

Management plan for the lynx population in Finland



MANAGEMENT PLAN FOR THE LYNX POPULATION IN FINLAND

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Abstract

In Finland, the lynx is a game animal species. Responsibility for the management and maintenance of the lynx population lies with the Ministry of Agriculture and Forestry. At the regional level, the responsible bodies for game animal management are the game management districts, which are administrative units of the Finnish game administration and of the regional level of the statutory hunters' organisation. The growth of the lynx population in the past few years and their spread to new areas combined with the emergence of lynx population concentrations have brought new challenges for lynx population management in Finland. The Finnish lynx population has not been this abundant since the 19th century.

The objectives set for lynx population management are to a certain extent conflicting, both on national and international levels. The Management Plan for the Lynx Population in Finland was drawn up applying the Convention on the Conservation of European Wildlife and Natural Habitats, Recommendations of the Standing Committee No 59 (1997) and No 74 (1999) as well as the IUCN's principle of sustainable use and on the obligations laid down in Council Directive 92/43/EC on the protection of natural habitats and wild flora and fauna (the Habitats Directive), so as to fulfil the international obligations placed on Finland. In drawing up the management plan there was a broad hearing of local people, regional actors and national stakeholder groups.

The lynx management plan is divided into two parts. The first part sets a background for the Ministry of Agriculture and Forestry's policy on the lynx. It describes the biology of the lynx and status of the lynx on the basis of up-to-date research information. Due to the lack of Finnish research on the lynx, the focus is on the findings of international research. The first part also deals with national legislation, international obligations and forms of international cooperation. There are separate chapters dealing, for example, with financial losses caused by the lynx, the coexistence of lynx and humans, earlier objectives of lynx population, population management measures implemented so far and sociological and social large carnivore research. The main part of the background material is based on the socio-economic research material obtained during the hearing procedure.

The management plan presents the basic socio-economic outlines of policy based on the biology of the lynx or which are considered important. By implementing these policy outlines, Finland will continue systematic management of the lynx population and establish the lynx population as a permanent feature of Finnish nature and its biodiversity. The basic objective of Finland's lynx population management and protection is to maintain the population at a favourable conservation level. The objective will be implemented by the combined effect of measures under various headings. The measures are presented regionally under the headings of lynx population management, damage prevention and the costs of damage prevention, compensation for loss and damage, exceptions to the protected status of the lynx, monitoring and research on the lynx population and their development, training, advisory services and information, supervision of hunting, translocation of lynx, cooperation between various interested parties on national and international levels, updating of the management plan, and responsibilities for population management. In the measures to be implemented, consideration will be given to economic and social requirements and special regional and local features. The implementation of the management plan will be monitored and it will be updated as necessary.

Contents

Abstract

1. Introduction	6
1.1 Background	6
1.2 Preparation of the management plan	7
1.3 Objectives and measures proposed in the management plan	8
PART 1. BACKGROUND TO MANAGEMENT AND PROTECTION OF FINLAND'S LYNX POPULATION	9
2. Biology of the lynx	9
2.1 The lynx as a species	9
2.2 Distribution	9
2.3 Ecology and habits	9
2.3.1 Home range	9
2.3.2 Nutrition	11
2.3.3 Impact of lynx on game populations	15
2.3.4 Reproduction	16
2.3.5 Mortality of lynx, parasites and diseases	17
2.3.6 Lynx and other large carnivores	19
3. Status and development of the lynx population in Finland	20
3.1 History of the population in the 19th and 20th centuries	20
3.2 The lynx population today	20
3.3 Monitoring of the lynx population	22
3.4 Spread and re-introduction of lynx population	22
3.5 The lynx in Finland's neighbouring regions	23
4. Financial losses caused by lynx	24
4.1 Lynx as vermin	24
4.2 Categories and number of losses	25
5. Legislation and commitments relating to management of the lynx population	27
5.1 The status of the lynx in national legislation	27
5.2 European Community legislation	27
5.2.1 Habitats Directive	27
5.2.2 CITES Regulation	29
5.3 Other international obligations	29
5.3.1 The Bern Convention	29
5.3.2 CITES Convention	30
5.3.3 Convention on Biological Diversity CBS	30
5.3.4 The classification status of the lynx	30
5.4 International cooperation	31
5.4.1 Cooperation between authorities in the Nordic countries, the Nordic Council, the Nordic Council of Ministers and the North Calotte Council	31
5.4.2 Nordic large carnivore research coordination group and cooperation with Russia and other European countries	31
6. Lynx population management so far	32
6.1 Finnish Council for Natural Resources: objectives of the Working Group for Large Terrestrial Carnivores 1996–2010	32
6.2 Information on large carnivores	33
6.3 Activities of carnivore contact persons	33
6.4 Advisory committees on large carnivores	34
6.5 The hunting licence procedure of the Ministry of Forestry and Agriculture	35
6.5.1 General	35
6.5.2 Instructions and allocation of hunting licences	35
6.6. Management plans for the Scandinavian and Baltic lynx populations	36
7. Expectations and objectives of Finns regarding lynx population management	37
7.1 History of attitudes to the lynx and of the reactions of Finns to the lynx	37
7.1.1 Wolf, lynx or wolf-lynx	37

7.1.2 The lynx in the press and the influence of media leaders on the emergence of negative attitudes to carnivores	37
7.2 Opinion polls on the lynx and other large carnivores	37
7.2.1 Lynx the most popular large carnivore	38
7.2.2 Negative attitudes to lynx also exist	38
7.2.3 The majority support regulation of large carnivore populations	39
7.2.4 In the reindeer herding area carnivores are accepted as long as compensation is paid	39
7.3 Lynx and humans	40
7.3.1 Summary of research findings	40
7.3.2 Key issues on which the different stakeholder groups agreed	41
7.3.3 Main causes of disagreement	43
8. Threats, viability and favourable conservation status of the lynx population	44
8.1 Possible threats to the lynx population	44
8.2 Viability and favourable conservation status of the lynx	44
PART 2. OBJECTIVES AND MEASURES FOR LYNX POPULATION MANAGEMENT	47
9. Outlines of lynx population management policy	47
9.1 Points of departure and criteria for lynx population management	48
9.2 Regional lynx population management	48
9.2.1 New population management areas	48
9.2.2 Regional target populations	49
9.2.3 Special regional objectives and measures	49
9.3 Monitoring and research on the lynx population	50
9.3.1 Population monitoring	50
9.3.2 Other research	50
9.4 Prevention and costs of loss and damage	51
9.4.1 General	51
9.4.2 Prevention and compensation of losses caused by lynx	51
9.5 Exceptions to the protected status of the lynx	52
9.6 Information, training and advice	54
9.6.1 Information on large carnivores	54
9.6.2 Training and advice	55
9.7 Supervision of hunting	55
9.8 Transplantation of lynx	56
9.9 Cooperation between different interest groups	56
9.9.1 Regional cooperation	56
9.9.2 National cooperation	56
9.9.3 International cooperation	57
9.10 Responsibilities for population management	58
9.11 Evaluation and monitoring of the implementation of the management plan	58

Literature

1. Introduction

1.1 Background

Finland's lynx population was fairly numerous until the 1880s, but by the early decades of the 20th century the lynx had already disappeared almost completely from Finland as a result of systematic persecution. In 1962, when the practice of paying bounties for killing lynx was stopped, the lynx population began to recover, and since the 1970s it has strengthened markedly. The number of litters has also developed favourably, and in 2005 the estimated number was 185 litters. At the end of 2005, Finland's lynx population was estimated at 1100–1200 animals. In addition, some lynx cross between Russia and Finland, but their exact number is not known.

The growth of the lynx population, the spread of lynx to new areas and the emergence of denser population concentrations have recently focused attention in a concrete way on the challenges of lynx population management in Finland. The lynx is now as widespread as it was in the 19th century, and recently conflicting objectives have begun to emerge in the context of lynx population management. In areas where the population has grown most local actors and residents have repeatedly expressed the opinion that populations, not only of lynx but also of large carnivores in general, should be culled by hunting. On the opposite side, nature conservationists have demanded better protection for large carnivores. The Finnish Ministry of Agriculture and Forestry has tried to take these conflicting objectives into consideration in matters relating to the management of the lynx population.

In Finland the lynx is classified as a game animal, and the responsibility for population management and conservation lies with the Ministry of Agriculture and Forestry. At the regional level, the management of game populations is the responsibility of game management districts, which are regional administrative units of Finnish game administration and of the statutory hunters' organisation. Their status and tasks are defined in the Hunting Act (615/1993). The Ministry of the Environment also has a role as an authority in these matters. It defines the status of threatened species and thereby has a significant impact on the debate regarding the lynx, both nationally and internationally.

The status of the lynx changed to that of a game animal species when Finland joined the EU, and hunting of lynx was strictly limited under the obligation to protect the species. The lynx comes under Annex IV of Council Directive 92/43/EC (the so-called Habitats Directive), on the conservation of natural habitats and of wild fauna and flora, which is binding on Finland, and according to which the lynx is subject to strict protection, and exceptions to this obligation are only permitted on certain precisely defined conditions. In areas where the lynx is found, people have had some difficulty in adapting to the consequences of this change in the status brought about by the EU membership.

In 2000 the Council of Europe completed species-specific action plans regarding lynx, bear, wolf and wolverine. The objective was that all EU Member States should prepare management plans for large terrestrial carnivores. In addition, the preparation of management plans for populations of large carnivores relates to the measures taken by the Ministry of Agriculture and Forestry for implementing the decisions on renewable resources and rural areas included in the action plan of the Johannesburg Summit on Sustainable Development.

The Ministry of Agriculture and Forestry's Natural Resources Strategy defines the objectives for the sustainable use of renewable resources and common targets for all sectors, as well as laying down the lines of action for each sector up to the year 2010. The natural resources strategy will be implemented primarily by the sectors through various strategies and programmes. In addition, the strategy is implemented within the framework of the Ministry of Agriculture and Forestry's operating and financial planning and the performance guidance system of the Ministry's administrative sector. The lynx population management plan is part of the Natural Resources Strategy and its implementation under the heading of game management.

1.2 Preparation of the management plan

The Ministry of Agriculture and Forestry began the work of preparing the lynx population management plan in 2004, simultaneously with a corresponding plan for the bear population. To ensure that the management plan would be based on a broad hearing of the Finnish population, at the end of 2004 the Ministry of Agriculture and Forestry asked the Ruralia Institute (formerly the Institute for Rural Research and Training) of the University of Helsinki to plan a research project with the objective of studying the socio-economic factors relating to the management of Finland's lynx population, and thereby to prepare the background for the management plan. At the beginning of 2005 the University of Helsinki launched a project aimed at producing a proposal for a national management plan based on an extensive hearing of interested parties. Written material collected during 2004 was used as background material. The importance of public hearing was also emphasised in the proposal for the Rural Policy Programme, according to which species-specific plans concerning the management of large carnivore populations in Finland should give sufficient weight to views representing the general public as well as business and industry, without endangering the favourable conservation status of populations of the species concerned.

At the first stage of the project "Criteria for the management of Finland's lynx population", the target was to find out people's views, expectations and demands relating to lynx and lynx policy, on a regional basis. The groups targeted were those whose daily lives are affected by the presence of lynx. Other target groups were organisations and authorities that in one way or another have to do with nature conservation, its use or the supervision of its use. The decision to use a wide-ranging hearing procedure was also influenced by the view that management of the lynx population, like that of other large carnivore populations, is more a sociological than a biological question.

In 2004 a total of 239 different regional interest groups, i.e. about 1,000 people, answered the questionnaire on management of the lynx population. A corresponding survey was carried out among national interest groups. Responses were received from nine of these. In addition to the written questionnaires, various negotiations aiming at cooperation were arranged with groups defined as stakeholders. Sixteen such meetings were held with more than 200 participants. In preparing the management plan, 7 public hearings were also held in different parts of Finland in 2005. These were attended by more than 200 people, who expressed their own views on the management of the lynx population. Furthermore, experts on large carnivores or on the lynx in particular were interviewed on questions relating to lynx and bear, and 30 experts expressed their views on the status and future of the lynx population. An in-depth report on the preparatory process for the management plan and its most significant results has been published in the publication series of the University of Helsinki's Ruralia Institute.

On 28 February 2006, the University of Helsinki's Ruralia Institute handed over the draft management plan for the lynx population in Finland to the Ministry of Agriculture and Forestry. On the basis of the draft, an updated version of the plan was drawn up at the Ministry. The work, carried out as part of their official duties, was completed on 28 March 2006, and on 29 March 2006 the Management Plan for the Lynx Population in Finland was sent out for an extensive round of statements.

In all, 60 statements were received. According to the statements, it was considered important that the drafting of the management plan had been based on international obligations, special national features and consultations with local people, regional actors and national interest groups, taking into account their views. The first part of the draft management plan was considered an excellent information package, and not many comments, suggestions or corrections were put forward. The second part of the draft management plan was also received fairly positively, but comments were made particularly on the population management areas, the target populations set for these areas, exceptions to the protected status of lynx, the development of a large carnivore contact network and the need for more effective research and monitoring. In addition, statements from several population management areas in western Finland had serious reservations about the target for developing lynx populations in their areas.

The lynx population management plan has been completed on the basis of the statements received. Efforts have been made to take the comments, suggestions and corrections proposed into account in the management plan to the extent that they do not jeopardise the targets set for the plan or its implementation.

1.3 Objectives and measures proposed in the management plan

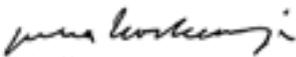
The Management Plan for the Lynx Population in Finland is divided into two parts. The first part gives the background to the Ministry of Agriculture and Forestry's policy on lynx population management. It describes the biology of the lynx and the status of the lynx population on the basis of up-to-date Finnish research. In addition, the situation in Finland is compared in essential respects with international research data. The first part deals with national legislation, international obligations, international cooperation, financial losses caused by lynx, the shared history of lynx and humans, earlier targets of lynx population management, population management implemented so far, and sociological and social research on large carnivores. The first part also includes socio-economic material based on the hearing procedure, which forms a link with the actual management plan.

The second part of the management plan describes the action to be taken, presenting the basic socio-economic outlines that are considered important, deriving from the biology of the lynx. By implementing these lines of action, Finland will continue to practise systematic management of the lynx population and establish the lynx population as a permanent feature of Finnish nature and of the biodiversity of its wildlife.

The basic objective of managing and protecting Finland's lynx population is to maintain the population at a favourable conservation status. This will be achieved through the joint impact of various measures that together form entities. Measures are proposed for regional population management, prevention of loss or damage and the related costs, compensation for losses, exceptions to the protection of lynx, population monitoring and research, development, training, advisory services, information, supervision of hunting, cooperation between the different parties involved and responsibilities for population management. The measures to be carried out will take into consideration economic, social and educational demands as well as special regional and local features.

The Management Plan for the Lynx Population in Finland presented in this document describes the action that the Ministry of Agriculture and Forestry will take to manage the lynx population. The implementation of the plan will be monitored and updated as necessary.

Helsinki, 15 December 2006



Juha Korkeaoja
Minister of Agriculture and Forestry



Seppo Havu
Director-General

PART 1. BACKGROUND TO MANAGEMENT AND PROTECTION OF FINLAND'S LYNX POPULATION

2. Biology of the lynx (Päivi Salo, University of Turku)

2.1 The lynx as a species

In addition to the Eurasian lynx found in Finland (*L. lynx*), the species *Lynx* includes three other sub-species, of which the Canada lynx (*L. canadensis*) and the bobcat (*L. rufus*) live in North America and the Iberian lynx (*L. pardinus*) in Spain and Portugal (Beltrán et al. 1996, Nowell & Jackson 1996, Mattern & McLennan 2000). Of these, the Eurasian lynx is the largest. Male adults weigh on average 17–20 kg and females 12–17 kg (Nowell & Jackson 1996, Pulliainen & Rautiainen 1999). The heaviest males may weigh up to almost 30 kg (Pulliainen & Rautiainen 1999). The length of the lynx's body is 70–120 cm and shoulder height 60–75 cm (Pulliainen & Rautiainen 1999).

The colour and type of spots on the lynx's coat vary greatly, but the basic colour of the summer coat is usually reddish brown while the winter coat is greyish (Sunquist & Sunquist 2002). On the basis of their spots, lynx can be divided into four types: those with large spots, small spots, rosette-patterned spots and no spots (Thüler 2002). On this basis, three different colour types have been distinguished: cat-type lynx have spots all over, fox-type lynx have spots only on their legs and wolf-type lynx on their backs, forming two long stripes. All these colour variations may, however, appear in the same litter (Pulliainen 1974).

2.2 Distribution

The distribution area of the Eurasian lynx has been and still is one of the most extensive of all feline species, since it stretches from Europe via Siberia to China and to the south as far as the Himalayas. Some 75% of its distribution range is within the borders of Russia (Nowell & Jackson 1996, von Arx et al. 2004). The range, covering many different climate zones and habitats, has inevitably experienced changes in time caused, for example, by the Ice Ages, which have isolated populations

from one another. Thus it is not surprising that the species has become differentiated into several sub-species, even though their final classification is not yet clear.

Von Arx et al. (2004) present their interpretation based on numerous studies of the current sub-species of the Eurasian lynx and their distribution. Of the nine sub-species, three are found in Europe: 1) the Northern lynx (*L. l. lynx*) in Fennoscandia, the Baltic countries and Russia, 2) the Carpathian lynx (*L. l. carpathicus*) in the Carpathian Mountains and 3) the Balkan lynx (*L. l. martinoi*) in the south-west Balkans. This division is supported not only by morphology, but also by genetic analyses, as both the Scandinavian and the Finnish and Baltic lynx differ clearly from the Carpathian lynx in terms of allele frequency (Breitenmoser-Würsten & Obexer-Ruff 2003).

Historically the lynx was found almost all over Europe, with the exception of the Iberian Peninsula inhabited by the Iberian lynx. As a result of human activities, the lynx began to disappear, first from the south and later from the north, until lynx populations reached their lowest point around 1950. Today, the continuous distribution range of the lynx stretches from Northern Europe to Russia. The lynx populations in Central and Western Europe are small and isolated. The populations in the Carpathians and the Balkans have survived naturally, but the lynx populations in the Alps, the Jura Mountains and the Vosges Mountains, for example, are the result of successful reintroduction (Breitenmoser et al. 2000).

In most of their distribution range, lynx live in densely forested areas, but in Central Asia, lynx also live in open, sparsely forested areas, semi-deserts and areas above the tree line. In northern latitudes, lynx are also found in the tundra (Breitenmoser et al. 2000).

2.3 Ecology and habits

2.3.1 Home range

There are no research data on the home ranges of Finnish lynx, but the movements of lynx fitted with radio transmitters have been monitored, for example, in Norway, Poland and Switzerland (Table 1). Great variations, as much as tenfold, have been observed in the size of the home ranges (Linnell et al. 2001, Jidrzewski et al. 2002). The same principles can be assumed to apply to Finnish conditions as well. The size of the home range has been shown to depend at least on the density of

Table 1. Variation in area of home ranges of lynx in Europe (Herfindalin et al. 2005)

	Research area	No. of animals		Size of home range (km ²) ¹		Source
		Males	Females	Males	Females	
1	Sarek, Sweden	8	21	709	407	Linnell et al. 2001
2	Nord-Trøndelag, Norway	3	2	1515	561	Linnell et al. 2001
3	Hedmark, Norway	7	10	1456	832	Herfindal et al. 2005
4	Akershus, Norway	2	2	812	350	Herfindal et al. 2005
5	Bergslagen, Sweden	4	1	632	307	Linnell et al. 2001
6	Bialowieza, Poland	5	3	248	133	Schmidt et al. 1997
7	Jura Mountains, Switzerland	3	5	264	168	Breitenmoser et al. 1993
8	Northwestern Alps, Switzerland	11	12	159	106	Breitenmoser-Würsten et al. 2001
9	Jura mountains, France	3	5	258	150	Stahl et al. 2002
10	Kocevje, Slovenia	2	2	200	177	Huber et al. 1995

¹ 100 % minimum convex polygon (MCP)

prey and thus indirectly on the productivity of the environment (Herfindal et al. 2005a). With a higher density of prey and greater productivity, the home range of the lynx becomes smaller. In Central Europe, where there is a greater variety of prey and the prey is more numerous than in the north, the home ranges of lynx are much smaller (Table 1).

The home ranges of male lynx are 1.3–3.4 times larger than those of females (Breitenmoser & Haller 1993, Breitenmoser et al. 1993, Jidrzewski et al. 1996, Schmidt et al. 1997, Sunde et al. 2000b, Linnell et al. 2001, Herfindal et al. 2005a, Table 1). In females, the use of the home range changes with the seasons; for example, in spring and summer, the females move with their small cubs over an area that is almost half the size of the autumn and winter range (Schmidt et al. 1997, Sunde et al. 2000b). The female's home range is smallest two months after giving birth, and can even be as small as 10 km² (Schmidt et al. 1997). The male's home range is very little affected by seasonal change, but their mobility increases in late winter/early spring in the mating season (Schmidt et al. 1997). There is little overlapping of the home ranges of lynx of the same sex, but there may be 1–3 females in the home range of one male (Breitenmoser & Haller 1993, Breitenmoser et al. 1993, Schmidt et al. 1997). Pre-adult animals may live in the home range of an adult of the same sex, and female cubs in particular may remain in their mother's home range (Schmidt et al. 1997).

Since adult lynx live in isolation, apart from the mating season, they make every effort to avoid encountering their neighbours. According to a Polish study, the average distance between male lynx in neighbouring home ranges was more than 11 km (Schmidt et al. 1997). The corresponding distance between females was 8 km (Schmidt et al. 1997). Lynx mark out their home range by means of scent glands, urine and faeces (Breitenmoser et al. 2000). Fresh odour signs tell other lynx about the movements of the occupier of a home range and help to prevent encounters with neighbours. If fresh scent traces are no longer found on the borders of a home range, lynx from adjacent home ranges begin to take over the range for themselves (Wölfel & Wölfel 1996).

In most mammals, the male of the species wanders further from the range where it was born (Greenwood 1980), and this is also the case in lynx (Liberg 1998, Schmidt 1998). In Sweden male cubs have been found to roam as far as 50–450 km, while females only travelled 30–150 km (Liberg 1998). In Poland males roamed 11–129 km, but two females with radio collars roamed no farther than 5 and 9 km from their birth range (Schmidt 1998).

The direction and distances travelled depend on the distribution of suitable habitats and unoccupied home ranges (Schmidt 1998). Open country presents an obstacle to the spread of lynx, and in efforts to conserve



The lynx is a skilled hunter

fragmented lynx populations in Central Europe and when planning introduction or re-introduction of lynx, it is especially important to preserve forest corridors linking patches of suitable habitat (Schadt et al. 2002).

2.3.2 Nutrition

Although other species of the *Lynx* genus generally hunt hare, the larger Eurasian lynx mainly preys on ungulates (hoofed animals) throughout its extensive distribution range (Nowell & Jackson 1996; Table 2). For example, in Poland the European roe deer (*Capreolus capreolus*) and red deer (*Cervus elaphus*) constitute 84% of all lynx prey (Okarma et al. 1997). In Central Norway 81% of the biomass consumed by lynx comprised roe deer, reindeer (*Rangifer tarandus tarandus*) and sheep (*Ovis aries*) (Sunde et al. 2000a). In the Swiss Alps 86% of lynx prey consisted of roe deer and chamois (*Rupicapra rupicapra*) (Breitenmoser & Haller 1993). In the Asian distribution range, lynx also preyed on the East and West Caucasian tur (*Capra cylindricornis* and *C. caucasica*), Sibe-

rian musk deer (*Moschus moschiferus*), red deer (*Cervus elaphus maral* and *C. e. xanthopygus*), Siberian ibex (*Capra ibex sibirica*) and argali (*Ovis ammon*) (Heptner & Naumov 1992). At times, a lynx may even kill moose (*Alces alces*) or wild boar (*Sus scrofa*), but these are usually young or sick/weak individuals (Jiřdrzejewski et al. 1993).

Lynx locate their prey by hearing and sight. Predation is based on surprise attack and a few leaps, sometimes up to 6–8 metres (Pulliainen 1974, Nyholm 1996, Liberg 1998, Kauppinen 2004). Two out of three kills are made after a chase of 20–30 metres. If the lynx does not reach its prey in this distance, it usually gives up the chase (Pulliainen 1997). The lynx kills small prey by biting them in the neck or back, but ungulates it suffocates by biting the throat (Liberg 1998).

The diet of Finnish lynx differs from that of both Central European and Norwegian and Swedish lynx. The density and number of species of ungulates decreases towards the north (Heptner et al. 1961), and at the same time the proportion of hare in the lynx diet increases

Table 2. Nutrition of lynx in Europe according to research findings

Roe deer	Chamois	Red deer	White-tailed deer	Reindeer	Unidentified deer	Sheep	Hare	Birds	Rodents, carrion etc.
17.0	–	–	–	31.0	4.0	4.0	19.0	10.0	15.0
54.5	34.1	–	–	–	–	2.3	5.7	–	3.4
42.5	43.6	0.6	–	–	–	6.1	4.5	0.6	2.3
–	–	–	–	–	–	–	80.0	16.3	3.7
86.7	–	0.7	–	–	–	2.7	2.2	0.7	6.6
21.7	–	–	–	42.5	–	–	21.7	11.3	2.8
52.4	–	12.4	–	–	–	1.6	3.2	9.3	38.4
–	–	–	–	–	84.2	–	17.5	1.8	14.2
–	–	–	–	–	87.0	–	10.9	<0.05	2.1
69.0	–	28	–	–	–	–	–	–	3.0
69.3	21.5	–	–	–	–	–	2.0	0.2	7.0
14.0	–	–	–	–	–	–	20.0	16.0	50.0
9.6	–	10.9	–	–	69.4	–	6.0	0.5	3.5
16.4	–	–	–	–	77.4	–	1.0	1.3	3.5
8.7	–	5.5	–	–	74.0	–	11.0	3.9	12.7
8.3	–	–	–	–	75.0	–	16.7	8.3	16.6
57.6	–	25.6	–	–	–	–	8.0	4.8	4.0
72.3	–	12.8	–	–	–	–	10.6	2.1	2.1
–	–	–	–	93.1	–	–	2.2	4.7	–
–	–	–	–	91.9	–	–	4.3	1.8	2.0
–	–	–	–	–	–	–	79.5	7.4	12.1
–	–	–	–	–	–	–	86.2	12.8	10.9
–	–	–	43.0	–	–	–	42.1	10.3	24.5
2.2	–	–	23.7	–	5.4	–	72.0	10.8	23.8
1.9	–	–	0	–	3.9	–	90.3	18.4	25.2
31.1	–	0.2	–	28.1	7.5	–	20.0	5.4	8.2
41.4	–	–	–	18.6	10.0	–	24.3	1.4	3.7
8.5	–	–	–	22.5	4.2	8.5	19.7	21.1	14.5
29.4	13.7	–	–	–	–	–	19.6	7.8	25.4

¹ According to Pulliainen (1981)

² Stomachs and hunters' reports

³ 111 faeces; 70 prey animals in winter and 71 in summer. Figures calculated from Table 2, p. 294, by combining both habitats

(Jłdrzejewski et al. 1993). In Northeast Siberia, populations of mountain hare (*Lepus timidus*) and of the lynx that prey of them fluctuate in the same way as those of the snowshoe hare (*L. americanus*) and the Canada lynx in North America (Heptner & Naumov 1992, Tavrovskii

et al. 1971 cited in Jłdrzejewski et al. 1993). In Russian Karelia hare make up 80% of the lynx diet (Danilov et al. 1979, cited in Pulliainen 1981), and also in eastern Finland hare clearly form the most important part of the winter diet (Pulliainen 1981, Pulliainen et al. 1995, Salo

Season	Research area	Source	Method
mainly winter	Norway	Birkeland & Myrberget 1980	% frequency of occurrence (146 stomachs)
all	Alps, Switzerland	Breitenmoser & Haller 1987	% prey found (88)
all	Alps, Switzerland	Breitenmoser & Haller 1993	% prey found (179)
winter?	Russian Karelia	Danilov et al. 1979 1	% nutrition
winter	Norway	Dunker 1988	% prey found (135)
winter	Sweden	Haglund 1966	% prey found (106)
?	Western Carpathians	Hell 1978 1	% frequency of occurrence (88 stomachs)
winter	Poland	Jiřdrzejewski et al. 1993	% frequency of occurrence (57 faeces)
winter	Poland	Jiřdrzejewski et al. 1993	% average biomass consumed (57 faeces)
winter	Poland	Jiřdrzejewski et al. 1993	% ungulate prey found (138)
all	Jura Mountains, Switzerland	Jobin et al. 2000	% prey found (617)
?	Carpathian Mountains	Lindemann 1956 1	% frequency of occurrence? (38 stomachs)
winter	Poland	Okarma et al. 1997	% biomass consumed (127 faeces)
summer	Poland	Okarma et al. 1997	% biomass consumed (12 faeces)
winter	Poland	Okarma et al. 1997	% frequency of occurrence(127 faeces)
summer	Poland	Okarma et al. 1997	% frequency of occurrence (12 faeces)
winter	Poland	Okarma et al. 1997	% prey found (125)
summer	Poland	Okarma et al. 1997	% prey found (47)
winter	Sweden	Pedersen et al. 1999	% biomass consumed (41 faeces)
winter	Sweden	Pedersen et al. 1999	% biomass consumed (37 prey animals)
winter	Southeast Finland	Pulliainen 1981	% frequency of occurrence (88 stomachs and/or intestines)
winter	Eastern Finland	Pulliainen et al. 1995	% digestive tracts examined (390)
winter	Southwestern Finland	Pulliainen et al. 1995	% digestive tracts examined (107)
winter	Eastern Finland	Salo 2004	% digestive tracts examined (93)
winter	Eastern Finland	Salo 2004	% digestive tracts examined (103)
winter	Norway	Sunde & Kvam 1997	% frequency of occurrence (441 lynx) 2
winter	Norway	Sunde et al. 2000a	% frequency of occurrence (111 faeces) 3
summer	Norway	Sunde et al. 2000a	% frequency of occurrence (111 faeces) 3
all	Jura Mountains, Switzerland	Weber & Weissbrodt 1999	% frequency of occurrence (38 faeces)

2004). In western Finland hare are a less important nutritional source, as white-tailed deer introduced from North America (*Odocoileus virginianus*) are numerous, especially in the south-westernmost part of the country (Southwest Finland, Uusimaa, Satakunta, South Häme and North Häme) (Svensberg 2004, Fig. 1). The white-tailed deer population is about 35,000–40,000 animals (V. Ruusila, oral estimate 2005). In western Finland the

proportion of hare in the winter diet varies from 42–72% (Pulliainen et al. 1995, Salo 2004).

The roe deer was rather rare in Finland until recent years, but now the population is growing rapidly. The areas with the densest roe deer populations are Southwest Finland, Uusimaa and South Häme (Ruusila et al. 2003, Fig. 1). As their numbers increase, roe deer will

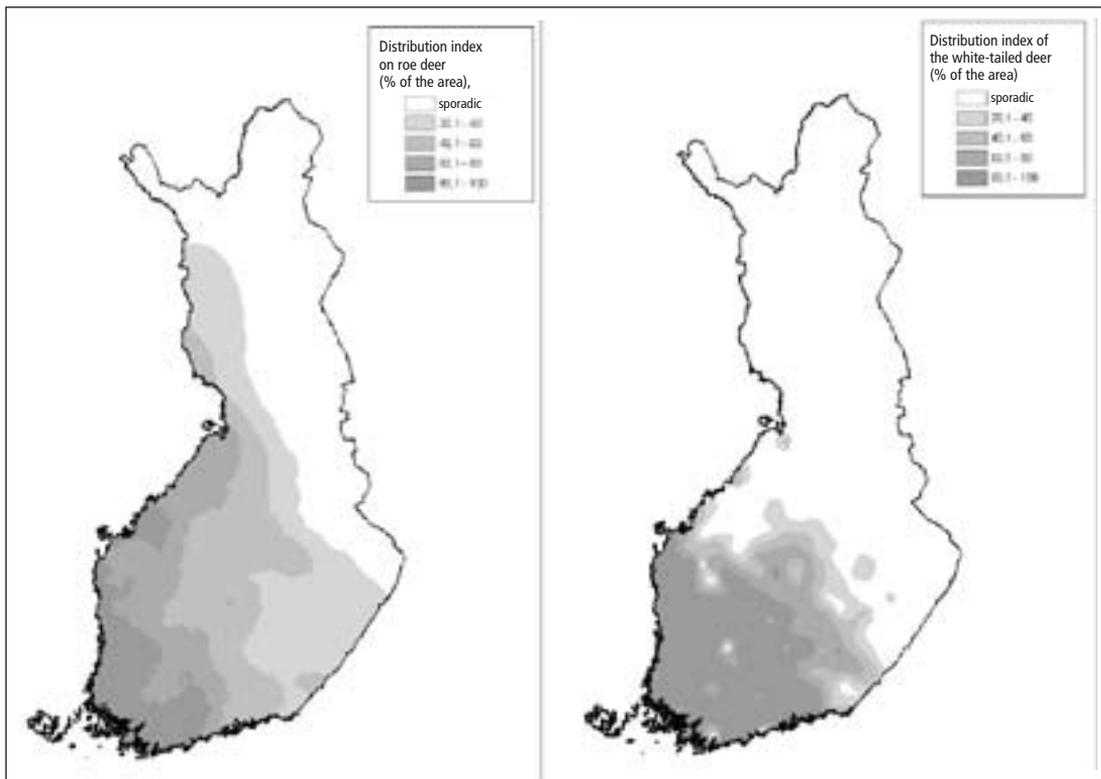


Figure 1. Distribution of roe deer and white-tailed deer in Finland (source: RKTL).

probably account for an increasing proportion of the lynx's diet. The roe deer population is in the range of 15,000–20,000 animals (V. Ruusila, oral estimate 2005). According to Pulliainen (1981) the size of the (Eurasian) lynx is an adaptation to the hunting of roe deer as prey. This is supported by the observation that of the ungulates available, lynx seem to prefer the smaller species, such as the roe deer (weight 18–36 kg, Bjärvall & Ullström 1996) and the Siberian musk deer (15–17 kg, Jłodziejewski et al. 1993). In addition, lynx that prey on roe deer do not seem to select their prey by age or gender, as is the case with larger prey (Jłodziejewski et al. 1993). For example, in Poland lynx preying on red deer generally kill only calves (Okarma 1984, Okarma et al. 1997), and of these 82% were in a weak condition (Okarma 1984). In the Alps lynx preying on chamois seem to choose both calves and old or weak individuals (Breitenmoser & Haller 1987). According to Jłodziejewski et al. (1993), it is due to competition with scavengers and wolves and the lynx's lone hunting style that it has specialised in hunting the smallest ungulates available.

In terms of nutrition, the division of the Finnish lynx population between two different areas is reflected in the condition of the animals. Both Pulliainen et al. (1995) and Salo (2004) have noted a higher percentage of fat reserves in the carcasses of western Finnish lynx than in those from eastern Finland. In addition, the western Finnish lynx are also bigger in other respects than those in eastern Finland; for example, the average weight of males in south-western Finland is 19.8 kg, but in eastern Finland only 16.8 kg, and the corresponding figures for females are 16.6 kg and 15.1 kg respectively (Pulliainen et al. 1995, Lehtelä 1999, Pulliainen & Rautiainen 1999). This phenomenon is probably explained not only by the better nutritional situation in western Finland, but also by the different climatic conditions. In western Finland the snow cover is lighter and of shorter duration than in the east, which may give the lynx greater mobility and make predation easier (Lehtelä 1999, Salo 2004). In spite of the better situation regarding nutrition, the size of lynx litters is no bigger in western Finland than in the east of the country (Pulliainen et al. 1995), and the lynx population in the west

does not seem to be any more stable than in eastern Finland, which is completely dependent on the hare as prey (Kojola 2003).

As well as the hare and ungulates that form the main diet of the lynx, the lynx hunts squirrels (*Sciurus vulgaris*), Galliformes, voles and even beavers (*Castor fiber/canadensis*) (Pulliainen et al. 1995, Liberg 1998, Salo 2004). In Central Europe, the importance of hare and small game for lynx is negligible compared with the situation in Finland. For example, in the Alps, hare make up less than 10% of the lynx's prey (Breitenmoser & Haller 1987). At the same time in Poland, the brown hare (*L. europaeus*) accounts for only 6–11% of the biomass consumed in autumn and winter (Jiřdrzejewski et al. 1993, Okarma et al. 1997). However, small game may be of great importance for young lynx, since according to Okarma et al. (1997), for example, the brown hare may serve as a kind of "buffer prey" for young animals, helping them to survive the first year without the mother lynx.

Lynx may also kill fox (*Vulpes vulpes*), pine marten (*Martes martes*), raccoon dog (*Nyctereutes procyonoides*) or mink (*Mustela vison*) (Pulliainen 1981, Pulliainen et al. 1995, Linnell et al. 1998, Salo 2004). Intra-guild predation is very common in nature and it may even have a positive influence on other game animal populations if top predators (such as lynx) are able to keep down the numbers of smaller predators (Palomares et al. 1995). In Sweden, lynx have been found to cause about 14% of the mortality of adult foxes, and the spread of the lynx population has reduced the fox population, which in turn has had a positive effect on the hare and grouse populations (Helldin 2004). The positive impact of lynx can even be seen in roe deer populations, since fox may kill as many as 90% of newborn calves annually (Liberg 2001).

Nutritional studies on the digestive tracts of lynx are mostly carried out in the lynx hunting season, i.e. in winter. Lynx faeces are also much more easily found by following tracks in winter than in summer. The data available on summer nutrition is less comprehensive than that on winter prey. Generally speaking, however, in summer the lynx diet includes more small game than in winter (Liberg 1998, Sunde et al. 2000a).

2.3.3 Impact of lynx on game populations

Lynx need about two kilograms of meat a day (Haglund 1966, Okarma et al. 1997, Jobin et al. 2000). A lynx can

therefore feed twice on an adult hare. A roe deer provides food for 2–4 days (Okarma et al. 1997, Liberg 1998, Jobin et al. 2000, Sunde et al. 2000a). A lynx may drag its prey into the undergrowth to hide it and often it covers the prey with snow, leaves or moss, but not as thoroughly as the bear does (Jiřdrzejewski et al. 1993, Liberg 1998). According to certain sources, the lynx has to kill fresh prey every night in winter, as it is unable to remove the meat from a frozen carcass (Haglund 1966, Pulliainen et al. 1995). According to observations made in Poland, Norway and Switzerland, however, lynx do return to their prey on several successive nights in winter, too (Jiřdrzejewski et al. 1993, Okarma et al. 1997, Jobin et al. 2000, Sunde et al. 2000a). According to Liberg (1998), lynx return to their prey in the same way in winter as in summer. Moreover, even in very cold temperatures, it takes several days before a large prey animal freezes so hard that a lynx can no longer eat it (Liberg 1998).

On the basis of research carried out in Poland, Switzerland and Scandinavia, lynx may kill an ungulate every 5–6 days (Okarma et al. 1997, Liberg 1998, Sunde et al. 2000a, Molinari-Jobin et al. 2002). In Norway, where the lynx diet consists of roe deer, reindeer and sheep, it was calculated that a female lynx kills 73 ungulates a year (Sunde et al. 2000a). In Poland, where lynx mainly feed on roe deer, a pre-adult lynx was estimated to kill on average 43 roe deer a year. According to Okarma et al. (1997) a male kills 76, and a female with one cub 69 ungulates a year, but if the female has three cubs, consumption rises to as many as 190 animals a year. In Poland lynx are in fact the most common cause of death of roe deer, lynx killing on average 26% of the spring population of roe deer when the density of the lynx population is 2.4–3.2/100 km² (Okarma et al. 1997). In a Swiss study, where the lynx population density was 0.94–1.01/100 km², predation by lynx was the main cause, immediately after hunting, of death in roe deer, with lynx accounting for 24–37% of roe deer mortality, killing a maximum of 9% of the spring population (Molinari-Jobin et al. 2002).

Nyholm (1996) estimated that lynx preying mainly on hare killed about 120–130 hare a year. In Finland the mountain hare (*Lepus timidus*) population varies in cycles of 9–11 years (Lindén 1988, Ranta et al. 1997). These variations in the hare population are assumed to be the main factor behind the regressions in lynx population that occur from time to time (Kojola 2003).

The size difference between male and female lynx is

considerable, and it is also thought to influence the choice of prey. In many cases, male lynx kill larger prey animals and less small game than female lynx (Pulliainen et al. 1995, Okarma et al. 1997, Molinari-Jobin et al. 2002). For example in Switzerland, male lynx prey more on chamois (*Rupicapra rupicapra*) and in western Finland more on white-tailed deer than females do (Pulliainen et al. 1995, Molinari-Jobin et al. 2002). According to Pulliainen et al. (1995), the lighter females may not be strong enough to kill the larger ungulates. Sunde and Kvam (1997), on the other hand, arrived at the conclusion that the differences in choice of prey between male and female lynx were rather based on differences in the use of the home range. The males have larger home ranges (Breitenmoser & Haller 1993, Jidzzejewski et al. 1996, Schmidt et al. 1997, Sunde et al. 2000b, Linnell et al. 2001), and they move faster and over longer distances in their home ranges than females (Jidzzejewski et al. 2002). Gender-based differences in the use of the home range may also lead to differences in predation techniques and in the frequency of encountering a certain type of prey (Sunde & Kvam 1997).

Gender-linked differences in choice of prey are also reflected on prey animal populations through the structure of the lynx population. In Switzerland the mortality of chamois fell by a quarter when the number of male lynx in the research area diminished, since females hunted mainly roe deer (Molinari-Jobin et al. 2002). Although the lynx usually eats its prey whole, in a Norwegian study males abandoned their prey after feeding on it once. This meant that they killed more ungulates than females with cubs, which ate almost every edible part of the prey animal (Sunde et al. 2000a).

Although there is some information available on the relationship between the lynx and its prey animals, it is difficult to form an overall picture on the basis of studies carried out in areas that are very different in terms of choice of prey and lynx population density. In addition to the choice of prey and the density of lynx population, the impact of lynx on the local prey animal population depends on the age and gender distribution of this population, the lynx population structure (gender ratio, proportion of breeding females in the population) and other sources of mortality (hunting, diseases) and on other external factors (von Arx et al. 2004). There are no recent research data on lynx that prey exclusively on hare in Europe, since in all the research areas so far, the main prey animal of lynx has been ungulates.

2.3.4 Reproduction

The mating season for lynx lasts from the end of February to the early part of April, reaching its height in March (Kvam 1990, Pulliainen 1997, Liberg 1998). At that time the otherwise silent lynx call each other by uttering a barking call (Pulliainen 1997). The females are only ready to mate for about five days (Jonsson 1983). The lynx's ovulation has to be induced, i.e. the egg is only released after mating (Liberg 1998). According to some sources, the female may come on heat again after 6–13 days if she has not conceived the first time (Naidenko & Erofeeva 2004).

The gestation period is about 70 days, i.e. the cubs are usually born in May-June (Kvam 1990, Liberg 1998, Pulliainen & Rautiainen 1999). There are usually two or three cubs, more rarely one or four (von Arx et al. 2004, Pulliainen & Rautiainen 1999). However, in North Savo litters of four cubs have been found quite often (J. Halikainen, oral communication, 19.3.2005).

The lair (especially the birth lair) is often located in rocky country, often in a hollow or under a ledge of rock, but it may also be in the shelter of the roots of a fallen tree, or under the lower branches of a dense spruce. It is important to have a stable temperature in the lair (Boutros 2002), as very small cubs cannot regulate their body temperature (Jensen et al. 1980 cited in Boutros 2002).

The mother suckles her cubs for about six months (Jonsson 1983, Lindemann 1955, Heptner & Naumov 1992), but suckling becomes less important when the cubs begin to eat solid food at three months (Jonsson 1983). In late summer the cubs leave the lair and begin to follow their mother (Schmidt 1998). The lynx family then begins to move about its home range from one prey to another when the previous prey has been consumed (Jonsson 1983, Schmidt 1998). In November the cubs begin to learn how to handle prey, practising at first on live animals captured by the mother, and soon they begin to participate in the actual hunting of prey (Jonsson 1983).

The cubs follow their mother for about a year. In exceptional circumstances the female may keep her cubs with her longer, provided she does not mate again. When the female comes on heat again in spring, she drives the previous years' cubs away and they have to seek their own home range at about 10 months (Jonsson 1983, Schmidt 1998, von Arx et al. 2004). At that age the cubs weigh 9–14 kg (von Arx et al. 2004). According to some

observations, a mother lynx may kill several prey animals for her cubs as a "food reserve" during the mating period (Jonsson 1983). In this case the mother returns to her cubs after being on heat and the family stays together for about a month longer (Jonsson 1983, Nyholm 1996).

According to a Norwegian study, about half of all female lynx come on heat at just under one year, and all females are normally sexually mature at 21 months (Kvam 1990). Likewise, according to Finnish data, females may come on heat at as early as about 10 months, but they do not yet conceive (Niemi 2005). In Norway, half of all male cubs are sexually mature at 21 months and at 33 months all males are able to reproduce (Kvam 1990). According to Finnish data, all 21-month-old males were sexually mature (Niemi 2005). Niemi (2005) defines sexual maturity on the basis of sperm findings, while Kvam's (1990) method was based only on weighing the testicles. At any rate it is unlikely that 21-month-old males are allowed to mate despite their sexual maturity, as they will lose the battle for females on heat to older and stronger males (Kvam 1990). At the same time it is unlikely that one-year-old lynx females which have only just become independent and are still learning predation skills could raise a litter, and therefore females do not usually give birth until they are two to three years old (Liberg 1998).

2.3.5 Mortality of lynx, parasites and diseases

The mortality of lynx cubs is at its highest at the age of 3–4 months (Jłdrzejewski et al. 1996), and only about 50% of cubs survive their first year (Breitenmoser et al. 1993, Jłdrzejewski et al. 1996, Boutros 2002, Niemi 2005). In a population in its natural state, the survival chances of young lynx increase enormously after that, and mortality rate drops to about 11% (Liberg 1998). Once the lynx reach adulthood, the mortality rate drops even further to 5–6% a year (Jłdrzejewski et al. 1996, Liberg 1998). If the impact of hunting is taken into consideration, the mortality rate of young lynx rises to 46% and of adults to 22% (Liberg 1998). The mortality rate of adult lynx remains fairly stable until the age of 15–16 years, after which it rises steeply (Kvam 1990). In the wild, the average age of an adult lynx is, however, only 4–5 years (von Arx et al. 2004).

The most common causes of death in wild lynx are hunting and road accidents (Ryser-Degiorgis 2001, Schmidt-Posthaus et al. 2002, Table 3). Lynx that have succumbed to various diseases are found only seldom,

which is why the importance of diseases has probably been underestimated. In Switzerland about 20% of lynx found dead had died of an infection, but of lynx fitted with radio transmitters (15 individuals), 40% of deaths were due to infections (Schmidt-Posthaus et al. 2002). As transmitters of disease, the lynx cannot be compared to the fox, for example, as their isolated way of life prevents infections from being passed to other lynx (Ryser-Degiorgis 2001).

As with all mammals, lynx are threatened by many external and internal parasites, as well as viral and bacterial infections. Especially during the warm season, lynx are afflicted by horseflies, fleas and mites (Ryser-Degiorgis 2001). Of intestinal parasites the roundworm is especially common in lynx (Ryser-Degiorgis 2001, Valdmann et al. 2004, M. Niemi, oral communication 2005). Of parasitic diseases the most common is, however, scabies, caused by the scabies mite, which is transmitted by contact from one animal to another (Ryser-Degiorgis 2001). The first symptoms are redness and flakiness of the skin, and later loss of fur and thickening of the skin (Ryser-Degiorgis 2001, Oksanen & Henttonen 2005). The symptoms include severe itching, as a result of which the animal scratches itself, causing wounds which then become infected. Scabies is not in itself fatal, but loss of fur and secondary infections weaken the animal and make hunting more difficult, with the result that the animal starves to death after some months (Liberg 1998).

There are various different strains of scabies mites. Fox scabies caused by (*Sarcoptes scabiei*s) mainly afflicts foxes, but it is also found in lynx, voles and wolves (Lappalainen 2003, Oksanen & Henttonen 2005). *Notoedres cati* is related to fox scabies and causes similar symptoms. It is called cat or head scabies, as the domestic cat is the main host animal and the symptoms mainly affect the infected animal's head. Cat scabies is found in wild lynx at least in Switzerland both alone and together with fox scabies (Ryser-Degiorgis et al. 2002). The relatively harmless ear scabies caused by the *Otodectes cynotis* scabies mite has also been found in wild lynx (Degiorgis et al. 2001).

Trichinellosis is caused by a tiny roundworm *Trichinella* sp., which lives in the small intestine. Its larvae spread and become encapsulated in the host animal's muscle tissue (Oksanen & Henttonen 2005). The disease is transmitted by eating the meat of an infected animal, so that it is primarily a disease of carnivorous mammals (e.g. fox, raccoon dog, bear, lynx, wolf, boar), but it can

Table 3. Lynx mortality in Finland, Sweden and Norway

Year	Finland ¹				Sweden ²				Norway ³			
	Population size	Hunting	Other mortality ⁴	%	Population size	Hunting	Other mortality ⁴	%	Population size	Hunting	Other mortality ⁴	%
1996	790	69	0	8,7	ca 1 500 in 1996– 2001	12	23	2,5	410	82	26	26,3
1997	795	63	0	7,9		89	23	8,0	486	82	15	20,0
1998	810	63	0	7,8		90	24	8,1	403	112	12	30,8
1999	835	55	0	6,6		92	22	8,1	448	88	11	22,1
2000	855	45	0	5,3		165	.	10,3	366	94	21	31,4
2001	870	58	0	6,7		116	.	7,3	327	79	10	27,2
2002	.	.	.	.		.	.	.	332	88	11	.
2003	.	.	.	.	.	.	.	267	62	.	.	

¹ Kojola 2004

² Liberg & Andrén 2004

³ Linnell & Brøseth 2004

⁴ Mainly caused by 5traffic, disease etc.

also be transmitted to humans (Ryser-Degiorgis 2001, Oksanen & Henttonen 2005). In Finland the main animal responsible for spreading trichinellosis is the raccoon dog, which has been found to harbour all four strains of the worm found in Europe (Oksanen et al. 1998, Oivanen et al. 2002). In Finland it has been found in about half of the lynx studied (Oksanen et al. 1998, Oivanen et al. 2002). The disease is more common in the west than in the east of Finland, while in the north of Finland it is relatively rare (Oksanen et al. 1998, Oivanen et al. 2002). An infection level of about 50% has also been described in Slovenia and former Yugoslavia and in Switzerland (Brglez 1989, Gottstein 1999 cited in Ryser-Degiorgis 2001), but in Sweden *Trichinella* sp. was found in only 5% of lynx studied (Pozio et al. 2004). The meat of animals that are susceptible to trichinellosis must be inspected and any food prepared from it must be heated to over 65°C to kill the larvae (Oksanen & Henttonen 2005). In Switzerland there are known cases of humans contracting trichinellosis after eating poorly prepared lynx meat (Horning 1983 cited in Oksanen et al. 1998).

Toxoplasma gondii is a protozoon that lives in the mucous membrane of the intestine of its primary hosts – the felines – causing toxoplasmosis (Oksanen & Henttonen 2005). The disease is spread by way of eggs (oocysts) in the faeces of feline animals and by eating infected (raw or unfrozen) meat, and it can also be transmitted to humans. In the secondary host the parasite becomes encapsulated in the muscular and other

tissue, but does not usually cause symptoms in carnivores. If a woman is infected during her first pregnancy, it may result in foetal damage or miscarriage (Oksanen & Henttonen 2005). In Finland toxoplasmosis occurs in more than 70% of lynx (Oksanen & Lindgren 1995).

Of the viral diseases, the most important is probably rabies, an infection destroying brain tissue and leading to death, which can be transmitted to all mammals (Oksanen & Henttonen 2005). The virus is transmitted by saliva and bite wounds, but the susceptibility of different species to the disease varies considerably. For example, the infective dose required by lynx and other felines is higher than that required by fox (Ryser-Degiorgis 2001). Rabies is in fact seldom found in lynx; for example, of 1,000 lynx studied in Slovakia over a period of 10 years only six had rabies (Fernex 1976 cited in Ryser-Degiorgis 2001). In lynx rabies does not usually include the so-called aggressive phase, where the infected animal is liable to bite any human or animal encountered, although cases of biting have been reported in Slovenia (Ryser-Degiorgis 2001). In Finland rabies is combated by inoculating cats and dogs and distributing vaccine baits on the southeastern border. Rabies was last found in Finland in the winter of 1989 (Oksanen & Henttonen 2005).

Other viral diseases found in lynx in Europe are the feline parvo virus (FPV), feline infectious peritonitis (FIP) and feline immunodeficiency virus (FIV) (Ryser-Degiorgis 2001). In Sweden blood samples from more than a

hundred lynx were tested for antibodies to these diseases, and according to the results, Swedish lynx had hardly any contact with these pathogens (Ryser-Degjorgis et al. 2005).

2.3.6 Lynx and other large carnivores

Lynx may be killed by wolves or wolverine (Pulliainen 1974, von Arx et al. 2004). In general it has been believed that if there is a strong wolf population in an area, lynx will not thrive, but there is no evidence of an inverse density relationship of this kind (Pulliainen & Rautiainen 1999, von Arx et al. 2004). In Finland wolves mainly prey on moose (Gade-Jørgensen & Stagegaard 1998, 2000, Huitu 2000), which is too large for the lynx. Of the wolf population, 60% live in eastern Finland, where there are also dense lynx populations (Kojola et al. 2005). In these areas lynx prey almost exclusively on hare (Pulliainen 1981, Pulliainen et al. 1995, Salo 2004), and so there is probably no competition for food between the species. In Poland, on the other hand, the

ecological niches of wolf and lynx overlap considerably, especially if there is shortage of smaller game (Jłdrzejewski et al. 1989, Jłdrzejewski et al. 1993). Even so, the wolf's main prey is the red deer (Okarma 1995), and lynx usually hunt only the calves. The lynx clearly specialises in smaller animals, such as hare and roe deer (Jłdrzejewski et al. 1993).

Finland's bear population is densest in the area where there are also thriving lynx populations, with 68% of bears living in central and eastern Finland (Kojola et al. 2005). However, the bear hibernates in winter, and for a carnivore, is exceptionally omnivorous (Kojola 1997). Thus the relationship between bear and lynx is probably rather neutral.

Of Finland's wolverine population, a third are found in eastern Finland (Kojola et al. 2005). Wolverine often follows lynx tracks, evidently in the hope of leftovers (Haglund 1966), and thus a strong lynx population may even benefit the wolverine.

3. Status and development of the lynx population in Finland (Tuija Liukkonen, University of Helsinki & Pälvi Salo, University of Turku)

3.1 History of the population in the 19th and 20th centuries

The lynx is the only wild feline in Finland, and it has been hunted throughout history for its valuable fur. The history of the lynx in Finland is similar to that in other Nordic countries. During the period of Swedish rule, in the 17th century, the bounty system was ratified by law and at that time the lynx was added to the list of the animals for which the state paid a bounty, in addition to the wolf, bear and fox (Pohja-Mykrä et al. 2005). Under Russian rule, in the 19th century, animals were divided into three classes. The lynx was classified as vermin, to be eliminated (Mykrä et al. 2005, Pohja-Mykrä et al. 2005). The last time a state bounty was paid for lynx was in 1962 (Pulliainen 1974, Pohja-Mykrä et al. 2005), when it was paid for 15 animals.

Up to the year 1880 the distribution of the lynx covered the whole of Finland with the exception of the coastal area of Central Ostrobothnia and Tunturi-Lappi (Fell Lapland). The numbers of lynx have been in direct proportion to the numbers of wolves. In the 1860s and 1870s, when the lynx population in Finland was numerous, the number of lynx killed was about 50 animals a year (Table 4). As the number of wolves killed fell, lynx began to be hunted in increasing numbers. Even though the lynx population at first recovered with the diminishing wolf population, it could not survive the hunting to which it was subjected. At the end of the 1890s the last lynx was killed in Åland, and by the beginning of the 20th century, the lynx had almost disappeared from southwestern and western Finland (Pulliainen 1974, Pulliainen & Rautiainen 1999).

Table 4. Number of lynx killed in the late 19th century

Years	No. of lynx killed / year
1860 – 1870	50
1879 – 1889	370
1890 – 1893	130
1893 – 1900	76

The effective extermination of the lynx continued in the early 20th century. By the year 1920 the lynx had almost completely disappeared in southern, central and western Finland. The state of the population is well illustrated by the fact that in the last years of the 1880s the number of lynx killed was 400–500 animals a year, while in the 1920s and 1930s only 1–2 lynx were killed annually. During the war years, the population recovered to some degree, but fell again sharply by the 1950s (Pulliainen 1974, Pulliainen & Rautiainen 1999).

In the mid-1950s the lynx was wiped out so completely that the present Finnish lynx population can be considered Swedish-Russian in origin. In the 1950s and 1960s, lynx began to cross the border from the southeast and since the 1960s the Finnish lynx population has become stronger. The lynx gained a protected status on 1 July 1962, and this together with the gain from cross-border migration strengthened the population. In 1962 there were about 30–40 lynx in Finland (Pulliainen & Rautiainen 1999).

The population recovered fairly rapidly in the 1960s. At the beginning of the decade the estimated population was less than 50 animals. In 1965 lynx could only be killed with a special permit in the municipalities on the eastern border. In 1966–1967 hunting was restricted to the province of North Karelia. From 1968 on, the hunting of lynx became subject to a special permit granted by the Ministry of Agriculture and Forestry. In 1968–1972, 6–11 individuals were killed a year, including road accidents. After the complete prohibition of hunting in 1976, the population recovered, and in 1978 there were already about a hundred lynx. In 1983 hunting of the population was begun (Nyholm 1996).

In 1988 the estimated population was 800 lynx (Pulliainen & Rautiainen 1999). As the population grew, the lynx spread back to many of its old habitats, including Häme, Uusimaa, Southwest Finland, Satakunta, Ostrobothnia and Central Finland (Pulliainen & Rautiainen 1999).

3.2 The lynx population today

The lynx population has grown steadily since 1978 and the minimum estimate in 2005 was 1100–1200 lynx (Kojola et al. 2006, Fig. 2). Since 1996 the lynx population had grown about 40% by 2005 (Kojola et al. 2006). In 2005 at least 185 litters were born, and the number of cubs totalled 280–300 (Kojola et al. 2006). Before the hunting season 2006–2007 the population was es-

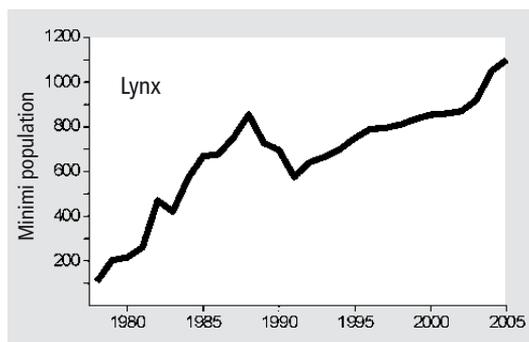


Figure 2. Lynx population trend in 1978–2005 (RKTL 2006).

timated to have increased even more (RKTL 2006, Drno. 92/301/2005). The lynx population densities in 2005 are shown in Fig. 3.

According to the EU Habitats Directive, the lynx, like the wolf and bear, is subject to strict protection. However, the lynx can be hunted, like the bear, subject to exceptional grounds given in the Directive. Hunting is based on an order issued to game management districts by the Ministry of Agriculture and Forestry annually (Härkönen 2003, Lappalainen 2003). A sustainable hunt according to Kojola (2003) is about 10–13% of the population. At present the bag is some 5–8% (40–70 individuals/year) (Kojola 2004). In 1999–2005 on average 51 individuals/year (38–67 lynx/year) have been killed

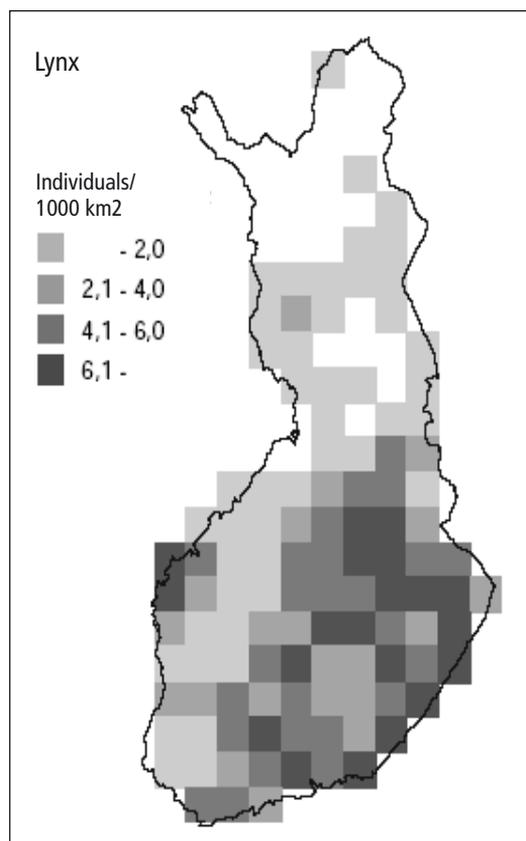


Figure 3. Density of lynx in Finland in 2005 (individuals/1000 km² per 50 x 50 km square) (Kojola et al. 2006).

Table 5. Maximum permitted number of lynx killed annually set by Ministry of Agriculture and Forestry (MAF), hunting licences granted by game management districts (gmd) and number of lynx killed in the whole of Finland in 1999–2005

	Maximum permitted no. of lynx killed set by MAF	Hunting licences granted by gmd	No. of lynx killed with hunting licences granted by gmd	Special permits granted by MAF	No. of lynx killed with special permits granted by MAF	No. of lynx killed with licences granted by police	No. of lynx killed by traffic, diseases, etc.
1999–2000	97	61	53	–	–	–	–
2000–2001	90	66	44	6	1	–	1
2001–2002	85	69	58	5	–	–	–
2002–2003	47	43	37	8	1	–	–
2003–2004	55	50	44	9	1	–	13
2004–2005	75	75	65	9	2	1	6
total	449	364	301	37	5	1	20
av./year	75	61	50	6	0,8		3,3

with hunting licences (Table 5, according to statistics of the Hunters' Central Organization).

The hunting season for lynx in Finland is 1 December–28 February, in Sweden 10 January–31 March and in Norway 1 February–30 April (Kojola 2004, Liberg & Andrén 2004, Linnell & Brøseth 2004). In Finland, the month of March was excluded from the hunting season since at that time the females no longer have the protection brought by cubs – a female with cubs always has a protected status, but when on heat the cubs are not constantly with their mothers (Nyholm 1996).

3.3. Monitoring of the lynx population

Monitoring of the lynx population has been carried out in Finland since 1978 with the help of carnivore contact persons (Nyholm 1996). At present there are about 1500–1600 contact persons. In northern Finland the network of contacts is sparser than in the rest of Finland. Monitoring of the population is based primarily on lynx sightings reported by the contact persons, especially sightings of litters. Sightings are also reported

by field personnel of Metsähallitus, border guards and reindeer herders. In addition to sightings by carnivore contact persons, the results of line transects are also used (Nyholm 1996). In 2005 a total of 11,809 lynx sightings were reported, which according to the Finnish Game and Fisheries Research Institute (RKTL) is 24% more than in 2004 (Kojola et al. 2006).

The method by which an estimate of the minimum lynx population is made is based on a study of the structure of the Scandinavian lynx population (Andrén et al. 2002), in which data were obtained from lynx fitted with radio transmitters and monitored in three different research areas. The data gave the proportion of litters in the numbers of lynx as 21%, 22% and 27% respectively in different parts of Sweden. Based on the average of these proportions (23%) the minimum number of lynx is calculated by multiplying the number of litters reported by six (Kojola 2003, Kojola, I. www.suurpedot.fi). In 2003 the percentage of litter sightings of all lynx sightings, indicating the population structure and at the same time its productivity, varied from 10% in South Savo, Kainuu and Kymi to 27% in Ostrobothnia (Kojola & Määttä 2004).



Figure 4. Minimum estimated number of litters in 2005, by game management district (Kojola et al. 2006).

The lynx population is fairly evenly distributed throughout the country, with the exception of the reindeer husbandry area. 29% of the population live in eastern Finland, 35% in the interior of Finland and 32% in western Finland. About 5% of the lynx population lives in the reindeer husbandry area. In 2005 the estimated number of cubs born in the different game management districts totalled 280–300 and the number of litters was estimated at 185 (Fig. 4). In the game management districts of Oulu and Lapland there were no litter sightings at all in 2004 (Kojola et al. 2005).

3.4 Spread and re-introduction of lynx population

Young lynx individuals driven away by their mothers roam the countryside looking for their own home ranges (dispersal), and these roaming young individuals are also sighted where the population density is low. According to data from the Finnish border areas, the migration of lynx into Finland has not affected the overall development of the population (Ministry of Agriculture and Forestry 1996). Although there have been strong lynx populations in eastern Finland during the past few decades, outside the reindeer husbandry area the lynx has spread more evenly than other large carnivores (Fig. 3, Kojola et al. 2006).

In Finland the question of introducing carnivores and releasing captive animals into the wild has been under discussion from time to time. During the survey that preceded the drafting of the management plan opinions were expressed on the question several times (Liukkonen et al. 2006). In the 1980s a few individual lynx were transferred to North Häme) (www.suurpedot.fi, Nyholm 1995).

For comparison, several Central European populations are the result of reintroduction by importing non-native species, for example, those in Austria, Poland, France, Germany, Slovenia, Switzerland and the Czech Republic (Andersen et al. 2003). In these cases the Carpathian lynx has often been used, but also animals of unknown origin (von Arx et al. 2004).

Lynx reproduce fairly well in captivity and, in addition to reintroducing lynx, e.g. Iberian lynx are reared in captivity in order to preserve the population in Spain and in future to restore populations that have disappeared (De Benito 1993). In the British Isles plans have been made very recently to reintroduce the lynx (Hetherington et al. 2006) and especially in Scotland efforts are being made to promote the project (D. Potts, personal communication 15 December 2005).

3.5 The lynx in Finland's neighbouring regions

In studying the lynx population, it makes sense also to look at the lynx populations of neighbouring regions. There is no recent detailed information from Russia, but in the 1990s, the lynx populations both of the *Leninograd oblast* (the region surrounding St Petersburg) and Karelia were strong, totalling about 500 and 750 individuals respectively. Where lynx density in the Karelian Isthmus at that time was 6–15, to the northwest of Lake Ladoga 10–25 and north of Lake Ladoga up to the latitude of central parts of Ilomantsi 6–15 individuals/1000 km², north of this area, the lynx population density was less than 5 individuals/1000 km² (Ministry of Agriculture and Forestry 1996).

In addition to the Estonian, Latvian and Lithuanian populations, the Baltic lynx population also comprises those of Belarus and the *Kaliningrad oblast* (Russia). In

addition, part of the Polish and Ukrainian lynx populations belongs to the Baltic population (von Arx 2004). The Estonian lynx population is thought to have decreased in 1996–2001 from 1200 to 900 individuals. The annual number of lynx hunted has varied between 100 and 150 (Valdmann 2004). In the same period the Latvian population was 650–700 individuals. Since 2003 the hunting quota for lynx has been reduced to 50 in Latvia (Anderson & Ozolins 2004). Lithuania has the smallest lynx population in the Baltic countries (about 100 individuals), and since 1979 it has had a fully protected status (Balčiauskas 2004).

The Swedish lynx population grew from about 1300–1500 in 1998 to some 1400–1800 in 2000 (Liberg & Andrén 2004). In 2004 there were an estimated 1500 lynx in Sweden (Liberg & Andrén 2005). In 1996–2001 an average of 90 lynx a year were hunted (Liberg & Andrén 2004). In Norway the estimated number of lynx in 2001 was about 400 individuals. Of this population, about 90 lynx a year were hunted in 1996–2001 (Linnell & Brøseth 2004). The Swedish and Norwegian lynx populations are in contact with each other (Liberg & Andrén 2004, Linnell & Brøseth 2004), but on the basis of genetic analyses (Hellborg et al. 2002) the Finnish population should not be dealt with together with the Swedish and Norwegian populations. According to Hellborg et al. (2002), the Finnish and Baltic lynx populations are genetically more diverse than the Swedish and Norwegian populations. In addition, the Scandinavian population may be divided into sub-populations, between which no gene flow has taken place (Rueness et al. 2003). The most probable reason for the reduction in genetic diversity is lack of gene flow (Amos & Harwood 1998, Frankham et al. 2002, Sponge & Hellborg 2002) combined with a bottleneck effect encountered by the population (Hellborg et al. 2002, Sponge & Hellborg 2002) – in the 1920s the number of lynx in Scandinavia was less than a hundred individuals (Liberg 1998). There is hardly any gene flow from Finland to Sweden, i.e. only about 0.82 lynx per generation (Hellborg et al. 2002, Sponge & Hellborg 2002). The current Scandinavian lynx population probably consists of lynx that survived the bottlenecks, both in northern and southern Scandinavia, and as a result of this three different sub-populations of lynx can be distinguished on a north-south axis (Rueness et al. 2003).

4. Financial losses caused by lynx (Tuija Liukkonen and Sauli Härkönen, University of Helsinki and Pälvi Salo, University of Turku)

4.1. Lynx as vermin

Attitudes towards large carnivores are often determined by how much harm they do, for example, to domestic animals and pets. Compared with other large carnivores, lynx cause rather little harm to domestic animals (von Arx et al. 2004, Härkönen 2004). Neither have any cases of lynx attacking humans come to the notice of the authorities.

In Europe it is estimated that lynx kill 0.01–0.55% of domestic animal stock annually (Kaczensky 1996 cited in Stahl et al. 2001a). The amount of loss of domestic animals depends, among other things, on the type of grazing, the abundance of domestic animals and natural predators, the structure of the environment and the presence of so-called problem animals (Stahl et al. 2002). Often losses are concentrated in a very small area, and even though the number of losses remains

small on a national level, they may have very great significance locally (Stahl et al. 2001a).

In Sweden the grazing of sheep is more common than in Finland, and losses caused by lynx are more frequent. For example, in 1998, the number of grazing sheep in Sweden was about 450,000 and 157 of these were killed by lynx (Linnell et al. 2001, Table 6).

In Norway sheep graze quite freely in forests and meadows during the summer. This means that nearly all carnivores in these areas are equally likely to encounter and kill sheep. They do not need to learn special skills to hunt and kill sheep other than crossing fences and avoiding sheep dogs. The question of problem individuals does not arise, as all carnivores can hunt sheep with equal chances (Linnell et al. 1999). In Norway the relationship between lynx and sheep farmers is very conflicting, since lynx kill annually 7,000–10,000 of the about 2.5 million sheep, (Linnell & Brøseth 2004, Table 6). According to Norwegian research, we can rather talk about a problem gender than about problem individuals, as male lynx kill more sheep than females (Odden et al. 2002). Non-selective hunting as a sport only reduces the loss of domestic animals if the whole lynx population is reduced (Herfindal et al. 2005b).

In 2000–2004 applications for compensation came in



The lynx causes the largest losses to reindeer husbandry in Finland

Table 6. Losses of domestic animals caused by lynx in Sweden and Norway in 1996-2003.

Year	Sweden ¹			Norway ²		
	Lynx population	Sheep	Reindeer	Lynx population	Sheep	Reindeer
1996		.		410	9 862	not specified
1997		153		486	9 075	not specified
1998	approx. 1 500	157	20 000-	403	9 204	not specified
1999	a year	51	40 000	448	9 300	not specified
2000	1996–2001	98	a year	366	8 337	not specified
2001		130		327	7 330	not specified
2002		.		332	6 198	.
2003		.		267	6 853	.

¹ Liberg & Andrén 2004

² Linnell & Brøseth 2004

Table 7. Losses and damage caused by lynx in Finland in 2000-2004 (excluding reindeer losses).

	2000	2001	2002	2003	2004
Claimants, no.	4	4	5	9	14
Separate cases of loss, no.	4	6	5	15	14
Dogs	-	–	1	1	2
Sheep	2	5	3	11	8
Cattle	–	–	1	–	–
Poultry	–	1	1	–	2
Other	2	–	1	3	2
Total compensation paid, euro	1866,73	4888,33	3407,29	9438,00	11070,56

for a total of 166 sheep and three head of cattle killed by lynx in Finland (Härkönen 2004). In reality, however, the losses are higher, as some losses are not recorded in the statistics (Table 7). Of all livestock farms (some 21,500), about 1,000 are sheep farms. They are spread fairly evenly around the country, but most of the sheep farms are located in Southwest Finland and Pirkanmaa (Information Centre of the Ministry of Agriculture and Forestry, press release on farm statistics / Maataloustilastotiedote 5/2005). Since section 18(3) of the Government Decree amending the Animal Protection Decree (171/2005) increased grazing as from July 2006, it is possible that losses of cattle caused by lynx will also increase.

The compensation of losses caused by game animals is provided in section 87 of the Hunting Act. Losses caused by lynx are compensated under the Government Decree on Compensation for Damages Caused by Predatory

Animals (277/2000). For each claim there is a sum amounting to 250 euros/calendar year payable by the claimant, which forms part of the compensation. A working group investigating the compensation of losses submitted its proposal for a new compensation system to the Ministry of Agriculture and Forestry in October 2005. The working group proposed a separate act on losses caused by game animals.

4.2 Categories and number of losses

In the case of lynx, losses caused to reindeer husbandry are the biggest loss group calculated per animal. In Sweden compensation is paid in the reindeer herding area according to the number of reproducing lynx, not according to the number of reindeer killed (Liberg & Andrén 2004). In Finland the number of compensations paid for reindeer in 2000-2003 varied between 130 and 230, but it is unlikely that all reindeer killed by lynx are

Table 8. Compensated reindeer losses caused by lynx and other large carnivores in 2000-2003. In brackets, percentage of all losses caused by large carnivores attributable to lynx

	2000	2001	2002	2003
Claimants, no.	731	659	594	485
Lynx	137 (4,9 %)	128 (6,3 %)	145 (9,0 %)	227 (15,3 %)
Bear	716	527	304	327
Wolf	270	386	561	320
Wolverine	1683	986	605	614
Total killed by all large carnivores	2806	2027	1615	1488
Compensation paid for animals killed by lynx, euros	8575	8001	8640	13770

found (Härkönen 2004). According to research, lynx account for about 8% of reindeer losses, while bears account for 25%, wolves for 22%, wolverine for 28% and eagles for 14% (Nieminen & Norberg 1997). In 2000–2003 an average of 160 reindeer killed a year were reported to the Ministry of Agriculture and Forestry (Table 8). The average figure for bears was about 470, for wolves 384 and for wolverine 972 reindeer (Härkönen 2004, www.suurpedot.fi).

Attacks on dogs are one of the biggest problems as regards tolerance of the wolf population (Palviainen 2000, Bisi & Kurki 2005), but in the case of the lynx the problem is much smaller. A lynx will not take a dog in its own yard as a wolf will (Kojola & Kuittinen 2002, Bisi & Kurki 2005), and losses have usually occurred in hunting, when the lynx has been unable to escape or climb a tree. In the past few years, at most one or two applications a year have been made for compensation of dogs killed by lynx (Härkönen 2004). Nevertheless, losses of hunting dogs caused by lynx one important negative aspect relating to lynx brought up in stakeholder questionnaires (Liukkonen et al. 2006).

When we examine all the losses that have occurred dur-

ing the past few years (Table 7) and the regional distribution of compensations paid by T&E Centre (Employment and Economic Development Centre), it can be seen that losses where compensation has been applied for are most numerous in North Karelia (6), South Savo (5), Central Finland (5) and Pirkanmaa (4). In North Savo, where the number of lynx litters is highest, there was only one case of compensation for the loss of a sheep. In North Karelia two of the losses were of sheep and in one case a lynx had killed geese. The biggest losses caused by lynx were in South Savo, where 4,400 euros was paid for loss of sheep, and Ostrobothnia, where 5,800 euros was paid for losses to a fur farmer. Elsewhere the losses were in the range of about two thousand to a few hundred euros.

It is difficult to predict the impact of the growth and spread of the lynx population on the trend in the losses, but the amount of losses compensated for does not seem to correlate directly with the size of the lynx population. As the lynx population has grown, the amount of losses has increased to some extent, but the proportion of losses caused lynx has, nevertheless, remained relatively small.

5. Legislation and commitments relating to management of the lynx population (Tuija Liukkonen & Sauli Härkönen, University of Helsinki)

5.1 The status of the lynx in national legislation

In Finland, matters relating to the well-being, protection and population regulation of wild animals are prescribed in the legislation on animal protection, nature conservation, and hunting. Animal protection legislation defines acceptable treatment of individual animals in the case of wild animals, but the law does not take any stand on the question of protection of species or regulation of animal populations. Chapter 6 of the Nature Conservation Act prescribes on the protection of wild animals, but it also (in Section 37) states that the provisions do not apply to the game animals referred to in the Hunting Act, Section 5, which include the lynx. On a national level, only the Hunting Act is applied to protection of the lynx and regulation of the lynx population.

Under section 5 of the Hunting Act, the lynx is a game animal, but since the lynx belongs to the species listed in Annex IV of the EU's Habitats Directive (animal and plant species of Community interest in need of strict protection), this has involved the introduction of a strict protection system for the lynx, also in Finland. The provisions of Article 12 of the Habitats Directive have been included in section 24 of the Hunting Decree (666/1993), i.e. the lynx is a strictly protected game animal throughout the year. The exceptional grounds mentioned in Article 16 of the Directive are prescribed in section 28 of the Hunting Decree, according to which exceptions may be made to the general closed season laid down in section 24 of the Hunting Decree, if no other satisfactory solution can be found and hunting does not impair the maintenance of a favourable conservation status of the lynx population in its natural distribution range. Provided that the exceptional circumstances are met, lynx may be hunted between 1 December and 28 February. Exceptions are made for female lynx with a cub or cubs under one year, which are always subject to protection.

According to section 1 of the Hunting Decree, a hunting

licence as referred to in section 10(2) of the Hunting Act must be obtained for hunting lynx. The hunting licence is granted by the relevant game management district. The Ministry of Agriculture and Forestry issues more detailed regulations on the granting of hunting licences.

The Ministry of Agriculture and Forestry can, under section 41 of the Hunting Act and with the consent of the holder of hunting rights, grant permission to kill or hunt a game animal as referred to in section 5 of the Hunting Act with prohibited equipment or by prohibited methods, for purposes of research, game management, prevention of loss, prevention of animal disease or other acceptable purpose.

Section 25 of the Police Act (493/1995) and section 14 of the Animal Protection Act (247/1996), also relate to management of the lynx population. According to section 25 of the Police Act, the police officers have the right to capture or put down an animal causing danger to the life or health of a human being, or if an animal is causing significant damage to property or serious danger to traffic. An animal may also be put down when it is in such a condition that keeping it alive would clearly represent cruelty towards it. Under section 14 of the Animal Protection Act, an effort must be made to help a sick, injured or otherwise helpless wild animal. If, however, the animal's condition is such that keeping it alive would be obvious cruelty, the animal is to be put down, or else steps must be taken to have it put down.

Table 5 shows the Ministry of Agriculture and Forestry's maximum annual permitted quota of lynx killed, the hunting licences granted by the game management districts and the number of lynx killed in the whole country in 1999–2006.

5.2 European Community legislation

5.2.1 Habitats Directive

The main aim of the European Union's Directive on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive, 92/43/EEC) is to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. The Habitats Directive distinguishes between conservation of species and conservation of habitats. Conditions for the implementation of a favourable conservation status have been defined separately for each

of these. In the case of the lynx, it is crucial to examine the situation in the light of the Directive's regulations concerning species conservation.

Article 1 of the Habitats Directive defines favourable conservation status as follows: conservation status of a species means the sum of the influences acting on the species that may affect the long term distribution and abundance of its populations.

The Habitats Directive defines the conservation status of a species as being favourable when

- population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats,
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is and will probably continue to be a sufficiently large habitat to maintain its populations on a long-term basis.

The Habitats Directive defines the conservation status of a habitat as being favourable when:

- its natural range and areas it covers within that range are stable or increasing
- the specific function and structures which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

As regards habitat conservation, the lynx comes under the priority species in Annex II of the Habitats Directive. The lynx is thus an animal species of Community interest whose conservation requires the designation of special areas of conservation. In practice this means that lynx habitats should be included in the Natura 2000 network to ensure that the favourable conservation status of habitats is maintained or, if necessary restored, in the natural distribution range of the lynx. However, the requirements of Annex II are not applied to Finland's lynx populations as Finland was granted a derogation from these in its Treaty of Accession.

In terms of species conservation, the lynx comes under the species listed in Annex IV of the Habitats Directive, i.e. animal and plant species of Community interest in

need of strict protection. According to Article 12 of the Habitats Directive, Member States shall take the requisite measures for establishing a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting all forms of deliberate capture or killing of specimens of these species in the wild

National legislation must comply with the requirements of the Directive. However, derogations are permitted from the prohibitions of Article 12 of the Directive, if no other satisfactory solution is found and if the derogation is not detrimental to the maintenance of a favourable conservation status of the populations concerned in their natural range. Article 16 of the Habitats Directive lists the grounds on which Member States may derogate from the prohibitions:

- (a) in the interest of protecting wild fauna and flora and conserving natural habitats;
- (b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property;
- (c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment;
- (d) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants;
- (e) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species listed in Annex IV in limited numbers specified by the competent national authorities.

The Habitats Directive requires Finland to act in such a way as not to endanger the favourable conservation status of the lynx population. The Ministry of Agriculture and Forestry, as the authority responsible for questions relating to game, has the responsibility for taking the requisite measures. The Ministry has the duty to monitor the development and regional distribution of the lynx population in Finland and to take an active role in its management.

The Habitats Directive is binding on the Member States. National legislation must meet the requirements of the Directive, and no national derogations from the provisions of the Directive are permitted.

5.2.2 CITES Regulation

In December 1996 the Council of the European Community passed the Council Regulation (EC) on the protection of species of wild fauna and flora by regulating trade therein (No 338/97). This regulation, known as the CITES Regulation, entered into force in June 1997. The CITES Convention is implemented by the CITES Regulation. The Convention is described in more detail in Section 5.4.2. The obligations of a Member State to carry out certain measures have been included in the Finnish Nature Conservation Act (1096/1996).

5.3 Other international obligations

5.3.1 The Bern Convention

General

The Convention on the Conservation of European Wildlife and Natural Habitats, known as the Bern Convention, was signed in Bern, Switzerland, on 19 September 1979. The Convention entered into force in Finland on 1 April 1986. The objective of the Convention, set down in Article 1, is to conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several states, and to promote such co-operation. Particular emphasis is given to endangered and vulnerable species, including endangered and vulnerable migratory species. The principle of "favourable conservation status" was first used in the Bern Convention.

The Convention states that, under Article 2, "The Contracting Parties shall take requisite measures to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements and the needs of sub-species, varieties or forms at risk locally."

Under Article 3 of the Convention, "Each Contracting Party shall take steps to promote national policies for the conservation of wild flora, wild fauna and natural habitats, with particular attention to endangered and vulnerable species, especially endemic ones, and endangered habitats, in accordance with the provisions of this Convention. Each Contracting Party undertakes, in its planning and development policies and in its measures against pollution, to have regard to the conservation of wild flora and fauna. Each Contracting Party

shall promote education and disseminate general information on the need to conserve species of wild flora and fauna and their habitats."

The status of the lynx

In the Annexes to the Bern Convention, fauna species are divided into strictly protected (Appendix II) and protected fauna species (Appendix III). The lynx comes under Appendix III, according to which the degree of protection is less strict than for the species in Appendix II, and their exploitation and hunting is permitted. The Member States are required to ensure that their conservation is not endangered. This may require special measures such as setting a closed season or regulating trade in these species.

The meetings of the Standing Committee of the Bern Convention have made several recommendations on large carnivores. The most important of these is Recommendation No 74 (1999): Recommendation on the Conservation of Large Carnivores, which approves the establishment of a network with the task of restoring viable large carnivore populations in Europe and promoting the co-existence of large carnivore populations with humans. The Large Carnivore Initiative for Europe (LCIE) is a network originally set up by the WWF (The World Wide Fund for Nature) consisting of experts and organisations from 25 European countries, which operates within the Species Survival Commission (SSC) of the IUCN (the World Conservation Union).

In 2000 the Council of Europe issued a statement and programme for the management of large terrestrial carnivore populations, with the objective that Member States should draw up national management plans for all large terrestrial carnivores, including the lynx. The species-specific programmes proposed in the statement are not actual management plans; their task is to function as action plans on a European scale, supporting international decision-making.

Based on the Bern Convention, the Action Plan for the Conservation of the Eurasian lynx (*Lynx lynx*) in Europe (Breitenmoser et al. 2000) was drawn up in 2000. The action plan described the state of the European lynx population and found that the conservation of the lynx as part of European fauna is less an ecological question than one of conflicts relating to the co-existence of lynx and humans. It also stated that protection and management plans should be based on socio-economic aspects. On the European level, five general goals were defined for the conservation of the Eurasian lynx:

- 1) to reduce the conflicts between humans and lynx in order to enhance human acceptance of the predator,
- 2) to save threatened autochthonous lynx populations,
- 3) to secure the long-term survival of viable populations through proper management,
- 4) to restore lynx in all areas suitable to host viable lynx populations, and
- 5) to support restoration of small local populations if they can be maintained as a sub-population of a viable regional population.

5.3.2 CITES Convention

The CITES Convention (Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an agreement signed by the Contracting States, regulating international trade in endangered species of wild fauna and flora. The Convention entered into force in July 1975. Finland has been a party to the Convention since 8 August 1976. So far more than 160 states have signed the Convention.

Trade in specimens of the species listed in Appendix I is prohibited. Trade in specimens listed in Appendix II is permitted but subject to permit. In the EU regulation implementing the CITES Convention, Council Regulation (EC) No 338/97, the corresponding annexes are A and B. In addition, it should be noted that the EU regulation covers not only trade between Member States but also internal trade within a Member State.

Of game animals, the bear, wolf, otter and lynx are included in Appendix A. Buying and selling of living and dead specimens of these species or parts or derivatives thereof is prohibited both in the Community and in each Member State. Exemption from the prohibition may be obtained by applying for a CITES certificate from the Finnish Environment Institute. The applications should have appended a certificate that the person in question is legally entitled to hunt granted by a game management association. The CITES certificate entitles the holder to trade across the whole EU area. Only a few certificates are applied for and granted annually for trade in lynx.

Hunting trophies as mentioned in Annex A (e.g. brown bear, wolf and lynx) may be imported into the Community only when the importer has the valid original permits, a CITES export permit or a CITES re-export certificate and a CITES import permit granted by the Finnish

Environment Institute (V. Miettinen, www.ymparisto.fi). For exports to countries outside the Community a CITES export permit granted by the Finnish Environment Institute is required.

5.3.3 Convention on Biological Diversity CBS

The Convention on Biological Diversity CBS was signed at the UN Conference on Environment and Development (the Rio Earth Summit) in Rio de Janeiro on 5 June 1992. The objectives of the CBS are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. Sustainable use is defined in the Convention as the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity. The Convention entered into force in Finland on 25 October 1994.

5.3.4. The classification status of the lynx

According to the IUCN's global classification, the lynx is a near threatened species. The classification is based on estimates of population density and the range of geographical distribution (Nowell & Jackson 1996, Breitenmoser et al. 2000). According to these estimates, the total number of reproducing lynx (effective population size) is less than 50,000 individuals. In addition, the trend in the total population development has been falling, due to the dwindling of habitats and prey animal populations and to hunting. Should the falling population trend continue, the supranational category for the species would have to be reviewed and changed from near threatened to vulnerable.

The lynx is classed as near threatened in a report on Finland's threatened wildlife species published in 2001. According to the report, however, near threatened species are not necessarily threatened, but may be declining or rare species that do not always meet the criteria for threatened species. Near threatened species also include little known species whose habitats are known to be threatened or declining; or they are threatened species according to the criteria, but are reinforced by cross-border migration. The status of the lynx will be reviewed in a new evaluation of threatened species to be carried out by 2010.

5.4 International cooperation

5.4.1 Cooperation between authorities in the Nordic countries, the Nordic Council, the Nordic Council of Ministers and the North Calotte Council

The Ministry of Agriculture and Forestry has participated in joint meetings with the corresponding authorities responsible for matters relating to large carnivores in Sweden and Norway (in Sweden: Naturvårdsverket and in Norway: Direktoratet för naturförvaltning) since 2000. The meetings, held once or twice a year on an alternating schedule, discuss current issues relating to large carnivores and ongoing projects.

The Nordic Council and the Nordic Council of Ministers are responsible for official Nordic cooperation. The Nordic Council, founded in 1952, is a forum for Nordic parliamentary cooperation. It has 87 members from five Nordic countries and three autonomous territories. The Nordic Council of Ministers, founded in 1971, is the governmental cooperation body of the Nordic countries.

The Nordic Council has proposed a joint Nordic administrative strategy for large carnivores. The Finnish, Swedish and Norwegian authorities commented on the revised proposal in a seminar organised by the Environment and Natural Resources Committee in September 2002. The Nordic Council of Ministers later stated, on the basis of a more detailed survey, that there is already cooperation between Finland, Sweden and Norway on issues relating to large carnivores, and that a joint administrative strategy is not feasible.

The North Calotte Council is a permanent body for cooperation between Finland, Sweden and Norway, whose task is to increase cooperation in the North Calotte in the fields of regional policy, employment policy and other sectors that affect employment in the North Calotte region. The Council is funded mainly by the Nordic Council of Ministers. The geographical area covered

by the Council's activities comprises the provinces of Nordland, Troms and Finnmarken in Norway, Norrbotten and Västerbotten in Sweden and Lapland in Finland.

The North Calotte Environmental Committee's working group on large carnivores, which operates under the North Calotte Council, has published four reports on large carnivores: one status report on the wolverine, lynx, wolf and bear in the North Calotte in 1993, a proposal to coordinate monitoring of carnivore populations in 1994, a proposal on the coordination of administration in 1996 and a status report on the wolverine, lynx, wolf and bear in the North Calotte in 1992–2000. In addition, the working group has made recommendations for cooperation between Finland, Sweden and Norway on issues relating to large carnivores.

5.4.2 Nordic large carnivore research coordination group and cooperation with Russia and other European countries

The purpose of the Nordic large carnivore research coordination group is to coordinate Nordic research on large carnivores. The authorities in Finland, Sweden and Norway (the Ministry of Agriculture and Forestry, Naturvårdsverket and Direktoratet för Naturförvaltning) are represented in the group, together with other significant bodies which provide the funding. Thanks to the coordination work, several major large carnivore projects have been launched, especially in Sweden and Norway. The group meets annually.

Finland and Russia have been involved in cooperation between the neighbouring regions. In this context, game authorities and researchers have organised joint seminars and exchanged information on the status of animal populations, population development and management, and development of research. Various meetings have been held annually. There has been similar cooperation with Estonia and other European countries.

6. Lynx population management so far (Tuija Liukkonen, University of Helsinki)

6.1 Finnish Council for Natural Resources: objectives of the Working Group for Large Terrestrial Carnivores 1996–2010

In 1996 the Working Group for Large Terrestrial Carnivores of the Finnish Council for Natural Resources set a target for the development of large carnivore populations up to the year 2010. At the same time Finland was divided into six large carnivore population management areas (Fig 7). The report "Suomen maasuorpetokannat ja niiden hoito" (Finland's large terrestrial carnivores and their management) presented an estimate based on existing knowledge of the size of lynx, bear, wolf and wolverine populations, their target populations and related perspectives, such as regional distribution, together with grounds, measures needed to prevent loss and damage by carnivores and matters relating to population regulation, where necessary. The Finnish Council for Natural Resources approved the working group's report and proposed to the Ministry of Agriculture and Forest-

ry that the management and sustainable use of Finland's large terrestrial carnivores be implemented in the six population management areas up to the year 2010, as proposed by the working group (Fig. 7).

The objectives were to strengthen the lynx population in western Finland (IV) and central Finland (V). The population was to be kept at the 1996 level in eastern Finland (VI). In the reindeer herding area (I, II, III) no target was set. The working group's report was not binding on the Ministry of Agriculture and Forestry or on other bodies. However, the Ministry of Agriculture and Forestry has made an effort to comply with the targets set in the report in the implementation of lynx population management.

The target for lynx in the whole country was a population increase of about 1.5% a year, in which case the population would be somewhat more than 20% higher in 2010 than in 1996. In 1996 Finland's lynx population was estimated at 790 individuals (Kojola, www.suurpetot.fi), and thus a 20% increase would mean about 160 lynx more i.e. a total of about 950 lynx by 2010. Considering the whole country the target population has already been reached, since the minimum population estimate in 2005 was 1,100–1,200 lynx (Kojola et al. 2006).

	I Northern reindeer herding area, no population target set
	II Western reindeer herding area, no population target set
	III Eastern reindeer herding area, no population target set
	IV Western Finland, moderate population increase, 2.1–4.0 %/year, 31–60 % in target period
	V Central Finland, moderate population increase, 2.1–4.0 %/year, 31–60 % in target period
	VI Eastern Finland, population to remain at 1996 level, ± 0.5 %/year, ± 7.5 % in target period

Figure 5. The large carnivore population management areas and population targets proposed by the Finnish Council for Natural Resources in 1996–2010 (Ministry of Agriculture and Forestry 1996). I = Northern reindeer herding area, II = Western reindeer herding area, III = Eastern reindeer herding area, IV = Western Finland, V = Central Finland and VI = Eastern Finland.

6.2 Information on large carnivores

In a survey carried out to provide a basis for the lynx and bear management plans (Liukkonen et al. 2006, Mykrä et al. 2006), the respondents considered the most important requirements for the co-existence of lynx and humans to be, after population regulation, the dissemination and communication of factual, impartial and truthful information on matters relating to the lynx.

Information on the lynx as on other large carnivores is available from many different sources. The tasks of the statutory hunters' organisation include education and information and the organisation can be considered the most important disseminator of information on large carnivores (e.g. through the hunting magazine, *Metsätäjä-lehti*). The Finnish Association for Nature Conservation also disseminates information on large carnivores. In addition to the Internet, the sources that reach the general public best are probably newspapers and articles in special-interest magazines relating to nature and hunting.

The website www.suurpedot.fi, which opened in summer 2002, provides basic information on large carnivores in a concise form as well as up-to-date information on the management of large carnivore populations and research on large carnivores. The organisations involved in creating the website were the Ministry of Agriculture and Forestry, the Hunters' Central Organization, the Finnish Game and Fisheries Research Institute, the Finnish Association for Nature Conservation and the Ministry of the Environment. The responsibility for updating the website lies with *Metsähallitus*.

The Petola Visitor Centre in Kuhmo was opened to the public in June 2005. As part of the visitor centre network run by *Metsähallitus*, it will specialise in large carnivores and in providing information about these. A steering group was set up to support the Petola Visitor Centre's information task, consisting of representatives from *Metsähallitus*, the town of Kuhmo, the Ministry of Agriculture and Forestry, Hunters' Central Organization, the Finnish Game and Fisheries Research Institute, the Finnish Association for Nature Conservation and the Ministry of the Environment.

6.3 Activities of carnivore contact persons

Monitoring of the lynx population is based on sightings both of individual lynx and of litters, recorded and re-

ported by carnivore contact persons. The minimum population estimate is based on sightings that have been reported and confirmed. Population regulation is based on this estimate. The contact persons for carnivores therefore play an important role in managing the lynx population.

At the moment there are about 1500–1600 carnivore contact persons in Finland. The number varies considerably by game management district, with about twenty in some districts and several hundred in others. The number of contact persons has remained fairly constant in approximately half of the game management districts and it is on the increase in about half of them. The numbers of assisting carnivore contact persons in the districts varies.

According to a questionnaire posted to the game management districts, the training of carnivore contact persons is carried out by the district in cooperation with researchers from the Finnish Game and Fisheries Research Institute. Training events are organised at least once a year in most of the game management districts. Usually the game manager or game management advisor is responsible for organising the training. The need for training and the role played by the Finnish Game and Fisheries Research Institute's carnivore researchers in training and producing training material are felt to be of vital importance in the game management districts. In addition, there is a need for versatile, high quality material to support the sighting of carnivores, such as PowerPoint presentations, guides, plaster cast models and photographs.

Even though the carnivore contact system is generally speaking quite effective, there is also room for improvement. In the case of the lynx, the problem is that sightings may be too numerous to be recorded and reported. As a result, the number of sightings may fall and thus the minimum population estimate can be distorted. Another problem is the emergence of areas that are not covered, which means that in the areas of some game management associations no sightings are recorded. Sightings made by the general public are acceptable if they are reported immediately to the contact person and can be confirmed. On the other hand, sightings of single animals only increase the number of individual sightings, whereas for estimating the population, sightings of litters are more important. In the above respects, the motivation, feedback and the appreciation shown for the work of the contact persons all contribute to the upkeep and effectiveness of the system.

6.4 Advisory committees on large carnivores

An advisory committee on large carnivores was set up in North Karelia in 1999 on the initiative of the regional government. Its members represent forest management, berry pickers, hunters, farmers, the Border Guard, game management, nature conservation and the relevant authorities. The purpose of the advisory committee was to start a dialogue between the various interest groups on attitudes to large carnivores and to develop a regional perspective on the issues involved.

Besides discussion and interaction, the activities of the North Karelia advisory committee on large carnivores have included research projects on large carnivores. Studies published by the University of Joensuu "Suurpedot Pohjois-Karjalassa, pohjoiskarjalaisten luonnokäyttäjien kokemuksia suurpedoista" (Large carnivores in North Karelia, experiences of large carnivores among nature users in North Karelia) (Palviainen 2000) and "Pohjois-Karjalan suurpedot" (Large carnivores of North Karelia) (Lyytikäinen et al. 2004) are the results of such projects. The advisory committee on large carnivores has met regularly and it has actively and interactively promoted regional information dissemination and prevention of damage, as well as dealt with problems relating to the hunting of large carnivores.

The regional government of Kainuu decided to set up a regional advisory committee on large carnivores in December 2000, on the initiative of the nature conservation association Luonnonsuojelupiiri ry 2000. It has functioned actively and shown initiative in increasing stakeholders' knowledge on large carnivores, creating a dialogue and promoting cooperation between the different interested parties. The advisory committee has consisted of representatives of the regional government and council, the police, the regional environment centre, the road administration district, the reindeer herding cooperative of Halla, and various enterprises relating to nature and wilderness activities, the Kainuu district of the Finnish Hunters' Association, the Kainuu district of the Central Union of Agricultural Producers and Forest Owners (MTK), Metsähallitus, the Kainuu game management district, the Kainuu Employment and Economic Development Centre, the Ornithological Society of Finland (now BirdLife Finland), the Kainuu nature conservation district, the Kainuu district of the Finnish Kennel Club and the Finnish Game and Fisheries Research Institute. The Ministry of Forestry and Agriculture has been informed about the results of these meetings.

In November 2004, the North Savo Regional Council convened local stakeholders and interest groups to discuss the situation regarding large carnivores in North Savo. The idea was that the activities of the Working Group on Large Terrestrial Carnivores would become a continuous forum for discussion, which would meet when necessary, and in which the game management district would participate as an expert member. Other stakeholder groups, in addition to the Regional Council, are the North Savo nature conservation district, the North Savo district of the Central Union of Agricultural Producers and Forest Owners, the Finnish Forest Owners' Association, the regional environment centre, the North Savo district of the Finnish Forest Owners' Association, the local district of the Finnish Kennel Club, representatives of the municipalities, Metsähallitus and the police. The dialogue that has been carried on between the various interested parties in the Working Group on Large Terrestrial Carnivores on problems and their possible solutions is seen to encourage a constructive and sustainable attitude to the issues involved.

An advisory committee on large carnivores was set up in Central Finland on 12 April 2006. The Regional Council of Central Finland convened various stakeholders (the University of Jyväskylä, Department of Bio- and Environmental Sciences, Central Finland Employment and Economic Development Centre, Central Finland Regional Environment Centre, Jyväskylä District Police, and the Central Finland districts of the Finnish Kennel Club, Central Union of Agricultural Producers and Forest Owners, Finnish Forest Owners' Association, Finnish Association for Nature Conservation and Finnish Hunters' Association), which decided to set up an advisory committee. A decision was also made to invite representatives from the association Wild Lynx ry, Keski-Suomen Kylät ry (association of villages in Central Finland) and the regional government. The Central Finland game management district serves as an expert member on the advisory committee. Other experts will be called as necessary. The Central Finland district of the Finnish Hunters' Association took responsibility for leading the activities of the advisory committee on large carnivores. The committee serves as a forum where various organisations and actors can discuss and make initiatives relating to large carnivores.

6.5 The hunting licence practice of the Ministry of Forestry and Agriculture (Sauli Härkönen, University of Helsinki)

6.5.1 General

The objective of the Ministry of Agriculture and Forestry is to maintain a viable lynx population at a favourable conservation status. In addition, population management should be ecologically, economically and socially sustainable. The Ministry has repeatedly stressed in statements that the number of lynx could be increased in suitable areas and where population densities are fairly low. The Ministry of Agriculture and Forestry has, however, also stressed that large carnivores may not place an unreasonable burden on any particular area, population group or means of livelihood.

6.5.2 Instructions and allocation of hunting licences

One aspect of lynx management is hunting for the purpose of regulating the population and removing individual lynx in order to prevent damage. The Ministry of Agriculture and Forestry may, if necessary, issue regulations on the restriction of hunting based on hunting licences, the conditions for granting hunting licences, the procedure for granting hunting licences and reporting on permitted hunting. The Ministry of Agriculture and Forestry has based its regulations on the conditions set for favourable conservation status. The annual lynx population estimate made by the Finnish Game and Fisheries Research Institute and the sustainable hunting based on this provide background information for the permitted number of lynx killed, which is established by the Ministry of Agriculture and Forestry.

Lynx hunting is controlled very strictly by an official order. The provisions of the order also take into account lynx killed otherwise than by hunting. These are referred to as "additional losses", which comprise lynx killed on the basis of special permits granted after the order was issued under section 41(2) of the Hunting Act or section 25 of the Police Act (493/1995) or lynx otherwise killed by human intervention that have been reported. The game management districts are to take the additional losses into account as a reduction in the numbers of lynx to be removed on the basis of hunting licences. The aim of this procedure is to ensure that the

lynx population is not endangered under any circumstances. Statistics are also kept of lynx killed on the road. The additional loss consisting of the above has remained relatively low in the past few years (Table 5). The overall loss has not had a detrimental effect on the lynx population, which has developed favourably.

The basic premise is that hunting takes place on the basis of licences issued by the game management districts. In exceptional cases the Ministry of Agriculture and Forestry may grant lynx hunting permits on a discretionary case-by-case basis for killing certain individual animals regardless of their protected status, on the grounds given in section 41(2) of the Hunting Act: scientific research, game management, prevention of loss, prevention of animal disease, or other acceptable reason.

Special permits have been granted, where possible, only at times when the game management districts have not been allowed to make exceptions to the protection of lynx. The Ministry of Agriculture and Forestry has in these situations acted on a discretionary case-by-case basis, and the decision has been based on the information presented in the application and any statements appended to it. In addition, the Ministry of Agriculture and Forestry has always, if necessary, requested statements from the local game management district and the Finnish Game and Fisheries Research Institute for the decision on the permit. The Ministry has also used other information in considering the permit application if it has been considered that such information would influence the decision.

In Finland there has been discussion on the effects of eliminating individuals on the lynx population. Some parties consider that hunting makes lynx avoid human beings and that this reduces the amount of damage caused by the animals. It has in fact been found that hunting affects e.g. the wolf (Thurber et al. 1994) and the bear (Brody & Pelton 1989), making them shy of human beings, and that the effect is long lasting. According to a Norwegian study, however, lynx have adapted to living in the vicinity of human beings (Sunde et al. 1998). If there is a suitable habitat available, even individuals of a lynx population subject to hunting may live very close to human habitation. Thus it may be more difficult to keep lynx shy of human beings by hunting than wolf or bear.

6.6. Management plans for the Scandinavian and Baltic lynx populations

Sweden, Norway, Estonia and Latvia have ratified their own management plans for large carnivore populations. Sweden's management of large carnivore populations is based on the Swedish Government's proposal on large carnivore policy "Regeringens proposition, 2000/01:57 Sammanhållen rovdjurspolitik", which the Swedish Parliament passed in spring 2001. The minimum target in Sweden is 300 lynx litters a year.

In Norway the management of large carnivore populations is based on a report approved on 12 December 2003 "Rovvilt i norsk natur" (Stortingsmeldining nr. 15, 2003-2004). Here the minimum target has been set at 65 litters a year.

The Estonian management of large carnivore populations is described in a report written by Asko Lõhmus and published in 2002 "Management of Large Carnivores in Estonia" (Lõhmus 2002). The target in Estonia is to keep the lynx population at a minimum level of 500 individuals.

In the Latvian management plan "Management Plan for Eurasian Lynx (*Lynx lynx*) in Latvia" (Ozoliņš 2002), no actual target population has been defined as yet.

In Lithuania, no management plan or population target has yet been set. The process may be held up by the conflicting aims of different parties (Balčiauskas 2006). The lynx has been fully protected in Lithuania since 1979.

7. Expectations and objectives of Finns regarding lynx population management (Tuija Liukkonen, University of Helsinki)

The existence of lynx does affect human activities to some extent (Liukkonen et al. 2006), but not nearly as much as, for example, the wolf (Bisi & Kurki 2005) or the bear (Mykrä et al. 2006). Even though there are no recorded cases of a lynx having attacked a human being in Finland, people still do not rely on it being harmless. People may even be afraid of lynx and especially of the harm it may cause to domestic animals (Liukkonen et al. 2006). A Norwegian study shows that lynx can tolerate quite a high level of human activity and disturbance in their environment without changing their behaviour or avoiding human beings. According to the study, lynx tolerate quite a high density of human habitation in their environment, as long as there are suitable patches of forest and thick vegetation to protect them (Sunde et al. 1998). Thus human beings and lynx can co-exist without any great conflicts arising.

7.1 History of attitudes to the lynx and of the reactions of Finns to the lynx

7.1.1 Wolf, lynx or wolf-lynx

Until the end of the 19th century, the Hunting Act of 1664 was in force. This act gave hunters a relatively free hand (Pulliainen 1984, Mykrä et al. 2005, Pohja-Mykrä 2005), since anyone "could freely shoot or trap, and keep for his own use, a bear, wolf, lynx, fox, wolverine, pine marten, otter, beaver, seal, or other vermin, and likewise an eagle, hawk, eagle owl, osprey and other bird of prey".

One type of lynx with a coat resembling that of a wolf, called the wolf-lynx, was considered equal to the wolf in the late 19th century, when wolves were said to have killed several children. The wolf-lynx and the wolf were to some extent confused in speech and in the press, they were talked about as if they were the same species and the same bounties were offered for killing wolf-lynx as for killing wolves, both by the state and by various municipalities. As a result, large numbers of lynx were killed instead of wolves. In fact, it was reported in

the Swedish-language newspaper Hufvudstadsbladet in 1881 that in the Kotka region of southern Finland, 11 wolf-lynx had been killed and 1 wolf (Pulliainen 1984).

7.1.2 The lynx in the press and the influence of media leaders on the emergence of negative attitudes to carnivores

Writing in the press about carnivores is generally coloured by expressions of extreme reactions. In the case of the lynx, however, the publicity is only a fraction of that targeted at the wolf or bear. In early spring 2005, the newspaper Kaleva had three news items about lynx. The focus of the headlines was basically on information.

"Lynx kills 20 deer in Vaala". Kaleva 24 March 2005

"Lynx tracks found in Lämsänjärvi, Oulu". Kaleva 29 March 2005

"Mäntylä may have an urban lynx. Kaleva 14 April 2005

In the book "Suurpetomme, karhu, susi, ahma, ilves" (Our large carnivores, bear, wolf, wolverine and lynx) (Pulliainen & Rautiainen 1999), the authors discuss the fear and hatred felt by Finns for carnivores. Pulliainen sees a link with the history of wolves killing human beings, the man killed by a bear in 1998, the media and its influence. In addition, Pulliainen describes the influence of the press, which by its style of reporting both stirs up and sustains negative attitudes to carnivores. There are opinion leaders, who by their statements can create an atmosphere that is negative to carnivores (Pulliainen 1984, Pulliainen & Rautiainen 1999, Pulliainen, oral communication 2005). By exploiting the media, it is even possible to politicise the issue, so that confrontations between humans and carnivores can be used as a political weapon; politicians can take sides with humans against the enemy, i.e. carnivores.

7.2 Opinion polls on the lynx and other large carnivores

The attitudes of Finns to large carnivores, in particular to the bear and the wolf, have been the topic of several Finnish surveys and academic theses in recent years. These studies can be considered to describe the average reaction of Finns to large carnivores and the objec-

tives of population management. As a background to the survey on the lynx (Liukkonen et al. 2006), some earlier studies on the attitudes and opinions of Finns to large carnivores and their most significant findings are presented in the following.

No actual surveys on opinions relating to lynx had been made before the study "Ilveksiä ja ihmisiä" (Between lynxes and people) (Liukkonen et al. 2006), while two separate studies have been made on attitudes to the wolf alone (Lumiaro 1998, Bisi & Kurki 2005). A report has been published on people's attitudes to the bear "Kansalaisten karhukannat" (Mykrä et al. 2006). In addition, during the past few years, some academic theses or research reports have been written on the attitudes of Finns to large carnivores (Korhonen 1996, Palviainen 2000, Vikström 2000, Ratamäki 2001). One recent survey investigated the attitudes of reindeer herders to large carnivores (Sippola et al. 2005).

7.2.1 Lynx the most popular large carnivore

Vikström (2000) studied the attitudes of Finns to large carnivores outside the reindeer herding area. The survey involved sending a questionnaire to 2000 people in 22 municipalities and towns. The respondents were selected by lot from the Population Register Centre, and 1,050 people returned the questionnaire. According to the survey, Finns have a better opinion of the lynx than of other large carnivores in Finland. The answers showed that people did not have a clear picture of the current size of the lynx population, and the lynx was thought to be one of the most threatened species of large carnivores. The lynx's popularity was also explained by the fact that it appears in coats of arms. The film "Poika ja ilves" (The Boy and the Lynx) may also have had a very positive effect on the lynx's image.

There are hardly any myths associated with the lynx in the traditions of indigenous peoples, and the lynx does not appear in fairy tales or fables in the same way as the "big, bad wolf" does (Wallner 1998). Nevertheless, the lynx, like the bear, may have been one of the totem or power-giving animals in Finnish shamanism.

7.2.2 Negative attitudes to lynx also exist

According to Vikström (2000), one central feature of people's attitudes to carnivores was that, in the respondents' opinion, Finland should have viable carnivore populations, but not in their own neighbourhood.



The lynx is our most popular large carnivore

Lynx were feared the least in eastern Finland, i.e. where they are the most frequent and where interaction between humans and lynx is more of a routine.

Vikström's (2000) findings were on the same lines as those obtained by Kaltenborn & Bjerke (2002) in Norway. In their survey, farmers and sheep farmers had the most negative attitudes to carnivores while people with a high level of education such as game biologists and researchers had the most positive attitudes. This is due to a fundamental difference in values. "Nature" as a value was most important in the value system of biologists and researchers, while in the case of sheep farmers the most important value was "security". Negative attitudes to carnivores correlate with values that are associated with security and traditions, while positive attitudes correlate with values that can be associated with "openness to change" and "nature" (Kaltenborn & Bjerke 2002). It can be said that differences like those mentioned above, which appear in fundamental values,

make it more difficult to reach agreement on questions relating to lynx population management.

According to Vikström (2000), older people have a more negative attitude to lynx than younger ones. There was no major difference in attitudes between eastern and western Finland. In other words, in areas where the lynx population is the most numerous, attitudes to lynx are not much more negative than in areas where they are only encountered occasionally. According to Hunziker (1999), the attitude of the Swiss to large carnivores is more positive among people who in other respects, too, take a positive attitude to nature and its spreading. The attitudes of people with more tradition-oriented values towards large carnivores and the spreading of nature were somewhat more negative. This is attributable to traditions and beliefs rather than to knowledge (Wölfel 1998, Hunziker 1999). In a recent survey carried out in Estonia, it was found that feelings of fear and hatred towards carnivores are not typical of Estonians. Extreme opinions are rare, and in the main, the attitudes of Estonians to large carnivores are rational (Randveer 2005). In the results of this survey, the dissemination of rational and correct information was presented as one way of promoting peaceful co-existence between humans and lynx, as it was believed that incorrect knowledge and beliefs are very often the factors behind fear and hatred of lynx. In addition, lynx are also affected negatively by the general fear and hatred of carnivores, which is mainly associated with the wolf (Bisi & Kurki 2005) and to some extent also the bear (Mykrä et al. 2006), but of which the lynx as a predator also gets its share.

Despite negative attitudes expressed by Finns, Vikström (2000) concluded that attitudes to large carnivores were more positive in 1999 than in a survey carried out by Korhonen (1996), which Vikström used as reference material. Fear of predators had, on the other hand, increased in the three year period 1996–1999, mainly in relation to the bear and the wolf.

A survey of hunters in North Karelia by Ratamäki (2001) produced three key observations. First of all, attitudes to large carnivores change slowly. Secondly, tolerance for carnivores can be divided into social and biological tolerance. In other words, while nature could support larger populations of large carnivores than at present, the issue of social tolerance must be given more consideration in making decisions on large carnivore populations. Thirdly, the fear of predators that has arisen in public discussion is explained, according to Ratamäki,

by certain features of modern society. Large carnivores represent an unknown threat in human habitats. The general uncertainty prevalent in society brings out the need to control one's close living environment. The same phenomenon applies to all large carnivores.

7.2.3 The majority support regulation of large carnivore populations

In 2004 the market research company Taloustutkimus Oy carried out a survey commissioned by the Hunters' Central Organization on the attitudes of Finns to hunting (Taloustutkimus Oy 2004). In all, 1,019 people were interviewed. The interviews were personal and carried out by 62 trained interviewers.

Of the interviewees, 82% agreed with the statement that "it must be possible to regulate large carnivore populations", 9% disagreed and 9% had no opinion on the matter. The majority of those who agreed with the statement were men, over 60 years old, their level of education was lower secondary and they were from eastern or northern Finland. Women, under 30 year olds, graduates with a higher education degree and residents in the Helsinki Metropolitan Area were less likely to agree with the statement.

In the survey by Ratamäki (2001), the need for regulating carnivore populations was considered to derive from the feeling that large carnivores represent an uncontrollable factor in the human environment, which in turn gives rise to fear. In a survey by Sippola et al. (2005), the majority of reindeer owners considered that it should be possible to reduce the numbers of large carnivores, and some believed that it should be possible to eliminate them altogether.

7.2.4 In the reindeer herding area carnivores are accepted as long as compensation is paid

According to a recent study (Sippola et al. 2005), the costs to reindeer husbandry caused by large carnivores are higher than the compensation received for losses. Of the reindeer owners who responded to this survey, about 80% considered that carnivores (bear, wolf, lynx, wolverine and golden eagle) can be accepted in the reindeer husbandry area as long as losses are compensated for and carnivore populations regulated. A large number of the respondents believed that carnivores are a part of Finnish cultural heritage. Nevertheless, about

80% of the respondents considered that humans have the right to destroy predators if they cause financial loss. Attitudes to carnivores were more positive in the northern reindeer herding area and among younger age groups.

About half of the respondents (Sippola et al. 2005) were satisfied with the current system of compensating for losses caused by large terrestrial carnivores, but the majority of them wanted to see the system developed. Most wanted the claimant's own liability, i.e. the amount deducted from the compensation, and inspection payments to be removed. In the proposals for change, attention focused strongly on the need to make better provision for calf losses and undiscovered reindeer killed by carnivores and to compensate for the search and guarding costs.

7.3 Lynx and humans

7.3.1 Summary of research findings

The preparation of the lynx population management plan was preceded by a research process carried out by a hearing procedure. The study was carried out by the Ruralia Institute of the University of Helsinki (formerly Institute for Rural Research and Training) with the aim of investigating the expectations and targets relating to management of the lynx population, from both regional and national perspectives. The study focused on the people whose everyday lives are affected by the lynx. The research material consisted of broad-based response material collected among different stakeholders regionally and the results of events open to the public, material from national stakeholder groups and expert interviews. The research report "Ilveksiä ja ihmisiä" ("Between Lynxes and People") (Liukkonen et al. 2006) was based on this material. The following is a summary of the key findings of the report.

Finland's lynx population has grown and spread to new areas during the past few years, so much so that today it is possible to see lynx practically anywhere in Finland, and this has given rise to conflicting attitudes to the lynx and the objectives of lynx population management. The lynx debate has become heated, especially in eastern Finland (South and North Savo, North Karelia and Kymi) and in the Swedish-speaking area of Ostrobothnia, where the lynx population is the densest, as well as in Uusimaa and Central Finland, where lynx

population growth is highly concentrated. Conflicts have arisen relating to the conservation targets brought by EU membership and the practical application of lynx policy at regional level.

The aim of the study was to determine the objectives and expectations relating to lynx population growth, examine the regional and national differences in these and define the objectives of the different stakeholder groups. One special aim was to find out the views of people living in areas where lynx occur and interact with humans on a daily basis. It was considered that the attitudes of these people should be decisive in successful lynx population management.

The survey was basically qualitative, and three main methods were used in collecting the material. First, a written questionnaire concerning lynx was sent to all the key actors connected with nature, nature use and the supervision of its use on both the regional and national level. The respondents were divided into nine different stakeholder groups and quantitative distributions were formed from the responses to the key questions. A total of 239 responses were processed. Together with these stakeholder groups, discussion meetings were also held in each of the 15 game management districts, where the responses of various stakeholder groups were presented and negotiations held on the basis these, with a view to promoting cooperation. The same process was conducted with the corresponding groups operating on the national level.

Secondly, on the basis of the need determined by the game management district, seven public hearings were held, where local people could express their views on the growth and spread of the lynx population, the lynx policy practised in Finland and problems relating to the lynx. Altogether, more than 170 people arrived to discuss the lynx and bear and the management of these populations. Almost 500 people spoke on topics relating to bear and lynx at the hearings.

The third method used was the expert interview. The interviewees selected were persons who on the basis of their profession, hobby or other activities, were assumed to have an insight into the present status and future of lynx population management. Thirty expert interviews were conducted on the subject of the lynx.

Attitudes to lynx were ambiguous. The lynx population was seen both from a problem-centred and biological perspective. Where positive aspects were seen in the

lynx population, they were related to the view that the lynx is part of Finland's natural environment and its biodiversity and ecology. It was also considered a valuable game animal. The biggest problems and losses caused by lynx were seen as relating to the feeding of game animals, mainly roe deer, white-tailed deer and hare. There was very little fear of the lynx, but it caused worry and annoyance. Especially the so-called urban lynx coming into people's gardens and yards was experienced as very negative. Lynx were also considered to cause serious problems for reindeer husbandry, fur farming, cattle and sheep farming as well as hunting dogs. The problem was not only losses caused by lynx, but also the damage and nuisance arising from the prevention of loss. At times lynx come close to human habitation entering gardens or yards, and some individuals can, either due to hunger caused by illness or from experience, repeatedly seek food there. Young roaming lynx individuals may enter gardens or yards, looking for easy prey such as domestic cats or garden hare. Even though these visits do not often cause loss or damage, they generally lead to local demands to eliminate these "urban lynx".

There were conflicting views both between different stakeholder groups and between different areas concerning the targets of lynx population management. The lynx populations in eastern Finland, Uusimaa, Central Finland and Swedish-speaking Ostrobothnia were considered to be already far too large by most of the respondents and local people. People felt that they can no longer influence the decisions concerning them, and that decisions were made by the authorities, conservation organisations and the EU without consulting them. Positive attitudes towards the lynx were expressed most often in South Häme and Uusimaa. Taking the whole country into consideration, it was considered desirable to regulate the lynx population more by hunting on the basis of hunting licences. Demands were expressed that the social impacts of lynx population growth should be taken into account in lynx population management. Nearly all the respondents wanted to see the lynx population more evenly distributed. The willingness to increase the lynx population was the lowest in North Karelia and North Savo, while Oulu and South-west Finland were the most willing to accept a larger population.

Negative attitudes towards the lynx were the most clear among reindeer owners and fur farmers, hunters and kennel owners. Unlike other stakeholder groups, many nature conservation and environmental authori-

ties wanted to see an increase in the lynx population, and they did not accept hunting as a means of managing the population. These groups considered education, information, communication and increasing knowledge as the most important ways of encouraging the peaceful co-existence of human and lynx populations. In addition, they emphasised ecological sustainability over social sustainability as the basis for population management.

Conflicting expectations were expressed both as regards the Ministry of Agriculture and Forestry and the national game authorities and regarding the survey and the management plan under preparation. So far the lynx policy of the Ministry of Agriculture and Forestry has been criticised by both hunters and conservationists. A demand brought up in the survey was that the population management areas of the lynx management plan should be decided by game management districts, as it was felt to be unnecessary to set up a new organisation. In addition, the game management districts consider local expertise to be sufficient so that the management of the lynx population can be carried out at the local level.

Numerous requirements were placed regarding legislation and its interpretation which, if duly followed, would promote the acceptance of the lynx population management plan and increase tolerance of the lynx. These requirements included the revision of the compensation system and changes to the conservation status of the lynx. The possibility of different interpretations allowed by the EU's species-specific conservation legislation may in itself lead to conflicts. For example, the concepts of favourable conservation status and social sustainability are interpreted by different stakeholder groups to suit their own interests. The different groups must be flexible as regards their own objectives if a common understanding is to be reached on lynx population management.

7.3.2 Key issues on which the different stakeholder groups agreed

The survey also brought up several issues on which the various groups involved were largely in agreement. In these questions, discussion is needed to fine-tune the details, but in principle a common understanding exists.

- 1) Policy concerning lynx that are not shy of human beings and that repeatedly move about in the vicinity

of habitation, enter gardens or yards and specialise in preying on domestic animals and pets should be determined at the level of the authorities. It should be possible to eliminate these individuals with maximum speed and flexibility.

All the interested parties were of the opinion that it is unacceptable to have lynx entering gardens or yards. They were unanimous in their reaction to such individual animals: they should be eliminated. The means by which these animals are to be eliminated aroused discussion. Is killing the animal the only method or could it be moved away?

2) The system for compensating losses caused by carnivores should be revised, i.e. the claimant's own liability deductible from the compensation should be abolished, and the time taken to pay the compensation should be shorter. It is not right that the person who has suffered the loss should have to wait an unreasonable amount of time for the compensation.

The view of all the stakeholder groups and the experts was that full compensation should be paid for losses caused by carnivores. The reasoning was very often that if it is prescribed from the above that carnivores must be protected, the losses they cause should be compensated for from the above and the responsibility should not be shifted onto private individuals.

3) The questions of what a favourable conservation status for the lynx is and what a sufficient level of the lynx population would be should be defined in more detail in Finland. If the management of the lynx population is to be successful, a national management plan should be drawn up and it should also have wide acceptance among the different parties involved.

A favourable conservation status for the lynx has not been defined anywhere and no one knows how many lynx there should be in Finland to ensure a sufficient population. Both conservationists and other parties brought up this problem in the discussions on the lynx. When discussing the minimum viable population theoretically, 500 is proposed as the number of reproducing individuals required to sustain genetic diversity and considerably reduce the risk of extinction. The Finnish lynx population is more than twice that number. The different stakeholder groups were of the opinion that a widely accepted plan would clarify this matter considerably.

4) More research is needed on the lynx.

At the moment there is no research being done on the lynx in Finland. Radio transmitter monitoring is being carried out on the wolf, bear and wolverine, but lynx are not monitored. At the moment we rely almost completely on Norwegian and Swedish research for our knowledge of the lynx. Research on carnivores is partly motivated by social debate, and the lynx does not play the most important role in this debate.

5) Efforts should be made to increase the amount of reliable and up-to-date information available. The active dissemination of information and education are of great importance.

Information about the lynx should be disseminated to Finns in order to dispel fears and suspicions caused by wrong information and beliefs. In areas to which the lynx is spreading this information work is of particular importance. Here researchers are in a key position and their role in popularising their research findings is crucial.

6) Methods should be developed for preventing losses of livestock, mainly of reindeer and fur animals, and sufficient resources must be guaranteed for this purpose.

More resources should be allocated for preventing losses caused by carnivores. Information on this should be disseminated widely and, for example, livestock breeders should be given advice on how to prevent losses. The development of new methods should be promoted. Discussion also arose on whether a compensation system like that used for losses caused by eagles could be applied to lynx as well.

7) Regional and national advisory committees on large carnivores should be established to promote cooperation and dialogue between different interest groups on both regional and national levels.

The different stakeholder groups agreed that there is a need for an advisory committee on large carnivores. How it would be implemented and what its role would be in the discussion on large carnivores were seen differently by the different groups. On the regional level it was felt that the advisory committee should have some powers, but its role as a discussion forum and in maintaining contacts were also considered important.

7.3.3 Main causes of disagreement

In the dialogue between the different interest groups, several issues relating to the lynx were raised that are significant in planning lynx population management from the socio-economic point of view, but on which it has so far proved difficult to reach compromises or to reach agreement on the regional level. These include the following:

- 1) Increase and more uniform distribution of the lynx population throughout the whole country.

Not all the parties involved accept that the lynx population should increase from its present level. This view is held mainly by hunters and kennel owners, but also by representatives of agriculture and forestry. The opposition is strongest in areas where the lynx population has been increasing the most in recent years. The uneven distribution of lynx, i.e. the emergence of concentrations of lynx in certain areas, has aroused debate, and it was considered desirable to find ways of dispersing these concentrations.

- 2) Lynx hunting, the dispersal of population concentrations and monitoring the impacts of hunting on the lynx population.

Not all the Finnish nature conservation and environmental authorities accept regulation of the lynx population by means of hunting. Population concentrations, which usually become established close to feeding places for small deer, cannot automatically be targeted by hunting.

The main proposal was that the number of hunting licences should be increased. On the other hand, it was mentioned that non-selective hunting might distort the population structure and thus affect the favourable development of the lynx population.

- 3) Increasing regional administration and local influence in decisions regarding the lynx.

All the groups operating at the national level wanted to see lynx population management mainly steered nationally. Local people feel that the necessary expertise for population management is to be found in the regional game management districts.

- 4) Accepting social sustainability in lynx policy (EU principle of subsidiarity).

It was generally considered that the local game management districts are the best experts on local carnivore populations, so that decisions on population management and regulation should be made at the regional level. It was also felt that the opinions of local people are not heard where the decisions are made.

The environmental authorities and some regional non-profit nature conservation groups do not consider social sustainability to be of great importance. They tend to stress biological and ecological rather than social issues in lynx population management.

- 5) Increasing research on the lynx, development of monitoring and the need to obtain up-to-date information from research findings.

The need for increasing basic research on the lynx was recognised but, on the other hand, some suspected that fitting radio transmitter collars would lead to individual lynx becoming tame. In general, the parties involved wondered about the delay in publishing research results and some suspected that results were being withheld on purpose. At the regional level there was a general lack of confidence in research.

- 6) Participation of environmental authorities and nature conservation groups in the implementation of lynx population management.

Not all local people accept that the influence of environmental authorities and nature conservation groups should be increased. It was considered that these parties are too willing to follow the EU's lead and that this prevents Finland from practising its own national carnivore policy.

- 7) Accepting the responsibility for maintaining a favourable conservation status of the lynx population in Finland.

Many people expressed the opinion that Finland does not have an obligation to take responsibility for the lynx population within the EU. The criticism on this issue was aimed primarily at the EU and its carnivore policy.

8. Threats, viability and favourable conservation status of the lynx population

8.1. Possible threats to the lynx population

In Finland the development of the lynx population has been favourable since the 1970s. The population has grown, its productivity increased, it has spread regionally and is still spreading. As the situations stands, the population can be considered viable and there is no immediate threat of its disappearance.

Hunting

In Finland hunting based on special permits has not had a detrimental effect on the favourable development of the lynx population. In the past few years the maximum permitted number of lynx killed has been about 5–8% of the total population. Another significant factor, in addition to the numbers of lynx killed, is which individuals are eliminated from the population. The time when hunting takes place, i.e. December to February, makes it possible to evaluate the gender and age of lynx on the basis of snow tracks.

Diseases, road accidents and illegal killing of lynx

Lynx that have died as a result of disease are seldom found, and it is possible that the significance of disease as a killer has been underestimated. Lynx are subject to many external and internal parasites, as well as viral and bacterial infections. The most common parasitic disease is scabies caused by the scabies mite, which is transmitted by direct contact from one animal to another. Scabies is not in itself lethal, but loss of fur and secondary infections weaken the animal and impair hunting, as a result of which the animal finally starves to death. Of viral infections, the most important is probably rabies, an infection that destroys brain tissue and leads to death and that can be transmitted to all mammals, also to humans. Rabies is very rarely found in lynx. In Finland rabies is combated by inoculating cats and dogs and by distributing vaccine baits along the south-east border. Rabies was last found in Finland in winter 1989.

Among the most common causes of death in wild lynx, apart from hunting, is road kill (Table 3). Illegal killing of lynx occurs as well, but how commonly or widely it happens is not known. The speed of growth of the lynx

population and the small number of lynx found shot suggest that illegal killing is not sufficiently common to represent a significant threat to the lynx population.

Social tolerance

The greatest threats to the lynx population can be judged to be the same as those in other countries where lynx are found (von Arx 2004) and the same as those affecting the wolf (Bisi & Kurki 2005) and the bear (Mykrä et al. 2006). These threats relate to people's attitudes to large carnivores, their tolerance for carnivores and the fear aroused by losses and damage caused. Some hunters experience the lynx as a competitor, especially where the roe deer is concerned. The management plans present several targets and measures aimed at increasing people's tolerance of large carnivores. These measures relate to the prevention of losses, improvement of the compensation system, monitoring of lynx, development of research, guarantees that lynx causing loss and damage can be eliminated, regulation of population growth and increasing opportunities to influence decision making.

It is especially important to monitor the development of the lynx population and to ensure that the monitoring system works. The responsible authorities should be prepared to act as required by the situation. Probably the biggest challenge to managing the lynx population in Finland is not so much the survival of the population but the increase in productivity caused by population growth, the resulting spread of the population and the occurrence of lynx over a wider area. In this respect the greatest challenge will be to increase and improve people's tolerance for the lynx.

8.2 Viability and favourable conservation status of the lynx

Viability of the population

Despite the fact that the lynx population in Finland was defined as near threatened on the basis of a study carried out in 1998 (Rassi et al. 2001), in the current situation it can be considered viable (taking into account development background, population structure, productivity and genetic structure, management measures taken and the success of these measures). In addition, when examining the lynx population, the geographical context must also be taken into consideration – the link with Russian lynx population. When the above factors

are taken into account in relation to the development of the lynx population, it can be considered that population management has been successful. On the basis of the overall situation at present, it can be assumed that the growth and spread of the lynx population in Finland will continue. Even though individual lynx have been eliminated from the population on the special grounds as set down in the Habitats Directive, individual animals causing damage and loss have been eliminated and some illegal killing is also likely to occur, the favourable development of the lynx population in Finland has not been threatened. In spite of the high mortality rate of cubs, there has been sufficient reproductive potential to compensate for deaths caused by human intervention.

The Finnish lynx population is not as heavily dependent on the hare population as, for example, in Canada, where the lynx population is dependent on fluctuations in the snowshoe hare population. In Finland the lynx has a large choice of alternative prey, such as small deer, foxes, raccoon dogs and Galliformes, which it can exploit if the hare population is low. For example, a collapse of the hare population due to tularemia or rabbit fever may affect the lynx population locally, but not necessarily on the national level.

Favourable conservation status of the lynx

Defining a favourable conservation status for the lynx is a prerequisite for implementing population management. The concept of favourable conservation status is very widely used, but it is not quite so easy to define it. The concept has been discussed extensively, for example, by Mykrä et al. 2006.

Favourable conservation status is examined in the lynx population management plan on the basis of the EU Habitats Directive, according to which the conservation status of a species is favourable when

- 1) population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- 2) the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- 3) there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

In examining the favourable conservation status for the lynx, the minimum viable population of lynx must be

considered. In evaluating the minimum viable population, the risk of extinction is studied over a certain period of time, basing the evaluation on the minimum number of individuals and minimum natural range for the survival of the population. The former is affected by birth and mortality rates and by migration into and out of the home range. The genetic structure of the population can also be considered important for the evaluation, as the viability and reproductive success of individual animals is weakened by diminishing genetic diversity (Frankham et al. 2002). Today the lynx is found in almost all parts of Finland (Kojola et al. 2006), and the minimum population, about 1200 lynx, seems to be growing and spreading further.

According to an estimate by Frankham et al. (2002), the harmful effects caused by inbreeding can be avoided if the number of reproducing individuals in the population is over 50. Finland's lynx population is supplemented by individuals crossing the border from Russia, but the exact numbers are not known.

As regards the favourable conservation status of the lynx, the population trend should be studied, in addition to the minimum number of individuals. This makes it possible to assess the development of the population in the near future. In this examination, the recent population trend is the crucial factor. The favourable development of recent years shows that the lynx population is viable, and that the elimination of individuals on special grounds specified in the derogations of the Habitats Directive or of individuals causing damage has not had a negative effect on the development of the lynx population. The elimination of individuals causing damage is extremely important for the success of lynx population management, as it considerably increases the social tolerance (Liukkonen et al. 2006).

The lynx is not a species that has specialised in any single habitat type; it inhabits a wide range of different forest and other environment types. Therefore, it cannot be assumed that it will be threatened by the disappearance of its habitat. In addition, the lynx has adjusted to living in very close proximity to human beings. Habitats suitable for the lynx are to be found almost everywhere in Finland. Only the flat coastal area in the northern part of Central Ostrobothnia and southern parts of North Ostrobothnia are not suitable habitats for lynx. The winter and snow conditions in the reindeer herding area may also be too harsh for lynx. In western Finland the population has grown and spread to new areas, and an increasing number of sightings are being made in

the southernmost parts of Finland as well.

From the point of view of habitat conservation, the lynx comes under the species listed in Annex II of the Habitats Directive, whose conservation requires the designation of special areas of conservation. In Finland, however, the requirements of Annex II are not applied, as Finland was granted exemption from these in its Treaty of Accession. The growth and spread of the lynx population in the last few years has shown that Finland has enough suitable habitats to maintain the lynx population at a favourable conservation status.

Nowadays, the lynx is found almost all parts of Finland

(Kojola et al. 2005) and the populations seem to be spreading even further. In addition, our lynx population has contacts with the populations beyond our eastern border. Even though the lynx does favour a habitat with certain geophysical features, it cannot be assumed that it would be threatened by the disappearance of habitats (Lande et al. 2003). The lynx is well adapted to using a wide variety of habitats and to living in close proximity with humans.

Against this background, it can be said that Finland's lynx population has reached a favourable conservation status.

PART 2. OBJECTIVES AND MEASURES FOR LYNX POPULATION MANAGEMENT

9. Outlines of lynx population management policy

9.1 Points of departure and criteria for lynx population management

The vigorous growth of the Finnish lynx population, its spread to new areas and the emergence of population concentrations have presented new challenges for lynx population management. The criteria laid down in the EU's Habitats Directive and the demands of local people living in the areas where the lynx population is the densest conflict as regards population management. In the areas of Finland with the densest lynx population, human habitation is not necessarily scattered, and lynx are found in very densely populated areas as well. In drawing up and updating the lynx population management plan, it is very much a question of reconciling the needs of this co-existence.

The management plan describes and justifies the necessary population management measures. Even though the range of measures is detailed and covers a wide variety of forms of interaction between humans and lynx, the following can be considered the main objectives of population management:

- 1) to ensure that the Finnish lynx population remains viable,
- 2) to minimise the damage and losses caused by the presence of a viable lynx population
- 3) to improve people's knowledge about lynx, and
- 4) to ensure that the lynx population remains shy of human beings.

The lynx management plan should be as widely accepted as possible. This is a prerequisite for the sustainable management of the lynx population, which in turn presupposes that the views of local people are taken into account. In Finland the shared history of humans and lynx does not involve the same kind of negative experiences that relate to the relationship between humans and wolves or bears, so that fear and opposition to the lynx is not in the same class as fear of bears or wolves,

or opposition to the wolf. Therefore, it may be easier to take into account the socio-economic criteria relating to lynx population management than it is for the wolf or the bear.

In outlining the policy for lynx population management, not only the socio-economic impacts of the population but also the biology of the lynx and the ecological needs of the species are taken into account. Although the views and demands of people living in contact with lynx were presented above, our current legislation does not allow for all demands to be met. The legislation in force gives the lynx a high protection status, which has a direct effect on any policies for population management. Demands to amend the Habitats Directive and Finnish legislation that have arisen in areas where the lynx population is dense relate, among other things, to the protected status of the lynx and to having the lynx transferred from Annex IV to Annex V of the Habitats Directive. Considering that the lynx belongs to Annex III of the Bern Convention, Finland could propose that the lynx be transferred to the corresponding Annex V in the Habitats Directive. However, an amendment to the Habitats Directive would require the existence of a need and will for change coming from outside Finland as well.

In the next few years, the management policy must take into account the population management measures that have actually been implemented and how successful they have been. In spite of the conflicting demands of various parties, the development of the lynx population has been favourable. Against this background, there is no justification for making any great changes to the current population management policy. The growing lynx population will, however, continue to present socio-economic and other challenges. It can be assumed that the lynx population will continue to grow and that the rate of growth will increase. As a result, it can be expected that new conflicts will arise over larger areas in Finland. In outlining the policy for lynx population management, it will become increasingly important to find a reasonable balance between conservation and game management, where the lynx as a species is considered in relation to other species.

Objectives of lynx population management

Finland's lynx population meets the criteria for favourable conservation status as defined in the EU's Habitats Directive. The health of the population is normal, the population has grown distinctly and the growth trend

seems to be rising in Finland. In the light of current knowledge, the lynx population can also survive in its natural habitat in the long term, and its natural distribution area will be preserved. In addition, it can be considered that there are sufficient natural habitats for the lynx to ensure the preservation of the population in the long run.

The increasing amount of damage caused by the growth of the lynx population has mainly affected reindeer husbandry and sheep farming. The lynx as a target of conservation, on the one hand, and as a game animal, on the other, combined with the problems caused by lynx, have created conflicting views on the lynx population and its management among different interest groups. Although the ecosystem could in principle support an even greater lynx population on the national level, the objectives of population management must nowadays consider, above all, the regional socio-economic tolerance. With a growing lynx population, game management issues will also take on increasing importance in population management. The lynx is thus a part of a region's natural resources, which are managed as a whole on the basis of sustainable use. The objective is to ensure balanced development of all wild animal species.

Objective:

The main objective of the conservation, management and regulation of Finland's lynx population is to maintain the favourable conservation status of the lynx population in the future. The measures carried out should take into consideration economic and social demands and special regional and local features. In areas where there are lynx population concentrations, the impact of lynx on the development of other species of wild fauna should also be taken into account.

9.2. Regional lynx population management

9.2.1 New population management areas

The focus of Finland's lynx population is in eastern and central Finland, but the population is spreading rapidly to southern and western Finland as well. Lynx population management carried out in different parts of Finland must take into account the typical environmental conditions, human activities, traffic and means of livelihood in each area. In lynx population management applicable to the whole of Finland it is not appropriate to divide the country into too small regional entities. On

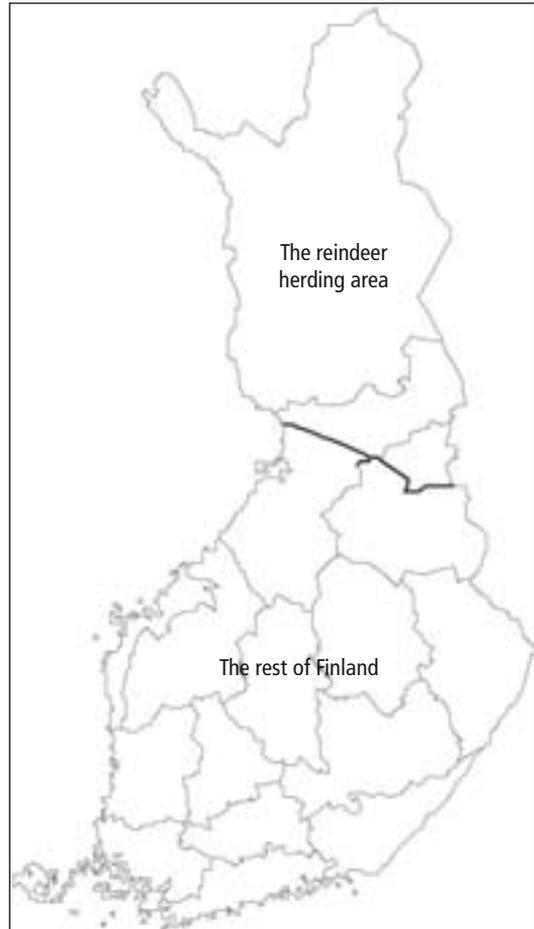


Figure 6. Lynx population management regions: the reindeer herding area and the rest of Finland.

the basis of the current situation regarding lynx, two large regions can be distinguished for population management (Fig. 8). The possibilities for maintaining the lynx population are different in the reindeer herding area than in the rest of Finland.

Measure:

Finland will be divided into two large regions for lynx population management purposes: the reindeer herding area and the rest of Finland.

9.2.2 Regional target populations

In the hearing procedure preceding the drafting of the lynx population management plan, as well as in the statements given on the draft management plan, it was stressed that regional target populations should be set for lynx population management. However, it is not appropriate to set a quantitative target population for the lynx at this stage of its growth, but the size of the population should be dictated by future developments in loss and damage and people's attitudes to the lynx. It is obvious that the growth and spread of the lynx population should not cause unreasonable damage or inconvenience to the local inhabitants or means of livelihood in a region. The parties involved in evaluating the regional lynx situation are the regional game management organisation together with other regional stakeholder groups.

Measures:

The development of the lynx population and its impacts will be monitored and the need for setting target populations based on numbers of individual animals will be reviewed after five years from the ratification of the management plan at the latest.

9.2.3. Special regional objectives and measures

Reindeer herding area

The reindeer herding area comprises the Province of Lapland, with the exception of the towns of Kemi and Tornio and the municipality of Keminmaa, and the areas of the municipalities of Hyrynsalmi, Kuivaniemi, Kusaamo, Pudasjärvi, Suomussalmi, Taivalkoski and Yli-Ii in the Province of Oulu, and the areas north of the River Kiiminkijoki and the Puolanka–Hyrynsalmi road in the municipalities of Puolanka, Utajärvi and Ylikiihimäki.

Reindeer husbandry is an important means of livelihood in the population management area in the above area, and a rapidly growing lynx population would possibly cause considerable damage. Through this area there are contacts between the Scandinavian and Russian lynx populations, and at present lynx can move freely to Scandinavia during spring and summer, when the lynx is protected also in the reindeer herding area. Hunting is permitted in the area between 1 December and 28 February on the basis of a hunting licence granted by the game management district by special permission of the Ministry of Agriculture and Forestry under section 41 of the Hunting Act.

Measures:

The objective is not to increase the lynx population in the reindeer herding area, but to ensure the free movement of lynx between Scandinavia and Russia.

Hunting licences will be allocated especially for hunting lynx that have caused damage to reindeer.

Closer cooperation with reindeer husbandry will be encouraged in the monitoring of the lynx population and the prevention of loss and damage. More up-to-date information will be made available.

The rest of Finland

At present most of the lynx in Finland live in the eastern and central parts of the country. This is the core lynx population area, but the population is to some extent unevenly spread. The population's productivity is sufficient to allow it to spread both within the area and to other parts of Finland.

In western and southern Finland the lynx population is growing. There is space and nutritional resources in sufficient quantities for the lynx population, but in many areas there are obstacles to the growth and development of the population, for example, the limited number of optimal habitats, density of human habitation, trade and industry and busy traffic.

Measures:

In management areas outside the reindeer herding area, the objective is to establish a lynx population that allows natural spreading and the creation of new habitats in harmony with special regional features.

Key methods for increasing the lynx population are monitoring, increasing the amount of information available, preventing losses and damage and increasing regional tolerance for the lynx.

Growth of the lynx population is to be limited, especially in areas where there is a population concentration, taking into account the principle of sustainable use and the objective of achieving a more even distribution of the lynx population.

9.3 Monitoring and research on the lynx population

9.3.1 Population monitoring

In monitoring the size of the lynx population, the sightings confirmed and reported by voluntary carnivore contact persons play a key role. There are a total of 1,500–1,600 carnivore contact persons in the whole country. The challenges facing the system are to keep up the motivation of the contact persons and to arrange their training. Informing the public about the importance of reporting sightings is one of the most important objectives for lynx population monitoring.

To supplement the data from observations, radio or GPS collar monitoring should be started in order to obtain more detailed information on the movements and habitats of lynx and to inventory the size of litters. Of the methods currently available, the analysis of DNA profiles would bring more detailed information on population sizes, gender distribution and relationships.

The Border Guard has recorded observations of carnivores, including lynx, crossing the country's borders since 1968. It would be useful if the material obtained from this information gathering, which was initiated by Prof. Erkki Pulliainen, could be included comprehensively in other population assessment material.

The aim of the monitoring system is to obtain up-to-date and geographically comprehensive information on the development of the lynx population. On the basis of the small number of current sightings and reports on these, it is not possible to estimate the real size of the population with sufficient accuracy. People's motivation to report sightings is felt to be a problem, especially in areas where the lynx population is dense. As sightings become more common, the motivation to report them decreases. The activities of the carnivore contact network should be developed so that committed people are motivated and trained regularly. They should also be given feedback on their voluntary work. Maintaining the carnivore contact system and motivating and training the people involved in it is the task of the Finnish Game and Fisheries Research Institute in cooperation with the game management districts. Training should be improved, for example, by compiling high quality training material. Carnivore contact persons should receive feedback on their work from the Finnish Game and Fisheries Research Institute, as this is one very important means of motivating people.

Measures:

More accurate radio or GPS collar monitoring should be started in addition to sighting material. The focus will be on the reindeer husbandry area in order to investigate the losses to reindeer owners.

In order to develop monitoring, a reporting system will be set up, stressing the active role of citizens in reporting sightings.

The activities of the carnivore contact network will be developed by ensuring that people committed to the work get regular feedback on their voluntary efforts and are motivated. DNA profiling will be used to the extent necessary alongside other methods for estimating the lynx population.

Research cooperation will be continued in order to follow the development of lynx populations in the neighbouring regions, especially in western Russia.

A study will be made on the feasibility of using Internet applications for gathering data on large carnivore sightings.

9.3.2 Other research

The migration of lynx to Finland from outside its borders can be assumed to be significant for the genetic structure and biodiversity the Finnish lynx population and for the viability of the population. In order to make a thorough assessment of this, comparative DNA analyses should be carried out in the Russian lynx population as well. The relations between the Scandinavian and Finnish lynx populations have been studied, and it has been found that there is very little gene flow between the two populations, i.e. less than one individual per generation (Hellborg et al. 2002).

It would be useful to have better knowledge than at present of the reactions of lynx to human activity. One central question is the impact, on the one hand, of individual characteristics and, on the other, of environmental factors on lynx behaviour. It is possible that so-called problem lynx are individuals of a certain genealogical lineage (Linnell et al. 1999). Young lynx weaned by the mother may have difficulties in finding food, especially in harsh snow conditions and new ranges. According to a Norwegian study, lynx adjust well to living

in close proximity with humans, even when the population is being hunted, although the presence of dense vegetation as protection is a necessary condition for this co-existence (Sunde et al. 1998).

The interaction between lynx and its prey animal populations is little known, even though it is a key factor as regards the ecology of the lynx. In order to understand this interaction, detailed information obtained by radio transmitter and track monitoring is needed to back up population data. It can be assumed that the Finnish lynx is not as dependent on the hare population as is the North American lynx, but the role of alternative prey should be studied in more detail.

In addition to the above, Finnish research is needed on the habits, population dynamics, diseases and parasites, behaviour, population fluctuations, dispersal, home ranges and nutritional choices of the lynx, as well as its impact on prey animal populations. The geographical coverage of lynx research is another factor to be considered. Monitoring of lynx fitted with radio transmitters should also be carried out in new habitats. In addition to developing basic research, means should be found for increasing knowledge of the lynx in general, improving loss prevention and increasing social tolerance of the lynx.

Measure:

Lynx research should be started on the main themes of population dynamics, the position of the lynx in the ecosystem and the relation between the lynx and other large carnivore species. Ecosystem research should be targeted regionally at the nutritional resources used by the lynx and their sufficiency. A specimen bank should be maintained for the collection of specimens of lynx shot and found dead.

Instructions will be drawn up for reporting dead lynx and sending specimens to the Finnish Food Safety Authority (EVIRA).

9.4 Prevention and costs of loss and damage

9.4.1 General

The losses caused by lynx have been fairly small compared with those caused by wolves and bears. However, lynx do cause losses, especially in the reindeer herding area by killing reindeer. Elsewhere in Finland, losses

have mainly affected sheep, to some extent cattle and less often other domestic animals. Losses of hunting dogs or domestic cats not only involve financial loss but they also have emotional value, which cannot be counted in terms of money. Fur farms are a potential target of loss if lynx are present in the farm area at the whelping time of fox and minks. In the case of freely grazing reindeer, prevention of losses is almost impossible.

Most of the farms engaged in sheep and cattle husbandry are situated in the population management area of western Finland (Information Centre of the Ministry of Agriculture and Forestry, press release on farm statistics / Maataloustilastotiedote 5/2005). Under section 18 (3) of the Government Decree (171/2005) amending the Decree on the Protection of Animals, grazing has increased considerably since July 2006 and it is possible that damage and loss caused by lynx will also increase unless prevention measures are taken.

Prevention of loss and damage caused by carnivores is subsidised by the state. For the year 2006, a sum of € 800,000 was budgeted for discretionary prevention of carnivore loss and damage and research. In 2005 the amount was the same € 800,000, while in 2003 and 2004 it was € 500,000.

The Hunters' Central Organization and regional game management districts have been responsible for advice and training on loss prevention and for the supply of materials for prevention. It is evident that effective solutions may involve significant costs and extra work. For example, wolf fences have been built on a voluntary basis in different parts of Finland. In 2003 the Ministry of Agriculture and Forestry allocated a total of € 160,000, in 2004 € 140,000, in 2005 € 140,600 and in 2006, € 2,850,000 for purchasing fencing materials to prevent loss and damage due to carnivores. In the case of the lynx, the main uses are for fencing around fur farms and sheep pastures.

9.4.2 Prevention and compensation of losses caused by lynx

The methods used to prevent losses caused by wolves also help to protect against lynx. No actual lynx fences have been built in Finland so far, but electric fencing built to keep out wolves and bears also works for lynx. In the case of the lynx, the problem of non-electric fencing may be the animal's ability to climb or jump over a fence, which to stop lynx would have to have an electri-

fied top wire or a smooth metal sheet on the top edge. As regards lynx, protecting fur farms is particularly important. Electric fencing around the farm, combined with the use of a watchdog guarding the area, might be the best solution for keeping lynx out.

In compensating for the cost of measures taken to prevent loss or damage, factors to be considered are whether the purpose of prevention is to protect a means of livelihood or to maintain a recreational activity. The significance of the long-term preventive effect must be defined when estimating the ratio between the costs of protective measures and the economic value of the object protected.

In protecting against losses, the principle of cost-effectiveness is important. In other words, public funds are not spent to subsidise the prevention of potential loss or damage where the costs of protection clearly exceed the value of the object protected.

Compensation is paid for damage caused by lynx under the Government Decree on Compensation for Damages caused by Predatory Animals (277/2000) issued under the Hunting Act. The decree currently in force clearly defines the compensation system and the bodies responsible for it. A deduction of € 250 is made for each claimant's own liability on all losses suffered in a calendar year. In 2000–2004 a total of some € 30,700 was spent on compensation for loss and damage caused by lynx. The sum increased from of € 1,866 in 2000 to € 11,070 in 2004.

In the course of the hearing procedure, the current system of compensation for loss and damage by large carnivores was criticised on the grounds that some of the costs are not compensated for. The state has compensated for the cost of materials for preventive measures but the practical prevention work is left for the claimant to arrange and pay. Another factor arousing criticism is the compensation payment schedule, which is felt to be far too slow. The hearing process held prior to the drafting of the lynx population management plan revealed that all the key parties heard considered it necessary to change the compensation system to correspond better to the amount of loss or damage incurred. It was considered particularly important to abolish the deduction for the claimant's own liability (Bisi & Kurki 2005, Sippola et al. 2005, Liukkonen et al. 2006, Mykrä et al. 2006).

A working group set up by the Ministry of Agriculture

and Forestry prepared the revision of the system for compensating for loss and damage caused by game animals in the manner intended by the Constitution. The working group submitted its proposal to the Ministry of Agriculture and Forestry in October 2005. The proposal recommends a new act on the compensation of damage caused by game animals. It was proposed that the regulations on compensating damage caused by game animals be amended so that the present deduction of € 250 from the compensation be abolished and a minimum limit set for compensation.

Measures:

Measures that are effective for all large carnivores should be developed for protecting against and preventing damage.

In the case of loss or damage caused by lynx, fencing and the use of watchdogs will be tried out.

In collaboration with other potential actors, action plans and instructions will be developed for keeping "urban lynx" away from human habitation.

The focus of public funds will be shifted from compensation towards prevention of loss or damage. There are no grounds for using public funds to subsidise the protection of objects when the value of the object is less than the subsidy.

9.5 Exceptions to the protected status of the lynx

Points that emerged as key factors for the acceptance of the lynx population in the hearing procedure preceding the lynx population management plan were: regulation of the growth of the lynx population, the need to disperse concentrations of lynx population and the need to find flexible and fast methods of removing problem animals (Liukkonen et al. 2006). In areas where the lynx population is dense, demands were made for more freedom to hunt and a clear increase in the number of hunting licences granted. Since the lynx is strictly protected under the Habitats Directive and killing and intentional disturbance of lynx is prohibited, hunting is only possible on the basis of one of the grounds for derogation given in Article 16 of the Habitats Directive. Individual lynx can be eliminated on the basis of the Police Act and the Animal Protection Act, and by hunting licences and special permits. The contents of the Acts are described in more detail in section 5.1.

The current hunting legislation allows exceptions to the protection of lynx only on special conditions. Elimination of individual lynx or use of hunting licences is permitted if a special and justified need arises for departing from the protected status of the lynx.

Exceptions to the protected status of the lynx under the Police Act

According to section 25 of the Police Act (493/1995), police officers have the right to capture or put down an animal causing danger to the life or health of a human being. Police officers have the same right if an animal is causing significant damage to property or serious danger to traffic. A stand was taken by the Parliamentary Ombudsman (Dnro 612/4/04) on the application of the Police Act in connection with a complaint addressed to the Ombudsman. According to the stand, the contents of the Hunting Act and Decree and the Habitats Directive also apply to a police officer as regards exercising discretion. In practice this means considering whether there is another satisfactory solution and assessing how the decision would affect the maintenance of the favourable conservation status of the lynx. The application of the Police Act is possible according the Parliamentary Ombudsman's stand primarily in a situation where there is no time to examine the conditions for applying the Hunting Act or Decree.

Exceptions to the protected status of lynx in Finnish hunting legislation

According to Finnish Hunting legislation, exceptions can be made to the protected status of the lynx either by a decision of the Ministry of Agriculture and Forestry or by a hunting licence decision of the game management district. The decisions of the Ministry of Agriculture and Forestry are based on section 41(2) of the Hunting Act. The hunting licence decisions of the game management district are based on section 28 of the Hunting Decree. Game management districts can make decisions between 1 December 1 and 28 February. An exception to this is a female lynx with a litter under one year, which always has a protected status. The Ministry of Agriculture and Forestry can make decisions on departing from the protected status of the lynx at any time of year.

Under section 10 of the Hunting Act, the Ministry of Agriculture and Forestry can, if necessary, issue orders to the game management district restricting hunting permitted by hunting licences, the conditions for granting hunting licences, the procedure to be followed in granting hunting licences and examination of the hunting

quota. The Ministry of Agriculture and Forestry has exercised these powers by annually issuing an order to the game management districts, in which the number of hunting licences granted by the game management district under the Hunting Decree (regional quotas) have been restricted in order to ensure that the favourable conservation status of the lynx is maintained.

The permitted number of lynx hunted on the basis of hunting licences is not a quota that has to be complied with, nor does it constitute grounds for granting hunting licences. Nor are the the maximum limits laid down by the Ministry of Agriculture and Forestry equivalent to the number of hunting licences issued. The maximum limits only indicates the number of individual lynx that can be sustainably eliminated by decisions of the game management districts, under the conditions stipulated by the Habitats Directive, without endangering the lynx population. The number of hunting licence decisions made by the game management districts, on the other hand, indicates the number of administrative decisions made, and the number of lynx killed or captured on the basis of a hunting licence indicates the population loss that has taken place on the basis of hunting licences.

More detailed instructions are given in the order on the conditions for issuing hunting licences, i.e. on how a hunting licence based on the grounds for exception referred to in section 28(1)(1-4) of the Hunting Decree (cf. grounds for derogation in Article 16 of the Habitats Directive) can be granted if a situation arises in the area of the game management district where there is no other satisfactory solution than to depart from the protected status of the lynx by hunting. The order also takes into account the lynx killed otherwise than by hunting (on the basis of special permits granted after the order was issued under section 41(2) of the Hunting Act or section 25 of the Police Act (493/1995) or lynx reported to have been killed otherwise by human intervention). The game management districts have reduced the numbers of animals that can be eliminated on the basis of hunting licences in order to ensure that the favourable conservation status of the lynx is not endangered under any circumstances.

The order is based on the annual lynx population estimates made by the Finnish Game and Fisheries Research Institute and, assessed on the basis of these estimates, the level of sustainable hunting that is compatible with maintaining the favourable conservation status of the lynx. In addition, the Ministry of Agriculture and Forestry has, when setting the regional quota for

the game management districts, taken into account as a deduction lynx removed by virtue of other administrative decisions and all other individuals killed, for example, in road accidents or otherwise by human intervention. The sustainable hunting is determined using the precautionary principle at a level where it cannot endanger the lynx population in the game management district.

The order of the Ministry of Agriculture and Forestry setting the regional maximum limits allows decision-making at the local level, i.e. in the game management district. In the hearing procedure prior to drafting the management plan this was considered extremely important. At present, local decision-making is allowed in areas where the lynx population is the strongest. The procedure can be considered justified because at regional and local levels there is special knowledge of the circumstances in the area, including the number of lynx and their ranges, damage or threats caused by them and the possibilities of finding other satisfactory solutions. On the other hand, the maximum limit set by the Ministry of Agriculture and Forestry ensures that the lynx population cannot be decimated, despite local demands.

In each decision allowing the removal of a lynx despite its protected status, the responsible decision maker must determine by a separate process whether another satisfactory solution exists and assess the effect of the decision on maintaining the favourable conservation status of the lynx population. There is no need to make changes to the established procedure complying with hunting legislation for deviating from the protected status of the lynx.

Measure:

The Ministry of Agriculture and Forestry will continue to give the game management districts instructions on the hunting licence procedure in order to maintain the favourable conservation status of the lynx population and to achieve the objectives of game management. The Ministry may also give the game management districts more responsibility on the basis of current lynx population development.

9.6 Information, training and advice

9.6.1 Information on large carnivores

There is research information available on the lynx, but most of it is based on Norwegian or Swedish research. The websites of Metsähallitus (www.suurpedot.fi) and the Finnish Game and Fisheries Research Institute, RKTL (www.rktl.fi), have information in Finnish about the lynx. Various parties produce information and offer their views on carnivores as well as taking stands on the objectives of management. Laymen may find it difficult to separate factual, objective information from the wealth of information offered on the Internet. The media's way of reporting on carnivores and people's opinions on carnivores are often sensation-seeking. However, writing in the press about the lynx is less frequent and more moderate compared, for example, with writing about the wolf. As the lynx population grows, the importance of disseminating information about lynx will become increasingly pronounced. The popularisation of research results plays an important role in providing information. The information must be neutral, up-to-date and absolutely reliable. According to Norwegian research, however, it is possible that people do not trust or believe the information made available despite its background in research (Brainerd & Bjerke 2002).

As a provider of information, the role of the Finnish Game and Fisheries Research Institute, RKTL, is extremely important. The personal efforts of researchers to popularise their results to bring them to the notice of the public improve the picture of research as transparent, reliable and socially significant. According to Norwegian research, people trust researchers more than they trust, for example, actors in the environmental sector (Brainerd & Bjerke 2002).

The Petola Visitor Centre run by Metsähallitus will have its own important role to play as an objective national and supranational source of information on the lynx and as a neutral information provider. Petola's activities are followed by a monitoring group consisting of members from Metsähallitus, the town of Kuhmo, the Ministry of Agriculture and Forestry, the Hunters' Central Organization, the Finnish Game and Fisheries Research Institute, the Finnish Association for Nature Conservation and the Ministry of the Environment.

Measures:

The results of monitoring and research should be made available to the public in a form that is up-

to-date and provides coverage of the whole country. The dissemination of information will be improved so that it is better accessible to all citizens. Popularisation of research results forms an important part of information dissemination. The information must be neutral and up-to-date. The role of the Finnish Game and Fisheries Research Institute is emphasised as a mediator of information. The Petola Visitor Centre's task is to disseminate information on large carnivores, both nationally and internationally.

The parties responsible for information on large carnivores should anticipate and define the needs of citizens as regards information on the lynx and seek to improve people's knowledge of the lynx by providing training, advice and information.

9.6.2 Training and advice

The hunters' organisation (see Section 9.10) is responsible for organising training for hunters, which includes recognition of species and their tracks, and also training on hunting and animal protection legislation. Its important function is to assist the research work done by the Finnish Game and Fisheries Research Institute by training large carnivore contact persons and maintaining the contact network.

The game management association level of the hunters' organisation, which is an important local actor, is largely based on voluntary work. The people involved in it are themselves active hunters. This causes occasional problems, especially in providing information about carnivores, because the objectivity of information produced by the hunters' organisation has sometimes been questioned by other parties.

Training and advice on the lynx is important because lynx population management is of crucial concern to hunters. An increase in the lynx population in turn affects game management and hunting of other game on a regional level. A question of special importance that has emerged is the co-existence of lynx, roe deer, white-tailed deer and hare.

Measures:

The hunters' organisation, which is responsible for statutory tasks, will play a role in disseminating up-to-date information on the lynx population, the prevention of damage and training and advice relating to these issues.

9.7 Supervision of hunting

The status of the lynx as a game animal is regulated by the Hunting Act (section 5). Section 88 of the Hunting Act defines the bodies responsible for supervising compliance with regulations and orders in matters concerning hunting in their own areas. Compliance with the Hunting Act is the responsibility of the police, the Frontier Guard, the customs authorities, as well as game wardens appointed by game management associations in their own areas. In addition, on state-owned land, supervision is carried by officials designated for the task. Landowners and hunting right holders are also entitled to supervise the compliance with the Hunting Act in their own areas (section 88 of the Hunting Act).

The Hunters' Central Organization and the game management districts have participated in developing supervision and related cooperation. This is part of their advisory work to the hunting community and coordination of the activities of the game management associations, which have a statutory obligation to supervise hunting (Hunting Act, Section 63). Cooperation between the different bodies is essential to ensure efficient supervision.

In 2005 the South Savo, North Karelia and North Savo game management districts carried out a project for promoting more efficient supervision of hunting called "Hunting supervision - an essential part of hunting". The project was financed by the Ministry of Agriculture and Forestry and the Ministry of the Interior. In addition to the game management districts, the project involved the police, the Border Guard, Metsähallitus, the Hunters' Central Organization and the districts of the Finnish Hunters' Association in eastern Finland. The most visible part of the project was training organised for game wardens by the game management associations in autumn 2005. As a further concrete measure, the police hunting contact network was updated. In connection with the project, the applicability of technical tools for hunting supervision was also tested. The final report on the project also took a stand on game trading and the development of legislation.

Measure:

Cooperation on hunting supervision between the police, the Border Guard, and customs authorities, Metsähallitus' hunting supervisors and the game management organisation will be developed. Concrete development measures should be agreed on by negotiation among the parties concerned.

9.8 Transplantation of lynx

In Finland the transplantation of some lynx was carried out to strengthen the regional lynx populations (www.suurpedot.fi, Nyholm 1995) in the 1980s. In eastern Finland, proposals were made during the hearing procedure that transplantation could be used as an alternative measure to reduce the lynx population in a certain area. This has not, however, been done, nor have lynx been released from zoos into the wild.

Measure:

Lynx transplantation will not be carried out in Finland.

9.9 Cooperation between different interest groups

9.9.1 Regional cooperation

At the national level, the main responsibility for Finnish game animal populations lies with the Ministry of Agriculture and Forestry. On the regional level the responsible bodies are the game management districts, which are part of the hunters' organisation. They act under the performance guidance system of the Ministry of Agriculture and Forestry, but their activities are coordinated on the national level by the Hunters' Central Organization.

In questions relating to game animal population management, especially where large carnivores are concerned, several interest groups are concerned besides the hunting organisations. To promote cooperation between the different groups, advisory committees on large carnivores have been established in Kainuu, North Karelia, Central Finland and North Savo. Their role is to act as a forum for cooperation and information exchange between the different interest groups.

The need for advisory committees on large carnivores was established during the regional stakeholder consultations held during the work of drafting the Management Plan for the Wolf Population in Finland (Bisi & Kurki 2005). Similar committees should be set up in areas other than the above-mentioned game management districts. During the lynx population management project, the idea of setting up advisory committees was proposed to all the game management districts for discussion, but not all of them considered the matter important or topical. It was generally thought in the game management districts that consultations on large car-

nivores could be organised as part of the negotiations on moose by extending the stakeholder base. Advisory committees on large carnivores were considered an unnecessary forum, lacking decision-making powers. In addition, the establishment of a new organisation was seen as laborious and it was suspected that it would lead to overlapping functions. Although a forum such as the advisory committee on large carnivores does not have any decision-making powers under current legislation, it could play an important role in initiating and maintaining a dialogue. Independent regional decision-making on matters concerning large carnivores is an objective that was expressed widely by stakeholders on the regional level (Bisi & Kurki 2005, Liukkonen et al. 2006, Mykrä et al. 2006).

An initiative to set up an advisory committee on large carnivores can be made, for example, by the game management district. The meeting to establish the committee may also be convened by a regional council or other body. The game management district may also play a purely expert role.

Measures:

Stakeholder cooperation should be increased in the areas of the game management districts. Discussion forums should be set up as necessary. Those involved in this should decide among themselves on the methods of operating, the need for meetings, the convener and procedures for chairmanship.

The central task of a regional cooperation forum is, through cooperation and interaction, to integrate the regional views and objectives of lynx population management with the decision-making system of the Ministry of Agriculture and Forestry.

9.9.2 National cooperation

On the national level, responsibility for maintaining the lynx population lies with the Ministry of Agriculture and Forestry. The Ministry of the Environment also has an official role, since it determines the definition of species as threatened or not threatened, and thus influences the protection of the lynx in Finland. The Finnish Game and Fisheries Research Institute has the main responsibility for research on the lynx and monitoring of the population. In addition, many national-level organisations have their own views on the protection and management of various species of fauna, population devel-

opment and, for example, damage prevention. Although as a species the lynx is clearly of less interest to the various stakeholder groups than the wolf or the bear, lynx population management does come up for discussion from time to time.

Measures:

At the national level, close cooperation between different stakeholders should be promoted.

9.9.3 International cooperation

International cooperation and international conventions binding on Finland as regards the lynx were described in more detail in Chapter 5.1. The importance of international cooperation on questions relating to large carnivores will be emphasised in the future.

Measures:

The Ministry of Agriculture and Forestry will continue active communication and cooperation with the comparable authorities responsible for large carnivore management in neighbouring countries.

Efforts will be made to influence international conventions and EU regulations and their interpretation in such a way that special national characteristics are emphasised in decision-making and that the principle of sustainable use remains the foundation of our use of natural resources.

9.10 Responsibilities for population management

The main tasks relating to lynx population management can be divided among the various actors as follows:

Actor	Task
Ministry of Agriculture and Forestry	Main responsibility for population management and protection, delegating, control and issuing of licences. Updating of management plan
Finnish Game and Fisheries Research Institute	Responsibility for monitoring population, research and information
Hunters' organisation Hunters' Central Organization	Information, training, advice, damage prevention coordination, statistics, expert function, other coordination
Game management districts	Regional information, training, advice, damage prevention, issuing of licences, regional population management
Game management associations	Regional information, training, advice, damage prevention, and hunting supervision
Police	Hunting supervision, permits to remove animals in exceptional circumstances
Metsähallitus	Information, hunting supervision and population monitoring, mainly in Lapland
Reindeer Herders' Association	Information, training and advice Prevention of and statistics on reindeer losses
Border Guards	Supervision of hunting
Ministry of the Environment	Updating of threatened species classification
Finnish Food Safety Authority Evira	Monitoring, research and information on diseases communicable from animals to humans

9.11 Evaluation and monitoring of the implementation of the management plan

The lynx population management plan gathers together, in a comprehensive form, current research knowledge on the state of the lynx population in Finland. In the future the lynx population will be managed according to the outlines laid down in the plan. The initial assumption is that the current favourable development of the lynx population will continue and that research on the lynx will be developed and new knowledge obtained to underpin planning and decision-making. The implementation of the management plan and its impacts must be monitored. If necessary, the management plan will be updated so as to maintain the favourable conservation status of the lynx. With a view to this, the large carnivore research carried out by the Finnish

Game and Fisheries Research Institute will assess the viability of the population. Special attention will be given to the structure of the population, reproduction, mortality, population distribution, the nutritional situation and, if necessary, changes in the number of available suitable habitats.

The 6-year report on the European Union's Habitats Directive for the years 2001–2006 is being prepared in a process started at the beginning of 2007. This is a project during which the conservation status of every species mentioned in Annex II of the Habitats Directive will be reviewed on the basis of monitoring. The Commission will draw up a summary report based on the reports submitted by the Member States, which will include an assessment of the realisation of the objectives set. Every Member State will be allowed to review its own section in the summary report. The Commission will publish the final report within two years from the

date when it has received the Member States' reports and when the committee has reviewed it.

Each responsible body will report annually on the implementation of practical work to the Ministry of Agriculture and Forestry. The Ministry of Agriculture and Forestry will assess the implementation of the management plan no later than five years from the date on which the plan came into force and thereafter at five-year intervals.

Measures:

The implementation of the management plan will be monitored and it will be updated as necessary in order to maintain the favourable conservation status of the lynx.

The Finnish Game and Fisheries Research Institute will be responsible for assessing the viability of the lynx population.

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