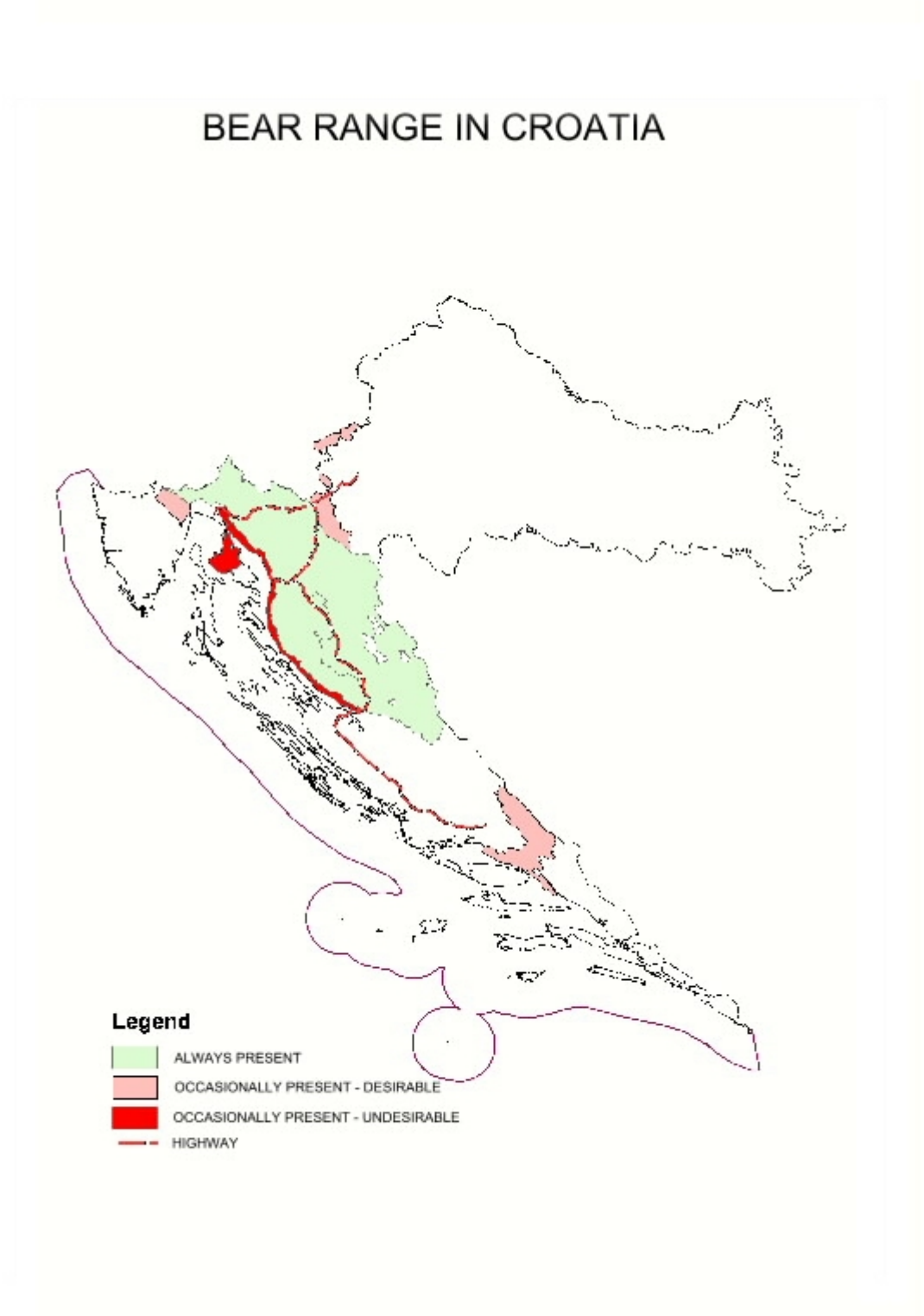
Bears inhabit areas in which they can satisfy their vital needs. Based on the habitat quality and possibilities for coexistence with people, the bear's living space in Croatia can be categorized into 4 types of areas:

PERMANENT PRESENCE

OCCASIONAL PRESENCE where it is acceptable

OCCASIONAL PRESENCE where it is unacceptable

ACCIDENTAL PRESENCE OF BEARS



A map showing these four zones is in the Appendix to this Plan. It should be noted that the bear habitat in Croatia is not fragmented. Areas with permanent and occasional presence of bears are connected to the corresponding areas in the neighbouring countries, Slovenia and Bosnia and Herzegovina, thus making up a **shared and continuous bear population of the Dinara eco-region**.

7.1. Areas with permanent bear presence

This is an area of high karst and, in most of its part, managed forests. The size of the permanent presence area is 9253 km2. At the same time, this is an area with low densities of people and, therefore, a tolerable amount of bear – human conflict situations.

This area can be divided into zones in which bears are managed according to hunting management programmes, or there is the intention to start bear management, and zones in which bears are not managed and there is no intention to start management. The central bear management areas, without national parks, total 8 718 km^2 in size.

The largest portion of hunting quotas should be planned for this area and harvesting should be performed according to that plan in order to prevent dispersion of bears into peripheral areas, thus also preventing conflicts with people. Also, in order to keep bears from dispersing, bears should be additionally fed in this area.

The central area includes four national parks with a size of 535 km^2, or 5.8% of the total central area. No economic activities were planned in the national parks, as well as no supplemental feeding of bears, with the exception of scientific studies and ecotourism activities.

7.2. Areas with occasional bear presence

The areas with an occasional presence of bears are in spatial continuation to the permanent presence (central) area and are less favourable for bears. They include areas of managed and other forests and the density of people is much higher than in the central part of the bear range. Based on possible conflict with people, this area can be divided into a zone where the presence of bears is desirable and because of that can in the future be reclassified as an area of permanent presence of bears, and a zone where the presence of bears is not desirable. Total size of all the areas with occasional bear presence is 2 570 km2.

7.2.1. The zone with an occasional and desirable presence of bears is 1 793 km2 in size and includes parts of Bosiljevo, the upper streams of Mrežnica and Korana, Zdihovo, Vukova Gorica, Lipnik, the Kamešnica mountains, Mosor, Biokovo and Žumberak (Figure 5).

Bear harvesting is planned in this zone, however it is considerably less intensive than in the permanent presence of bears area.

7.2.2. The zone where bear presence is not desirable is 778 km2 in size and includes the coastal areas from Bakar to Maslenica and the island of Krk as well as other islands of the Adriatic Sea. This zone has higher densities of human population and developed tourism, thus with high potential for bear – human conflicts. Extreme care should be taken to prevent the

attraction of bears to this zone with food sources (e.g. garbage dumps, food along roads and railways). The supplemental feeding of bears is prohibited in this zone.

Bear harvesting is regulated with special permits. The goal is a complete absence of bears. The criteria for bear hunting are described in Chapter 9 – Actions directly affecting the bear population.

7.3. Accidental Presence of Bears

This area includes all the other parts of Croatia. Since bears are found there only exceptionally, there are no planned activities, except in case of conflict situations.

8. MONITORING OF THE BEAR POPULATION AND MORTALITY

The status of the bear population is to be constantly monitored through systematic collection of all data on living bears and bear mortality.

8.1. Monitoring of the population dynamics

The monitoring of the bear population is to be performed through observation and counting of the bears at the feeding sites and through monitoring of other signs of bear presence in the habitat. In particular, a record is to be kept of the number of family groups consisting of a mother and cubs in their first or second year of life. Special forms will be used for the record keeping. This sort of monitoring will offer insight into population trends.

Genetic identification is to be used to determine the absolute number of bears. Samples of fresh bear scats will serve as the material for DNA extraction used for genetic identification. From a sample from the surface of a fresh bear scat that is collected, marked and preserved in alcohol in accordance with a standard protocol, a large enough quantity of DNA can be extracted in a laboratory procedure to individually recognize the bear from which the scat originated. A large enough sample of scats collected in a specified area and during a limited time period enables an estimation of the total size of the bear population with an error margin of less than 10 %. Using this data, the index showing population trend acquired through the counting of sighted bears can be calibrated. A genetic estimate of the total population size is planned every three to five years. Besides the total numbers, these genetic methods enable insight into the effective population size (part of the population participating in reproduction), the extent of genetic diversity of the researched population, the number of males participating in reproduction as well as the gene flow in the wider area or across borders of neighbouring countries that share the same bear population with Croatia.

Since the genetic method for estimation of population size is scientifically based and objective, it is expected to serve as a basis for management decision making and to be accepted by all interest groups.

8.2. Monitoring and analysis of mortality

Every bear mortality is to be recorded. Measurements and samples are to be taken in accordance with a prepared form. The information about bear mortality is to be reported to the competent ministry within a 24-hour period.

The form for the mortality data will include the date and place of occurrence, the cause of mortality (if the bear was shot, then also the data about the hunter and the trophy value) as well as basic measurements (total length and measured weight), sex and age. Further, basic samples are to be collected: one of the rudimentary molars for age determination (preserved dry in a paper bag), a piece of soft tissue for genetic analysis (kept in a freezer) and a sample for Trichinella investigation. Collecting of additional measurements and samples will be agreed upon if required.

Every bear fur and skull is to be individually marked. Marking tags, their distribution and method of application are to be determined by the competent ministry.

9. ACTIONS DIRECTLY AFFECTING THE POPULATION

9.1. Hunting

9.1.1. Hunting season

The bear hunting season in a specific calendar year is to last from 1 February until 30 April and from 15 October until 31 December, which is 45 days shorter than the current hunting season.

9.1.2. Cull quota

On the state level, a total annual cull of 10 to 15% of the total estimated number of bears is planned. This percentage is determined with respect to the actual established trend of population growth. A quota of 15% can be used if the trend shows an increase or if there is a need to slow this trend down or stop it. If such an action doesn't change the trend, and objective problems with a local number of bears exist, a larger action directly affecting the population can be applied by way of exception over a limited area. If a negative population growth trend is recorded, the quota can be set below 10% or the cull can even be suspended in certain years or areas. The percentage for calculation of the quota and the total number of bears planned for culling in the next calendar year are determined on the basis of the capacity of the habitat, the population size estimate and the population growth trend. It can be expected on the basis of current experience that the proportion of harvest in total cull will be 80%, and that 20% will be attributable to other losses. If the total annual quota is exceeded, this surplus cull is to be subtracted from the next year's quota. Likewise, if deviations appear from the expected proportion of harvest in total cull, the percentage for calculation of quota is also to be amended.

The cull quota includes legal harvesting, poaching, culling of problematically behaving bears, bear mortality caused by traffic and other anthropogenic causes, as well as the removal of live bears from the population.

Young bears following their mother and females leading their young are not to be shot.

9.1.2.1. Quota distribution and hunting rights

9.1.2.1.1. The criteria for quota distribution

The basic criteria for the distribution of quota are:

- quality and size of available habitat;
- population density.

In the zone with the best quality habitat and permanent bear presence, the presumed bear population density is 1.5 to 2.0 bears per 10 km2. This density permits an annual harvest of 0.15 bears per 10 km2. This applies to the central part of Gorski Kotar, Velika Kapela and Mala Kapela, and Northern and Central Velebit (approximately 2400 km2). Such parameters define a possible harvest of 36 bears in that area.

In the rest of the zone with permanent bear presence (6300 km2) the presumed density is 1.0 bears per 10 km2. This density permits an annual harvest of 0.1 bears per 10 km2. Such parameters define a possible harvest of 63 bears in that area.

In the zone with occasional bear presence (2570 km2) the presumed population density is approximately 0.5 bears per 10 km2.

In the part of this zone where there are no conflicts between bears and local residents (1793 km2) the permissible annual harvest is 0.05 bears per 10 km2. The possible harvest in this area is up to 8 bears.

In the part of this zone where bear presence is not desirable (e.g. islands, coastline, urban areas: 779 km2) there are no limitations regarding the harvesting of bears to avoid conflicts with local residents. These killings are not treated as part of the harvest quota; they are considered as other population losses. For culling of any such bear the competent ministry issues a permit after the presence of that bear has been confirmed several times, whether or not that bear has caused any damage and regardless of the bear hunting season. The culling of a bear is not permissible before that same bear appears several times in different days, since the killing of a bear that is just passing through the area is to be avoided.

Before culling of a bear is permitted, a competent body must ascertain that there are no recognizable motives (anymore) causing the bear to appear in that area, that all such motives were at least partially removed, or, respectively, that the organization or person responsible has been warned in writing and instructed regarding actions that should be taken. The person suffering damages has no right to compensations if he hasn't guarded his property appropriately.

All islands on which bears appear (Krk) and on which they might appear are excluded from the management. Fulfilment of the conditions necessary to attain permission for the culling of a bear in other areas where bears are not managed according to the hunting management programmes is not required for the islands.

The culling of undesirable bears will be done by a local hunting unit leaseholder. In doing this he is allowed to use other group or individual hunting methods as well. If he doesn't wish to or is not able to perform this task within the specified time frame, the Ministry will allow other executors to cull the bear.

9.1.3. Hunting methods and hunting tools

Until now, bears have been hunted by individual hunting, with the hunter waiting on a high hunting stand next to a feeding site during a full moon, in accordance with the provisions of the Hunting Act, as described in the "Current Management" chapter. This Plan presumes the further use of this hunting method.

Advantages of bear hunting from a high hunting stand:

- It provides a good vantage point for observation, determination of age and sex category of the bear and for hunting itself.
- It reduces the possibility of wounding the bear.
- Minimal disturbance of the habitat.
- Usually, there is a forest road leading to a hunting stand with a feeding site, which makes access to the stand, transportation of food to the feeding site and manipulation of the killed game simple and easy.
- It is the safest hunting method for the hunter, the accompanying person and everyone around.
- Enables the most efficient implementation of harvesting control.

9.2. Supplemental feeding

Supplemental feeding with food of plant or animal origin is a common bear management measure.

A detailed description of the type of food the bear uses in the wild is presented in the preceding chapter. Bears are omnivores. Most of the food they take is of plant origin, and may account for up to 95% of their diet, depending on the season. Besides plant food, they also need protein-rich food to maintain normal metabolism. Bears increase their consumption of protein-rich food (mostly) in spring. Of the protein-rich foods it eats insects, invertebrates, rodents and carrion. It can attack young large game and domestic animals.

The reasons for supplemental feeding are:

- To keep a bear in the desired part of a habitat to prevent it from getting close to human settlements.
- To reduce damage to people's property.
- It provides a chance to observe and monitor trends of bear population growth.
- Possibility of administering health treatment.
- Increase of the habitat carrying capacity, population growth and reproductive increase.
- Eco-tourism (photo-hunting) and education.
- Execution of the planned harvest.

9.2.1. Time of supplemental feeding

The supplemental feeding of bears can be carried out up to 120 days per year in November, February, March and April.

The aim of limiting supplemental feeding days is to keep bears from getting used to or becoming dependent on food from human sources.

9.2.2. Supplemental feeding sites

Feeding sites will be designated for the supplemental feeding of bears. These structures can be constructed in small forest clearings next to roads with year-round access, making it always possible to get to the feeding site.

A maximum of one feeding site for the supplemental feeding and hunting of bears can be constructed per 40 km^2. Hunting units smaller than 40 km^2 can have one feeding site with a hunting stand, but it can be active (i.e. food is placed there) only during a year in which that hunting unit owns a permit for the shooting of a bear. A feeding site must be at least 2 km removed from the closest permanently inhabited human settlement. The minimum distance from the feeding site to a border of a national park must be 300 m. Their location must be chosen in a manner that prevents contamination of water sources, waterways etc.

Bears shouldn't receive supplemental feeding in protected areas, with the exception of sites arranged for the observation and filming of bears for educational and commercial purposes.

9.2.3. Types of food

Grain, wet fodder and meat products, as well as special surfaces planted with annual and perennial crops are used for the supplemental feeding of bears. The grains primarily used are corn, oats and barley. It is permitted to supply a maximum of 300 kg of grain per adult bear during the supplemental feeding period (up to 120 days per year). The wet fodders used for supplemental feeding of bears are sugar or fodder beet and various fruits. A maximum 300 kg of wet fodder per adult bear can be supplied during the bear supplemental feeding period. The meat products used should primarily consist of carcasses of dead animals (which have been inspected

by a veterinarian before being supplied to the bears). If not enough animal carcasses are available, condemned meat from slaughterhouses may also be used. It is permitted to supply a maximum of 400 kg of meat foods per adult bear during the bear supplemental feeding period. Other animal species also come to the specially constructed bear feeding sites, for example wild boar, wolves, foxes, martens, birds etc. Besides the listed supplemental bear foods, annual or perennial crops may also be planted with the goal of improving the nutrition of bears. This primarily includes oats. These fields are not only used by bears, but also by other game. They should be located in forest clearings, as far away as possible from human habitation areas.

Likewise, the bears utilize the feeding sites of wild boars and deer. It is desirable to keep the number of such feeding sites that attract bears as low as possible. Within the bear range the number of feeding sites for wild boar and deer should be as prescribed in the hunting management programme, but not more than this. These feeding sites must also be sufficiently removed from places of human habitation or borders of national parks.

10. CONSERVATION OF THE HABITAT

The Croatian bear habitats, as well as those of the entire Dinaric and Pindos mountains area, are very valuable and can be compared with the highest quality habitats in the Carpathian region. This has been shown in detail in previous chapters. These habitats, as confirmed by several different studies (Cicnjak et al., 1987; Huber and Roth, 1992, 1993; Huber and Frković, 1993; Kusak and Huber, 1998; Frković, 2001; Frković et al., 2001; Majnarić, 2002), allow for high population increase, population stability, and actions directly affecting the population that would not be possible in many parts of Europe with bear presence.

The basic prerequisite for the production and implementation of the Brown Bear Management Action Plan in Croatia is the conservation of the habitat. When discussing the bear habitats in Croatia, the following must be emphasized:

- they are an integral part of the Alps-Dinara-Pindos region of bear distribution in Europe;
- they are homogenous and not fragmented, in the meaning that strictly separate areas of bear presence exist;
- they are associated with extensive natural forest ecosystems;
- they are connected with habitats of equal quality in neighbouring Republic of Slovenia and Bosnia and Herzegovina, allowing unrestricted migration of bears.

10.1. Measures for habitat conservation

Constant monitoring of habitat status and possible changes is required for the correct identification and subsequent implementation of the measures for its conservation.

10.1.1. Identification of:

- bear range;
- habitat suitability for bears;
- habitat quality.

10.1.2. Transportation infrastructure

- all types of existing infrastructure and its effect on bear habitats are to be identified;
- all types of planned infrastructure and its effect on bear habitats are to be assessed;
- construction of new and modernization of the existing roads and railroads through the bear habitat is to be prohibited until the requirements set by the Law on Nature Protection are met;
- when construction of roads or railroads is inevitable, it should be attempted to:

- avoid intersection of the most vulnerable parts of the habitat (e.g. Greece);
- enable passage of bears and other animals across fast traffic roads (with tunnels, viaducts, green bridges) (Permeability of Roads for Animals – Design Guidelines, 2002);
- roads used for forestry are to be excluded from public use.

10.1.3. Conservation and improvement of forest ecosystems

- identification and evaluation of current status;
- adoption of long-term forestry development guidelines (Forestry Strategy), natural restoration, mixed forest stands, conservation of nut-bearing beech and oak trees;
- evaluation of the parts of nature placed under special protection;
- planning to increase the size of the parts of nature placed under special protection.

10.1.4. Agricultural development

- the existing agriculture is to be identified and evaluated;
- planning and assessment of future actions in this field (avoidance of intensive crop production over large areas, preventing the promotion of intensive livestock production in open spaces).

10.1.5. Sport and tourist facilities and activities

- current status and the effects on bear habitation are to be identified;
- construction of such facilities and activities is to be banned from the central part of the bear range unless they meet the requirements set by the Law on Nature Protection;
- tourist and sport activities that disturb peace and quiet in bear habitats are to be banned;
- all activities resulting in damage to bear habitats are to be avoided.

10.2. Garbage

Every food source that is treated as garbage – food scraps, garbage in various garbage cans and containers or garbage deposited in legal or illegal garbage dumps – must be inaccessible to bears.

On such sites bears start associating the smell of humans with a positive experience, this being the opposite from experiences they had before. A bear with such experiences might not try to avoid humans in every contact, or may even become habituated to humans. This does not mean that the bear is dangerous per se, but such behaviour is certainly very undesirable.

Prevention of bear access to garbage:

1. Garbage dumps should not be located in bear habitats. Where this cannot be avoided, a garbage dump should be fenced-in in a manner that prevents bears from accessing and feeding on garbage. The most effective method is to surround the garbage dump with an electric fence. The entrance gate to the garbage dump should be closed.
2. Illegal garbage dumps should be cleared. Perpetrators should be penalized.
3. Containers for the collection of garbage before it is being transported to a garbage dump should be inaccessible to bears. Additionally, they should be made of sturdy metal and always closed in a manner that prevents a bear from opening them. They should be emptied on a regular basis and there should never be garbage lying around them.

4. Household garbage bins should be kept inside structures that are inaccessible to bears. They should be placed out in the open only during the day, immediately before pick-up.
5. Trash cans in bear habitats should be made of metal and equipped with covers which can prevent bears from accessing their contents. They should also be emptied on a regular basis.
6. The dumping of food remains in bear habitats should be banned and people should be educated on this issue.

11. PROBLEM BEARS

Bears who do not flee from humans are potentially dangerous. Loosing their fear of man does not mean that the bears will become more aggressive; however, the actual danger is significantly greater. Some people will try to get closer to such a bear to get a better look or picture, while others will shoot and wound it. In both cases the bear may respond with an active defence. Besides, frequent sightings of a single bear habituated to humans often make people think that bears have multiplied beyond reasonable numbers. Some bears habituated to humans will start causing regular damage in their search for food from human sources, and thus become

problem bears. Their behaviour is difficult to amend. Such bears usually end up getting killed by traffic, shot in so-called self-defence or killed through planned culling.

Measures preventing the appearance of problem bears:

A) Preventing habituation to foods from human sources.

These measures include all the measures listed in the chapter on the prevention of garbage feeding (Chapter 10.2.).

All other human food sources (e.g. food stores, orchards and gardens next to houses, means of transport, places for reloading of cargo etc.) which might attract bears should be appropriately fenced in, protected or removed.

B) Preventing the appearance of bear cubs who have lost their mothers.

Bears which have lost their mother before the time of physiological separation are particularly inclined to search for food close to humans. The following should be done:

1. Measures should be taken to decrease the probability of appearance of orphan bear cubs: a) special care in hunting operations, b) prevention of poaching, c) avoidance of disturbance in habitats during winter months (from December until April), especially around known bear denning sites.
2. It is prohibited to feed a motherless cub bear when one appears.
3. A bear cub that loses its mother during the first 4 to 5 months of its life cannot survive in the wild. If it is taken and fed artificially, then it will have to be kept in some sort of enclosed space for its entire life. Such bears may be taken by a specialised shelter, within the limits of its capacities. (In Croatia, at the time of preparing this plan, a shelter like that exists in Kuterevo.) If such facilities are not available, no artificial feeding of orphan bears of that age should be started. Bear cubs that were orphaned at the end of May or later in their first year of life have certain chances for survival in the wild, but will behave normally only if people do not feed them and if they do not find food in garbage.

Measures for dealing with problem bears

A bear that has become habituated to humans or has started making problems is difficult to cure of such undesirable behaviour. Possible measures are:

1. Prevention of access to food sources it regularly visits.
2. "Negative conditioning" – curing of the habit through unpleasant stimuli:

- noise from various acoustic simulators;
- electric shocks from electrical fences;
- shooting with noise-making ammunition;
- shooting with rubber bullets.

3. Removal of a bear for which the preceding measures did not work:

- Capturing and relocation. This is not advisable in our conditions, as there are always human settlements within any area of size to accommodate a bear's homerange.
- Capturing and putting into captivity. This is possible only for young bears (less than one year old) that can adjust to such a life and only when they can be kept in captivity for the rest of their lives (20 to 30 years).
- Lethal measures. Shooting or capturing and euthanasia.

4. Sick and wounded bears.

If a bear appears that is suffering from an injury or disease and is temporarily incapable of surviving on its own in the wild, the possibility of medical treatment can be considered only if the bear can be helped by a single treatment performed on-site.

12. BEARS AND TOURISM

Chapter 6.3. of this Plan describes in detail the fundamental factors that define the bear habitat in Croatia. The bear habitat in Croatia covers an area larger than 11 800 km^2 of hills and mountains mainly covered with forest vegetation. It has a low density of human population and a typical rural character. Besides the conserved biological and ecological values there are few other comparable advantages in this area. The gross domestic product of this area is considerably lower than in other parts of Croatia; people are leaving the area and the local economy is in decline, in comparison with the Croatian economy overall.

This large part of the country is threatened by the construction of large infrastructures connecting the more developed continental parts of the country with similarly developed coastal parts. Furthermore, this area is being used for the disposal of different types of waste. At the same time, local administrations and local communities hardly benefit from any of the abovementioned activities, which could cause a lot of problems in the future.

Because of this, it is important to gain the maximum value of the presence of bears and to use it for the benefit of the locals. Here it should be noted that Croatian bear areas are also inhabited by the remaining two large carnivores: the wolf and the lynx. These two species are completely protected by law and cannot be hunted; however they have considerable impacts on hunting management because they use game animals as food. Owing to this, it is important to ensure enough financial resources from the bear hunting fees and from the other ways of using bears, wolves and lynx, for the conservation of these species and for the benefit of the local population.

Brown bears have been both persecuted and valued by people through the centuries. They have been, as with other large carnivores, considered a menace and hunted down – resulting in reduced numbers in most of Western Europe. More recently, bears have been valued for trophy hunting. In some areas, their numbers have been maintained by hunters, who have eventually helped bear populations to survive and recover.

Today, the presence of a healthy bear population is a sign of a high-quality forest and thus the availability of resources such as timber, mushrooms, berries and game animals.

Bears are a symbol of the richness of nature and it is known that the quality of the natural environment is one of the main factors in tourism. Local communities can use this symbol to increase the market value of the local traditional products, such as handicrafts. For instance, the creation and use of a "bear label" on local products would mean that the products are derived from a well-maintained forest.

For wildlife enthusiasts the presence of bears can considerably enhance their wilderness experience. Research has shown that the majority of residents in bear areas feel that the animal's presence attracts tourists, bringing economic benefits to local communities. Besides the "hunting tourism" already mentioned in this Plan, bears can be used in other ways for tourism purposes and within a concept usually called "ecotourism". According to the International Ecotourism Society, ecotourism can be defined as "responsible travel to natural areas that conserves the environment and improves the well-being of local people" (2003). The concept therefore includes so called "non-consumptive" use of natural resources.

This chapter will primarily attempt to cover the possibilities of non-consumptive utilisation of bears in producing economic benefits for the local people.

Although this is a bear population management plan, this chapter shall also analyse and propose some activities related to bears in captivity. There are two main reasons for this:

1. Some of the bears in captivity were taken from the wild.
2. Bears in captivity can be used for achieving some of the objectives of this plan (for example, education of the public about bears).

Shackley (1996) mentions four main factors that influence the development of the non-consumptive use of wildlife in tourism:

- The global increase in a variety of tourism products;
- Cheaper and faster journeys to tourism destinations;
- Increased public awareness about the environment;
- The search for sustainable substitutes to mass tourism.

We believe that it is important to plan and develop the usage of bears in Croatian tourism according to the aforementioned global changes.

12.1. Bears in the wild

In the context of tourism, there area three different categories of areas which bears inhabit in Croatia. These are protected areas, hunting units and mountaineering destinations. The three categories can overlap. Visitors to these areas come in contact with the bears, which can result in different effects both on the visitors and the bears. The key issues regarding the interactions of visitors with bears that need to be dealt with are:

- The disturbance of bears;
- The habituation of bears to people;
- The safety of visitors;
- The satisfaction of visitors;
- The visitors' carrying capacity.

For the purposes of this plan we use the following definition of the visitors' carrying capacity: the highest possible level of utilization of an area by the visitors with the highest possible level of visitor satisfaction and the lowest possible level of the negative impacts to the bear population. Such an approach is particularly important in the protected areas and because of that it is necessary to carry out objective and quantitative scientific studies on:

- The levels of visitor disturbance to the bears;
- The visitor satisfaction levels during a visit to a protected area.

In order to avoid the disturbance and habituation of bears and ensure the safety of visitors, it is important to educate visitors about the correct ways of behaving in the bear habitat (through brochures, flyers, signs on the hiking trails, lectures etc.), and if necessary, to limit the areas accessible to visitors or to limit the number of visitors in certain areas or times. It should be noted that the remaining activities related to these issues can be found in the Chapters "Garbage" and "Problem bears".

With the aim of increasing their satisfaction levels, visitors can participate in the following controlled activities:

- enjoying the bear habitat;
- searching for, observing and photographing (filming) signs of bear presence;

- observing and photographing (filming) bears from high stands near bear feeding sites;
- participating in the activities of researchers and/or park rangers; and
- education about bears.

12.2. Bears in captivity

Institutions that keep bears in captivity should use the bears with the aim of educating and entertaining visitors, as well as creating economic profit.

The bears must have:

- Suitable enclosures with sufficient space for moving, in which the animals will not get bored and which are the best possible copy of their natural habitat;
- Proper nutrition;
- Peace and quiet.

The visitors should have:

- Safety;
- Education about bears;
- Entertainment;
- The chance to spend money.

13. MINIMIZING AND COMPENSATING DAMAGE

13.1. Minimizing damage

13.1.1. Measures to be undertaken by hunting unit leaseholders and other bear managers:

Develop a plan for the prevention of damage (seasonal measures, measures by different crops and so on);

Gather and distribute instructions on how to prevent damage;

Supplemental feeding of bears, with the purpose of keeping the bears away from human goods;

Keep the size of the population at a level with tolerable damage.

13.1.2. Measures to be undertaken by the land users:

Report damage and possible damage to the hunting unit leaseholders;

Allow proper implementation of the protective measures by the hunting unit leaseholders;

Correctly use protective equipment;

Harvest crops within agrotechnical timeframes.

13.1.3. Other measures

Includes all other measures defined in the chapters Garbage (10) and Problem bears (11) related mainly to the bears' access to garbage and other human-sourced food.

13.2. Compensation of damages

The current legal practice makes hunting unit leaseholders responsible for all damage caused by game, regardless of the location of their occurrence. There is no doubt that a bear can cause damage with material value several times higher than what a leaseholder can compensate. This can endanger bear management and game management in general.

Any damage which has been proven to be caused by a bear must be compensated in as short a timeframe as possible. If the person suffering the damage has not added to the damage with irresponsible behaviour, the compensation has to cover the entire damage.

Taking into account the current legal provisions and the current case law concerning the responsibilities for bear-caused damages, the following is proposed:

- where bears are managed according to the hunting management programmes – damage should be compensated by the hunting unit leaseholder according to the location of the damage (remains the same);

- in hunting units where bears are not managed by hunting management programmes, yet where bears are, more or less, constantly present, the damage will be compensated by the state. Where bear hunting has been allowed, the hunting unit leaseholder becomes responsible for the compensations.

- in cases when a bear causes damage in an area with only accidental presence of bears or in national parks, damage will be compensated by the state.

Additional proposals:

An examination of the possibility of establishing a special fund for the compensation of bear-caused damage, regardless of the location of the damage. Resources for the fund would come from different sources (e.g. hunting unit leaseholders, local administration, fines and others). The fund would be state-owned.

The long-term solution should be that all compensation for bear-caused damage is paid from a central source, preferably an insurance fund. This approach would be particularly suitable for compensation of damage resulting from bear-vehicle collisions, since this damage can be very large and not all of the leaseholders can compensate them.

Besides amending various legal provisions, a single method for evaluating the damage should be developed, as well as criteria related to justification of the compensation claims.

14. PUBLIC INFORMATION AND PARTICIPATION IN DECISION-MAKING

In order to improve the quality of bear management in Croatia and to avoid conflicts between different interest groups, in coordination with the Bern Convention recommendations for Croatia, the following activities have been planned:

A) Education and information campaigns for different target groups.

With the aim of ensuring public support for bear management and to prepare the public for constructive participation in decision-making, the public has to be informed correctly and in time. Depending on the targeted groups, the ways and volumes of the informing have to be adjusted.

1. Local inhabitants of areas with permanent bear presence

Accurate information has to maintain the current level of acceptance of bear population. Special care should be directed towards educating the public about measures for the prevention of damage and of the direct dangers to humans, as well as avoiding behaviour which can lead to the creation of problem bears. The public should be informed about the progress of bears and the ways of utilizing them in the local economy.

2. Local inhabitants of areas with occasional presence of bears

Emphasis should be placed on education about the biology of bears, in order to avoid panic reactions related to the presence of bears. Here as well special care should be directed towards educating the public about measures for preventing damage and of direct danger to humans, and about avoiding behaviour which can lead to the creation of problem bears. The public should be informed of the potential value of bears for the local economy.

3. Inhabitants of areas where bears are not present

All Croatians should be familiar with the basics of bear biology and accept and appreciate the existence of the bear population in Croatia. Also, the general public should understand and accept all of the elements of bear management, including harvesting.

4. Students

Elementary and high school education should provide a clear understanding of bears and other large carnivores in Croatia as valuable parts of our natural heritage with a special ecological status in regards to their habitat, feeding and relationship with humans.

5. Visitors to bear areas

Every visitor, Croatian or foreign, to bear areas and especially to protected and tourism-attractive areas, should receive basic information about the fact that he/she is visiting a bear habitat and about the recommended behaviour in the bear habitat. The causing of fear in bears and the danger to humans should be avoided and, at the same time, information on how to recognize signs of bear presence provided. The proper informing of visitors will decrease the responsibilities of the organizations that are managing the area in case of conflict situations.

B) Identification and involvement of interest groups as representatives of the public in bear management, through consultations and joined planning.

The Brown Bear Management Plan for the Republic of Croatia and the yearly Action Plans should be public documents to which interest groups can give comments and proposals. Once a year, a public workshop meeting should be organized in which the results of the previous year's management and plans for the next year should be presented

C) Development of a lasting protocol of cooperation with the local population

Local inhabitants have to be informed about the status of the bear population on a regular basis. In particular, they have to be informed about any out of the ordinary situations (e.g. problem bears or motherless cubs). Also, local inhabitants have to be familiar with the procedures for reporting damage or dangerous situations as well as their general opinion about bears and bear management.

D) Monitoring of public attitudes toward bears and bear management

An understanding of public attitudes towards bears and towards different options in bear management will facilitate fairer decision-making. To this extent, public attitudes and possible changes in attitudes should be monitored by suitable sociological survey methods.

15. INTERNATIONAL COOPERATION

With the ratification of the international treaties described in Chapter 3.1., Croatia has committed to follow their provisions and this Plan confirms its commitment to all of the provisions related to brown bear population conservation.

On the global and/or European scale this means harmonization with the guidelines for conservation of the species in a "favourable conservation status", in as high numbers as possible and over as large areas as possible, but in coexistence with local residents. The Plan will also respect the provisions related to habitat conservation and international trade of bears or parts of their bodies.

The Croatian brown bear population is part of a population which we share with neighbouring countries: the Republic of Slovenia and the Republic of Bosnia and Herzegovina. There are no obstacles to the free movements of the bears between the countries and such a situation will also be ensured in the future. With an understanding that the actions of bear population management in Croatia can influence the bear populations in neighbouring countries, Croatia has committed to such management that will keep our population in balance – so that approximately equal bear migrations across the borders in both directions can be expected. Croatia expects a similar approach to bear management from the neighbouring countries.

Scientific knowledge on Croatian bears will be available to experts in the neighbouring countries. This Plan encourages cooperation between researchers, in the sense of harmonising research methods to enable comparisons and supplement results. This is especially important for genetic and radiotelemetry studies. Marked animals found on the other side of the state border should be reported without delay.

Meetings of bear managers are planned on a yearly basis, with the intention of exchanging experiences and jointly planning quotas for the upcoming year.

16. INTERVENTION GROUP

The intervention group will have 7 to 10 trained and equipped professionals. They will have to visit each location in which there has been: exceptional damage caused by bears, an accident or a death of a bear and, especially, a problem bear occurrence. The intervention group has to be contacted for all procedural issues, especially in cases where a bear is attacking a human. The group must be equipped with a dart gun, a rubber-bullet firing gun and noise producing bullets, as well as traps for capturing live bears.

Members of the intervention group must go as rapidly as possible to all cases where a bear is in danger (e.g. in a poacher's snare) or when a bear causes conflicts with the activities of humans.

We will attempt to cure the problem bears of their bad habits by frightening. Where this is not effective other options will be employed, such as: capturing and marking problem bears (for easier tracking of the bear's behaviour), translocation, placing in captivity (if there is the possibility), and as a final resort – culling of the animal.

The members of the intervention group will be appointed by the competent Ministry, which at the same time, will act as a mediator for the information transfer between the intervention group and the public. The members of the group will, in cooperation with the hunting unit leaseholders, evaluate the situation and make a decision about the intervention.

It is important to show to the local inhabitants that, in cases of dangerous situations with bears, they are not left alone. The intervention group will operate according to a protocol. It will try to prevent situations that result in the occurrence of problem bears and orphan cubs.

17. FUNDING FOR THE IMPLEMENTATION OF THE PLAN

17.1. Domestic sources:

- the state budget of the Republic of Croatia, from the portion ensured assigned for the competent ministries;

- funds which the implementation of the Hunting Act provides to the budgets of the Ministry and the counties;

- hunting unit leaseholders' resources;

- local and regional administrations' resources;

- scientific and academic institutions' resources;

- Croatian Hunting Association's resources;

- other sources.

17.2. Foreign sources:

- the European Commission – through programmes such as LIFE – for certain years and for certain projects;

- foreign donations;

- other sources.

18. IMPLEMENTATION AND REVISIONS OF THE PLAN

The Ministry of Agriculture and Forestry (currently the Ministry of Agriculture, Forestry and Water Management) and the Ministry of Environmental Protection and Physical Planning (currently the Ministry of Culture, Department for Nature Protection) have formed a committee for the elaboration of the Brown Bear Management Plan for the Republic of Croatia and the yearly Brown Bear Management Action Plan.

This committee will carry out revisions of the management plan and the action plans, as well as amend the plan and produce any necessary reports. The revisions of the plan and the action plans will be open to the interest groups and the general public and their comments and proposals.

The committee will form smaller functional units to help facilitate the implementation of the plan, as well as in urgent cases (e.g. problem bears, attacks on humans and livestock, diseases). These units will work in constant collaboration with the local administration, different interest groups, hunting unit leaseholders and others.

The Ministry of Agriculture, Forestry and Water Management and the Ministry of Culture, Department for Nature Protection are both competent for the implementation of the plan, however, the practical implementation is under the competence of the Ministry of Agriculture, Forestry and Water Management. The implementation of this plan includes the informing of the public and public participation in the decision-making processes.

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