

Biodiversity in Finnish Wilderness Areas: Historical and Cultural Constraints to Preserve Species and Habitats

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Abstract—The present status of species and habitats in Finnish wilderness areas is largely a consequence of past administrative, use, and management traditions in northern Finland. The existing wilderness legislation sets a framework for management, but historical uses and administrative decisions have influenced many prevailing practices. In addition, management of many uses is complicated by overarching legislation. The present wilderness legislation is a tradeoff between conservation aspects and both traditional and modern use forms, including reindeer herding, hunting, fishing, berry picking, forestry, mineral prospecting, and tourism. Many of these use forms have negative impacts on biodiversity. Forestry, which is allowed in restricted parts of wilderness areas, fragments areas and destroys habitats of old-growth forest species. Large reindeer populations have caused overgrazing in many areas. Heavy hunting pressure has caused the decline of capercaillie and black grouse populations, and increased tourism causes disturbance of animals and terrain. The constraints to preserve species and habitats are often related to the contradictory goals of different laws or complicated administrative structures. Hunting is an example of a use form where different organizations are responsible for monitoring of game populations, making recommendations for prey numbers, selling of licences, and law enforcement. Different values and attitudes also complicate conservation efforts. Conservation of large predators, for example, conflicts with the interests of reindeer herders, often leading to poaching. This paper examines both historical and cultural factors that affect the status of biodiversity in Finnish wilderness areas, and discusses possibilities to achieve commonly accepted goals and practices in biodiversity conservation.

Introduction

The natural, as well as the cultural, environment has its own history. In a geological time scale, forces such as climatic warmings and coolings, ice ages, continental drifts, and other large-scale events have affected landscapes and species. For the past thousands of years, the history of the natural environment has been closely connected with the history of human beings almost everywhere on the Earth, and it is not always easy to detect whether the present state of nature is a result of purely natural processes, or if it has been influenced by human activities. For example, the present structure of many old-growth boreal forests of Finland, which in their natural state are modified only by storms, forest fires, and small-scale gap dynamics, may in fact be modified by slash and burning cultivation, man-induced forest fires, and cattle grazing over hundreds of years (Heikinheimo 1915).

The ecological history—also known as historical ecology—of an area considers the relationships between man and nature over the course of time. The focus of ecological history can be purely on the state of nature in different times, but it can also be directed to the relationships between ecology and economy, to the attitudes and awareness of a society toward environmental aspects, or to the regulation of the resource use and environmental policy of societies (Massa 1991). In these aspects, ecological history is closely related to environmental economy, environmental policy, and sociology (Massa 1994).

Wilderness areas, according to most definitions, have been considered as uninhabited, remote, and free of human influence (IUCN 1998; Martin 1993). However, except for the most remote polar areas, practically all regions that we now consider as wilderness areas have been inhabited or utilized by native people for thousands,

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or even tens of thousands, of years (Hestmark 1993; Magga 1993; Miller 1993). In later times, many of the areas were also used by settlers from other regions. In Fennoscandia, the history of human presence starts soon after the last Ice Age about 10,000 years ago, when the first hunters and fishermen followed retreating ice toward the North (Lehtola 1997). In Finnish Lapland, the oldest traces of inhabitants, which most probably were ancestors of the present Sámi people, date back to 7000 B.C. (Huurre 1983; Julku 1985). In the Middle Ages, Finnish peasants used to make long fishing and hunting trips to the backcountry areas, which, in the course of time, were divided between villages and families (Luukko 1954). The Finnish word for wilderness, “erämaa,” comes from that time. It refers to a hunting area divided by hunters, or to the game divided by hunters. It also came to mean areas that were separated from cultivated areas (Hallikainen 1998). Thus, there is a long history of human use of the wilderness areas in Finland, and even the word for wilderness in Finnish has a strong use aspect. This aspect has also influenced current legislation concerning the wilderness.

The first use of the wilderness in Lapland was for hunting and fishing. Starting in the 16th century, the Sámi residents adopted large-scale reindeer herding from Swedish Lapland (Lehtola 1996), and in the 17th century, the Finnish settlers introduced agriculture to the area (Luukko 1954). The peasants collected hay for cattle from natural meadows, many of which were located far away from villages, around lakes, or on the riverbanks. Later, these meadows were attached to farms as separate private allotments. The use of these meadows ceased in the 1950s and 1960s, but these allotments can still be found even in remote wilderness and nature conservation areas.

Modern times have brought new forms of use such as forestry, tourism, and recreation to Lapland. Partly as a response to these pressures, mainly those of forestry, 12 wilderness areas were established in Finnish Lapland in 1991 (Erämaakomitean mietintö 1988; Erämaalaki 1991). Their total area is approximately 1.5 million ha (3.7 million acres). Many of the traditional, as well as some of the modern, forms of use are allowed in the wilderness. These include hunting, fishing, gathering natural foods, reindeer herding, mineral prospecting, and restricted tourism and forestry. In this article, I consider more closely three of these forms of use—hunting, reindeer herding, and forestry—with the aim of giving an overview of their historical and cultural background and the constraints that these backgrounds set for species conservation today.

Biogeographically, the Finnish wilderness areas represent three different biomes: northern boreal forests, characterized by Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*), the ecotone of treeline area with mountain birch (*Betula pubescens* ssp. *czerepanovii*) as a timberline species, and the subarctic tundra zone with barren mountains (Erämaakomitean mietintö 1988). Because of their northern location, the designated wilderness areas can protect only a small portion of the total fauna and flora of the country. However, wilderness areas are important for the protection of species that have a typically northern distribution, many of which are not found in the more southern latitudes. These include arctic and subarctic animals such as the arctic fox, gyrfalcon, and bar-tailed godwit, and many arctic plant species (such as *Diapensia lapponica* and *Ranunculus glacialis*). Besides the arctic species, wilderness areas are important for the species that need large territories such as the wolverine and golden eagle, and for species that are confined to old-growth taiga forests, such as the capercaillie, Siberian jay, and Siberian tit, and a large number of lower plants and animals that are specialized in old-growth forests.

In the larger context, Finnish wilderness and protected areas serve as a corridor between the continuous taiga forests of northwestern Russia and the mountains of northern Norway and Sweden, where these countries have their largest conservation areas. For instance, the wolf population of northern Finland and Scandinavia is much dependent on the population source on the Russian side of the border. Less movable species, such as invertebrates and plants, also exchange genes over large areas. This often happens slowly through neighboring populations, and therefore requires large continuous habitats with long temporal continuity.

Species Preservation and the Use of Wilderness: An Overview of Three Forms of Use Within Their Historical Context

Hunting

Hunting, fishing, and gathering natural foods are the oldest forms of using wilderness areas. Old Sámi culture in the forested area of Lapland was mainly based on these livelihoods. The most important game animal was wild reindeer, which was hunted using pitfalls. Beaver, fox, and ermine furs were important for trade and the payment of taxes (Luukko 1954). Both of the most important game animals, wild reindeer and beaver, were hunted to extinction in the 19th century. These extinctions were related to the expansion of Finnish settlers to Lapland and the introduction of firearms. Large flocks of wild reindeer were killed by hunting and by destroying their rangeland with fire, which was used by peasants in slash and burn cultivation. Finnish peasants also used forest fires to drive away the Sámi, whose reindeer destroyed the settlers' hay storages (Fellman 1906; Tegengren 1952). The right to hunt beaver, which was originally restricted to the Sámi, was expanded to Finnish settlers in the mid-18th century (Tegengren 1952). There were attempts to protect the beaver by rotating hunting areas annually, but this move was incapable of ensuring populations from efficient hunting (Pihkala and others 1986; Tegengren 1952).

The present so-called free hunting right in northern Finland on state-owned land derives from the time when hunting was an important part of the livelihood of local residents, because small-scale farming could not necessarily support people over winter. According to the free hunting right, all the permanent residents in Lapland and Kainuu can hunt within their home municipality without paying a separate license for the prey. Naturally, they have to possess a hunting license and follow general hunting laws and regulations. The right is also valid in wilderness and nature conservation areas (except strict nature reserves), and it concerns not only the descendants of local people, but also the people moving from other areas when they settle permanently in northern Finland. The free hunting right concerns all the game animals except elk (moose). Local residents also must buy permissions to hunt elk, the number of which is based on an annual census of animals. Besides elk, the main game animals are the grouse species, especially capercaillie, black grouse, and ptarmigan. Waterfowl and small predators such as red fox and pine marten are also hunted.

The Finnish Forest and Park Service (FFPS), which administers state-owned lands, sells licenses to sport hunters from other areas. These licenses are sold for commercial forests, wilderness areas, and for some nature conservation areas; however, they are not sold for national parks and strict nature reserves. The estimated number of prey has varied annually and regionally on state-owned land from 5 to 10 percent of the total number of prey (Joensuu 2001, personal communication). The paucity of prey, especially capercaillie, has led to a conflict between local and outside hunters. The decision on the number of licenses was made earlier by the Recreation Department of the FFPS, which is a profitmaking organization. Local hunters accused the Recreation Department for selling too many licenses to outside hunters, while local hunters were asked to restrict their hunting (Lapin Kansa 1998a,b). The administration of hunting issues was changed within the FFPS in 2001; now the FFPS Forestry Department is responsible for setting hunting quotas in commercial forests, and the FFPS Nature Conservation Department is responsible for setting the quotas in the nature conservation areas of each district. To keep sport hunting at a sustainable level, the FFPS aims at agreeing on the hunting quotas with local hunting organizations.

Besides legal hunting, poaching occurs within and outside the wilderness areas. In 1996, 67 cases of elk poaching were revealed in Lapland, 38 of them in the municipalities where wilderness areas are located (Nevala 1998, personal communication). In addition, game birds and large predators are common targets of poaching.

Two groups of game animals have declined considerably in Lapland during the past few decades—grouse species and large predators. The populations of capercaillie have declined steadily in the whole country since the 1960s (Helle and Helle 1991;

Helle and others 1997). Natural factors, such as weather conditions and the availability of food, influence the reproduction of birds but cannot explain the continuous decline of the capercaillie populations. Landscape-level changes caused by large-scale forestry have been shown to be one reason for the decline (Helle and Helle 1991). However, decline has also occurred in wilderness areas and national parks that are not subjected to forestry.

Increased hunting pressure is one possible reason for the decline. In northern Finland, forestry has probably caused increased hunting pressure in wilderness and conservation areas because other natural areas have decreased. Both the number of prey and the intact environment of wilderness and nature conservation areas attract hunters. For example, the main reason for local people hunting in the Urho Kekkonen National Park (30 percent of respondents) was the wilderness character of the area. The other reasons were also mainly related to the naturalness of the area, making up 65 percent of the most important reasons when combined with the wilderness character (Sippola and others 2001).

Currently, both the capercaillie and black grouse populations are low in northern Finland, including the wilderness areas, but the species are not endangered. To increase grouse populations, regional and local game management districts have recommended restricting the harvest. However, the complicated structure of hunting management and the limited possibilities for law enforcement make it difficult to regulate the number of animals killed. In practice, there are no legal tools to control the number of animals hunted, and the only efficient way is to shorten the hunting period annually. This was used, for example, in 2001, when the hunting period of grouse species in northernmost Lapland was only 11 days.

Of the large predators, the wolf is extremely endangered in northern Finland. The estimated number of animals throughout the North Calotte (northern Norway, Sweden, and Finland) is only about six to eight animals (The North Calotte Council 2001), and the wolf population of the area is dependent on the supply of animals from the Russian side of the border. The last documented reproduction of wolves in the area is from the year 1978. Usually, the fate of a wolf in the reindeer herding area is that it is killed, either legally or illegally. There has been a 5-month hunting season for wolf in the reindeer herding area in Finland, and outside of that time, it is possible to kill a wolf with special permission from the Ministry of the Agriculture and Forestry if the wolf attacked reindeer. Between 1996 and 2000, two to three wolves have annually been killed legally in Lapland (The North Calotte Council 2001). In the nature directives from the European Union, the wolf is listed as a species requiring special protection. Because the previous hunting practice did not guarantee favorable conservation status of the wolf, hunting regulations were changed in July 2001 (Ministry of Agriculture and Forestry 2001a). Since then, wolf hunting always needs permission, even within the reindeer herding area. Attitudes toward the protection of wolves seem to be negative throughout the country. In her study about the attitudes of people toward large predators in central and southern Finland, Vikström (2000) found that of all the large predators, the least sympathy was given to the wolf. Dislike and fear of wolves has deep cultural roots, based on the economic losses caused to cattle, sheep, and reindeer, and on tales, myths, lack of knowledge, and active campaigns against wolves (Pulliainen 1984).

The wolverine is also an endangered species in Finland. The population in Lapland in 1999 was about 65 animals, with a slight increase over recent years (table 1). Even though the wolverine also kills reindeer, it seems to be better tolerated than the

Table 1—The number of large predators in the reindeer herding area of Finland from 1996 to 1999. The number in parenthesis is the estimated minimum population for the whole country (sources: Kojola, I. 1998, 1999a,b, 2000).

	1996	1997	1998	1999
Brown bear	150 (770)	160 (785)	170 (795)	180 (845)
Wolf	14 (141)	10 (120)	6 (95)	9 (98)
Wolverine	62 (112)	53 (116)	64 (120)	65 (123)
Lynx	45 (790)	40 (795)	40 (810)	40 (835)

wolf. However, poaching occurs every year. Between 1996 and 2000, 11 wolverines were poached or found dead in Finnish Lapland (The North Calotte Council 2001).

The population of brown bear has increased throughout the country over the past few years (table 1). Hunting brown bear is possible within the free hunting right, but the number of animals killed during each hunting period is restricted by a quota set annually and regionally (Ministry of Agriculture and Forestry 2001b). The number of legally killed bears varied from 11 to 28 annually in Lapland between 1992 and 2000 (The North Calotte Council 2001). Hunting of brown bear has strong traditions in northern Finland, and is popular despite the relatively low number of prey. Until 1993, the hunting season for bear was in the spring. Shifting hunting season to autumn was strongly opposed by bear hunters, who found it more difficult to track bears during the snow-free period. Hunters also claim that the control of poaching was easier in spring, and many of them would like to see the return of the spring hunting season (Sippola and others 2001).

Hunting is an essential part of culture in the countryside in Northern Finland. It is the main pastime for most men, and many social structures are built around it (Ermala and Leinonen 1995; Lampio 1967). The free hunting right is one of the few privileges in the rural areas in the North, and it is highly appreciated (Sippola and others 2001). The question about limiting or repealing the free hunting right has led to strong opposition by local residents. Within the context of subsistence, there is no longer any reason for the free hunting right because the majority of hunting in the countryside is for sport. However, within the cultural context, it is very difficult to restrict this privilege. Currently, societal aspects play an essential role in the protection of game animals. The degree of success in maintaining viable grouse and predator populations depends, therefore, on the possibilities of the authorities to find common goals among different interest groups, and to get the interest groups to bind themselves to these goals.

Reindeer Herding

The law on reindeer management gives the right of free use of all land as reindeer pastures within the reindeer husbandry area (fig. 1) (Poronhoitolaki 1990). Reindeer herding and other subsistence livelihoods were mentioned as reasons for protecting wilderness areas when the wilderness legislation was prepared (Erämaakomitean mietintö 1988). Since the 1960s, however, reindeer numbers have increased considerably throughout the herding area. The main reasons for this are changes in slaughtering practices and increased winter feeding. Beginning in the 1960s, most of the young males have been slaughtered in the autumn. This allows more females to survive over winter, and the females are in better physical condition because there is less competition for food. Increased winter feeding with hay and commercial forage also improves winter survival (Helle and Kojola 1993; Kojola and Helle 1993). Winter feeding has not been commonly used in wilderness areas, but over the past few years, hard snow and ice conditions have forced herders, for instance in western Lapland, to feed reindeer in the wilderness (Helle and Timonen 2001).

Another reason for winter feeding is that the pastures are heavily overgrazed in many areas. There are contradictory results on the effects of reindeer herding on biodiversity. To summarize those, it seems that moderate grazing increases the diversity of plants and soil invertebrates, while heavy grazing is detrimental to both (Kojola and others 1998; Suominen and others 1998). Reindeer grazing also prevents the regeneration of birch forests, modifying forest structure (Helle and others 1998; Mäkitalo and others 1998). In the 1960s, a large-scale natural outbreak of autumnal moth (*Epirrita autumnata*) caused defoliation of mountain birch forests over several thousand square kilometers in Finnish Lapland, mostly in current wilderness and nature conservation areas. Reindeer grazing has prevented regeneration of birch by shoots, and it is probable that parts of these areas will become barren mountains due to the heavy grazing pressure (Helle and others 1998).

Reindeer numbers have been reduced by the Ministry of Agriculture and Forestry during the last few years (Filppa 2000). However, reindeer have been part of the nature of Fennoscandia for thousands of years. At what point the natural effect of reindeer grazing is exceeded, remains a question. The present system of herding cooperatives, in which many cooperatives have a relatively small land area and the



Figure 1—The Finnish wilderness areas and the reindeer husbandry area.

areas are separated from each other by fences, does not allow traditional herding, which was to move reindeer between summer and winter pastures and to rotate winter pasture areas. In addition, the economic basis of this means of livelihood has changed radically over the past few decades. The decrease of winter pasture areas due to other forms of land use, the use of motor vehicles in herding and gathering of reindeer, additional winter feeding, and new requirements to concentrate slaughters in slaughterhouses have all increased expenses. Under these circumstances, reindeer owners would prefer to increase rather than decrease their number of reindeer.

The interests of reindeer herders conflict with the goals to preserve viable populations of large predators. The compensation paid to herders due to predator killings has increased from about FIM 2 million in 1990, to about FIM 10 million in 1999 (The North Calotte Council 2001). In 1998, the approximate percentages of reindeer killed by different predators were: wolverine 51 percent, brown bear 23 percent, golden eagle 14 percent, wolf 6 percent, and lynx 6 percent (Norberg 2001, personal communication). The present, relatively reliable estimates of predator populations start from 1996, when the amount of compensation was about FIM 8 million. Since then, only the brown bear has increased their numbers in the reindeer herding area (table 1). Most of the increase in compensation is due to wolverines (Norberg 2001, personal communication). Part of the increased losses in Western Lapland may be due to the increased wolverine population on the Norwegian and Swedish side of the border, where the reproduction of the wolverine increased from about 32 to about 80 from 1992 to 2000 (The North Calotte Council 2001). However, compensation due to losses is based on the reports by reindeer owners, and the real causes of death are seldom known. Thus, there may be cases in which reindeer have

died from starvation, but they have been reported as having been killed by predators. On the other hand, all the losses by predators will never be revealed, herders are not compensated for expenses incurred when seeking dead reindeer, nor are the losses compensated in full (Särkelä, personal communication). The development of the compensation system is a necessary step if viable predator populations are to be maintained within the reindeer herding area. Since 1997, the losses brought about by the golden eagle have been offset through payment based on the number of nesting eagles within the area of each herding cooperative. This might be a new way of approaching the predator question, but it is too early to judge how well the new system works.

Forestry

Forestry is permitted in the most productive parts of the pine-dominated forests in six wilderness areas. Logging in wilderness is related to the economic history of Finland. Forestry has been the economic backbone of Finland since the beginning of the 20th century. Because of long transport distances, the northernmost areas of the country remained outside forestry operations until the 1960s when a pulp mill was built in Kemijärvi in Central Lapland (Lehtinen 1991). This opened the northernmost forest areas to logging, and started the rapid fragmentation of the remaining wilderness areas (Lehtinen 1991; Oinonen 1993). The plans to cut down the last large pristine forests in northern Lapland, especially in the Kessi (Vätsäri) area in the 1980s, created the wilderness movement. In fact, part of the Kessi area had been subjected to logging as early as the 1920s, when part of the area was selectively logged and the logs were floated into the Arctic Ocean (Metsähallitus 1999). However, Kessi became a symbol of the wilderness movement, which aimed at protecting the remaining wildernesses (Lehtinen 1991). A committee was established by the Government to solve the issue. The Government had given the Committee the task of creating a unanimous proposal for wilderness protection. Thus, a compromise among interest groups included allowing logging in some forest areas within the newly established wilderness (Erämaakomitean mietintö 1988). Currently, logging is underway in restricted areas in the Hammastunturi Wilderness, but plans exist for all six areas.

One of the major effects of forestry is fragmentation. In some areas, such as the Hammastunturi and Kemihaara Wildernesses, the planned forestry operations would divide the wilderness areas into two parts (Metsähallitus 1994, 1996). Even though there are no plans to construct permanent roads to the logging areas, temporary roads and bridges would increase fragmentation and attract more people to the areas, causing increased disturbance. The effects of fragmentation are often hard to detect, and they can influence different levels of ecosystems, varying from micro-environments to the landscape level, and from individuals to populations (Haila 1994).

Species respond to logging in different ways, depending on their environmental requirements. The bird species most affected by forestry are the hole-nesting species and sedentary birds that are confined to old-growth forests. Evidence of their decline has been obtained in studies where the species compositions of birds have been compared between pristine and logged forests near the wilderness areas (Jokimäki and Inkeröinen 1995).

Another affected species group are species that inhabit decaying wood. These include many invertebrates and wood-decomposing fungi. In studies where the species composition of wilderness forests were compared with those of regeneration areas, polyporous fungi inhabiting large-diameter and well-decayed trunks had mostly disappeared from the regeneration areas, where recruitment of new large-diameter tree trunks was disrupted (Sippola and Renvall 1999). In addition, many beetle groups, especially those inhabiting different microfungi, were absent or low in numbers at the logged sites (Sippola and others 2002). For many insects and polyporous fungi, the lack of suitable substrate seems to be the restricting factor for their survival, but some are also sensitive to the microclimatic changes caused by logging. Polyporous fungi, which are commonly used in forest inventories as indicators of the conservation value of an area (Kotiranta and Niemelä 1996), usually react relatively slowly to environmental changes, especially in northern boreal forests where

decomposition is slow. Thus, the real effects of logging may be detectable only several decades after logging (Sippola and Renvall 1999). Although logging in wilderness areas may cause the extinction of local populations, they are unlikely to cause species extinctions on a regional scale. However, our knowledge on the distribution of many lower plants and animals in northern regions is incomplete, and we do not know exactly the species composition and conservation value of all the areas.

Conclusions

As the examples above show, the modern use of wilderness often has deep roots in history. Inevitably, current practices in wilderness areas have many detrimental effects on biodiversity. Besides the forms of use dealt with above, tourism, mine prospecting, and even fishing may affect species and populations. The challenge of management is to regulate the extent and severity of these effects so that viable populations of all native wilderness species can be maintained. In Finnish wilderness areas, the main obstacles to preserving species and habitats effectively may be listed as follows:

1. Lack of goals for biodiversity conservation in legislation.
2. Complicated legislation and management organizations regulating different forms of use.
3. Lack of trust between authorities, stakeholders, and interest groups.
4. Insufficient possibilities for local participation.

Many of these problems have been recognized by the Forest and Park Service, which administers wilderness areas. It has been noted that the wilderness legislation prevents some human activities that radically alter the environment, for example, forestry (except in the restricted forestry areas), mining, and road construction. However, the legislation does not provide a basis for species protection, and the goals for species preservation must be set on the basis of general nature conservation legislation (Metsähallitus 1994, 1999). The complicated relationships between different laws have also been analyzed in connection with management planning (Metsähallitus 1994, 1999), and local participation has been increased.

Some of the problems, such as those concerning the more efficient regulation of hunting and fishing, could be improved by further clarification of local and immemorial rights, by simplifying management systems at the national, regional, and local level, and by more efficient law enforcement. One of the most difficult questions is how to maintain viable populations of large predators, especially wolves. One approach would be to reconsider the compensation system for reindeer losses, basing it on the number of living predators within the herding areas. However, in the case of mammal predators, which may move long distances within a short time, creating an effective and equitable compensation system may be difficult (Kojola 2001, personal communication). The management situation in northern Lapland is further complicated by the Sámi land claims. If Sámi land ownership is also recognized, the management responsibilities might shift to Sámi organizations. Whether this would happen or not, commonly set goals, local participation, common responsibility in resource use, and building trust between different actors are essential tools in maintaining biodiversity in wilderness areas in the future.

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