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Conservation contracts in habitat protection in southern Finland

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Abstract

Demands for additional conservation of forests have been strong in Finland where a remarkable number of threatened species need wooded lands. In the southern half of the country the proportion of strictly protected forestland is as low as 1.1% and three quarters of forests are owned by private individuals and families. In order to promote forest protection on private lands the possibilities of landowners to participate in decision making should be improved. To assess the role of voluntary or incentive-based conservation contracts in protection of privately owned forestlands two existing conservation practices were studied: (1) voluntary establishment of permanent nature reserves and (2) payment of environmental grants that are appropriated for fixed-periods and that compensate for statutory preservation of woodland key habitats. Mean areas and compensation sums associated with sites protected using these two practices were simply compared to each other. Nature reserves were on average larger than key habitat sites. However, in the long run fixed-period environmental grants paid for key habitats provide landowners with higher compensation than that paid for establishing permanent nature reserves. These results are assessed in the light of international discussion on social, economic and ecological factors related to protection of private lands.

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Keywords: Conservation contracts; Fixed-period conservation; Key habitats; Private lands; Voluntary protection

1. Introduction

The need to protect nature concerns private lands as well as public areas (Knight, 1999). However, top-down approaches often used to obtain private areas under protection, such as juridical or administrative regulation or compulsory purchase of land, have been criticised for their inefficiency and lack of flexibility. In order to elude top-down conservation decisions landowners may even intentionally eliminate endangered species from their property or develop their lands in a way that decreases conservation value (Polasky et al., 1997; Innes et al., 1998). To avoid such situations, the possibilities of landowners to participate in decision making should be improved and the options used in compensation policy should be diversified. These are relevant demands in both industrial and developing countries (Simpson and Sedjo, 1996). Nevertheless, the focus of compensation policies has so far been either on compensating for the negative effects of conservation, such as market losses, or on efforts to encourage conservation indirectly, by subsidising certain commercial activities (e.g. Polasky et al., 1997; Ferraro, 2001).

In Finland, forestry is an important source of income and the forest owners tend to generally favour economic util-

isation of forests more than conservation (Karppinen and Hänninen, 2000). Moreover, Finnish citizens consider securing landowners' property rights very important (Rekola et al., 2000), which may be a reason for resistance to compulsory purchase of land for protection, as well as implementation of top-down regulation of any kind. In consequence, there is a need to further study and develop *voluntary conservation contracts* in which landowner is a fully authorised contracting party and which compete economically with other land use options, such as timber harvesting. Also the recent Forest Protection Programme for Southern Finland emphasises the need to create and use voluntary and incentive approaches to preserve biodiversity in private forests (Etelä-Suomen metsien suojelutoimikunta, 2002).

I hypothesise that making conservation contracts for definite periods might be one option to increase the willingness of landowners to protect nature voluntarily. However, the subject matter of fixed-period contracts as opposed to establishment of permanent nature reserves has been poorly studied. Conservation contracts that are both voluntary and made for fixed-periods are still rare also in practical nature conservation. Even though the present Nature Protection Act in Finland (1096/96) allows such contracts, in the whole country there are only six cases, the size of which ranges from two to ten hectares (Ministry of the Environment, unpublished data). Therefore, two intermediate practices that are in wider use in Finland are examined in this

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paper: (1) the use of fixed-period environmental grants in protection of forest key habitat sites, the saving of which is statutory and (2) voluntary establishment of permanent nature reserves in privately owned forests. The questions presented are as follows: (1) What kind of habitats and how large areas are covered by the two practices? (2) Which one of the practices gives better compensation to a landowner or is more profitable for the society? The emerging patterns are assessed in relation to institutional, social and economic structures involved, such as the nature of regulation (statutory or voluntary), the ownership of land and the willingness of landowners to accept protection. Ecological effects of saving key habitats and establishing nature reserves are discussed on the basis of existing literature.

2. Protection of private lands in southern Finland

Nature reserves in Finland covered 14,300 km², i.e. 4.7% of total land area in 2002. More than 90% of the reserve area is located on public lands that have been available mainly in northern Finland (Finnish Forest Research Institute, 2001; Ympäristöhallinto, 2003). Since 43% of threatened species in the country use wooded lands as their principal habitat (Rassi et al., 2001) demands for additional protection of forests have been strong. In southern Finland, c.a. 75% of forestland is privately owned (Finnish Forest Research Institute, 2001) and only 1.1% of forests are strictly protected (Working group on the need for forest protection in southern Finland and Ostrobothnia, 2000). If new reserves are to be established, or if other policies are to be implemented in order to protect biodiversity, it is essential to focus on private lands in southern Finland. However, policies for conserving private lands should take the economic and social dimensions of protection into account.

Land management is still an important source of income in the rural areas, especially in southern Finland where the productivity of cropland and timberland is several times higher than in northern Finland (Finnish Forest Research Institute, 2001). At the same time, nature protection is an increasingly important objective of land use. It may supplement or compete with land management objectives related to agriculture, forestry or recreation. In Finland, land set aside as permanent nature reserves may either be purchased by the government or remain in private ownership under the Nature Protection Act, 1096/96. The nature reserves studied in this paper are situated on private lands. Such reserves are normally established either as a result of an application made by the landowner or as a consequence of negotiations in which the landowner accepts protection. Protection of these reserves is thus voluntary in most cases. Reasons for their protection may be various; they may include ecosystems in virgin state, habitats of threatened species, or sites of great natural beauty. They are basically meant to be protected forever and landowners are entitled to a lump sum compensation that corresponds to the current

market value of timber or other natural resources, such as peat.

The other practice analysed in this paper is protection of woodland key habitat sites. They are habitat patches worth saving within normal production forests. Key habitat sites differ in a way or another from the regular forestland and are assumed to maintain species with specific requirements. Key habitat sites must, on certain conditions¹, be set aside or managed in a manner that preserves their specific features (Forest Act 1093/96). Therefore, their preservation represents statutory top-down regulation. A landowner has to bear the costs of preservation up to a certain threshold. She can apply for an environmental grant if, and only if, preservation causes loss of income exceeding a threshold, i.e. 4% of felling value of all her forests in the municipality in question. The environmental grants are appropriated for periods of 30 years at a time. (Act on Financing of Sustainable Forestry, 1094/96; Maa-ja metsätalousministeriö, 2000).

For both nature reserves and key habitat sites, compensation is based on the realistic value of timber or other resources at the moment of signing the contract. The growth of forest and the consequent increase in the volume and value of timber are not taken into account when calculating the compensation sum. As the ownership does not change, no compensation is paid for the land itself. The major difference in compensation practices is as defined above, environmental grant for key habitat sites is calculated for a fixed-period at a time while compensation paid for nature reserves is meant to cover protection forever.

3. Material and methods

Information on nature reserves was compiled from the archives of Uusimaa and Häme Regional Environment Centres in southern Finland (Fig. 1). Reserves in forests and in habitat types resembling key habitats protected by the Forest Act are included, concentrating on the reserves established in 1990–2001. The total number of such reserves was 193. In regards to key habitat sites, the Ministry of agriculture and forestry supplied data on environmental grants for key habitat sites covering the period from the introduction of the system in 1997 to the end of the year 2000. In order to make the data on key habitat sites numerically comparable to that on nature reserves, all sites from the area of the eight southernmost regional forestry centres ($n = 182$, Fig. 1)

¹ If the following habitat types in forests are in natural state and clearly distinguishable from their surroundings, they must be saved or managed in a manner that preserves their special features: (1) immediate surroundings of small water ecosystems, such as springs, brooks, rivulets and small ponds; (2) following peatland types: herb-rich, ferny or eutrophic paludal hardwood-spruce swamps and eutrophic fens; (3) fertile patches of herb-rich forest; (4) heathland forest islets in undrained wetlands; (5) gorges and ravines; (6) steep bluffs and the underlying forest; (7) nutrient-poor forest ecosystems, such as sandy soils, exposed bedrock, boulder fields and scrublands (Forest Act, 1093/96).

Fig. 1. Research area.

were included. An area corresponding to the geographical distribution of nature reserves would have included only 46 sites. As the productivity of timberland is, on average, the higher the further south sites are situated, the potential effects of different geographical areas on timber yields and, consequently, on the compensations must be taken into account when interpreting the results.

On the basis of the documents at hand the sites were classified by their principal habitat type. To be able to use similar classes for both nature reserves and key habitat sites I modified the key habitat classification of the Forest Act. As shown in Table 1, the number of sites in different classes is

Table 1
Habitat type classification used in this study and the number of sites in the classes

Habitat type	Key habitat sites (<i>n</i>)	Nature reserves (<i>n</i>)
Small water ecosystems	67	5
Peatlands	21	40
Herb-rich forests	18	76 ^a
Heathland forest islets	2	–
Gorges, ravines and bluffs with the underlying forest	12	–
Nutrient-poor forest ecosystems (sandy soils, exposed bedrock, etc.)	16	14
Old forests	1	23
Combination of several types	43	34
Unclassified	2	1

This table is based on information provided by Ministry of agriculture and forestry (key habitat sites the saving of which has been funded in 1997–2000), as well as Uusimaa and Häme Regional Environment Centres (nature reserves established in 1990–2001).

^a One of these reserves is excluded from the analysis in Table 2 due to incomplete data.

highly variable. In addition to habitat type, two more variables were formulated: area of site (ha) and compensation per hectare (€/ha).

For statistical testing the normality of areas and compensation sums was first studied. Six of the nature reserves clearly stood out from the rest of reserves: their sizes and compensation sums were two to three times higher than the corresponding figures for the next largest reserves. They are omitted from the statistical analyses here but are discussed in the text. In the case of remaining nature reserves the distributions of variables describing area and compensation per hectare could not be normalised and the standard deviations are comparable in magnitude to their means. Hence, the mean size and compensation sum of nature reserves were compared to those on key habitat sites using the non-parametric Mann–Whitney *U*-test.

4. Results

The total area of all 193 nature reserves was 2030 ha and the summed compensation cost was 4.77 million €. With the six exceptionally large sites (3% of the number of sites and 30% of the total area) omitted, the total area of remaining 187 reserves amounts to 1430 ha and the total compensation cost diminished to 2.52 million € (a decrease of 48%). These remaining reserves will be used in the following analyses. The corresponding figures for key habitat sites were as follows: their summed area was 684 ha and the total compensation sum 2.98 million €.

The mean area of key habitat sites, 3.8 ha (S.D. = 4.8), was significantly smaller than the mean area of nature

Fig. 2. Distribution of areas: (a) key habitat sites; (b) nature reserves. Notice the uneven scale of x-axis and the different scales of y-axis. The figures are based on information provided by Ministry of agriculture and forestry, as well as Uusimaa and Häme Regional Environment Centres.

reserves considered, 7.7 ha (S.D. = 11.2), (Mann–Whitney U -test, $Z = -4.56$, $P < 0.001$). In general, small sites dominated the distribution of areas: the median of area was 2.0 ha for key habitat sites and 3.9 ha for nature reserves (Fig. 2). Unlike area, the mean sum paid as environmental grant for key habitat sites (5422.50 €/ha, S.D. = 4119.80) was more than two times higher than the average compensation paid for establishing a nature reserve (2121.80 €/ha,

S.D. = 2771.90), (Mann–Whitney U -test, $Z = -9.51$, $P < 0.001$). The distributions of compensation sums were also skewed, small sums being the most frequent (Fig. 3).

In half of the cases (93 out of 187) no compensation had been paid to the owners of nature reserves. Compensation for establishing such reserve must be paid if landowner demands for it. However, in these data a half of the landowners had been ready to protect their land with no payment. The nature reserves protected for free were, on average, as large as those for which compensation had been applied (Mann–Whitney U -test, $Z = -0.95$, $P = 0.34$). The statistical difference in area between nature reserves and key habitat sites remained even after omitting the sites protected with no compensation (Mann–Whitney U -test, $Z = -4.61$, $P < 0.001$). In contrast, the difference in price per hectare almost disappeared: the mean compensation for nature reserves rose to 4220.70 €/ha (S.D. = 2532.10) in comparison to the mean compensation of 5422.50 €/ha (S.D. = 4119.80) for key habitat sites. This difference is only indicative in statistical sense (Mann–Whitney U -test, $Z = -1.95$, $P = 0.051$).

Comparison of the properties of similar habitat types in nature reserves and key habitat sites was also informative. The number of sites was high enough for comparing the areas and costs on nature reserves to those on key habitat sites in the case of peatlands, herb-rich forests and nutrient-poor forest ecosystems. When all these sites were included, the mean area of sites on peatlands and in nutrient-poor forest ecosystems did not differ statistically from each other but the sum paid per hectare was higher for key habitat sites than for nature reserves (Table 2). In herb-rich forest sites nature reserves tended to be larger but the mean compensation paid for them remained lower than for key habitat sites. Again, the situation somewhat changed when nature reserves protected for free were omitted. In the case of herb-rich forests and nutrient-poor forestlands the differences in compensation cost per hectare disappeared. On the other hand, on peatlands the average environmental grant paid for key habitat sites was still higher than the compensation paid for nature reserves. This becomes at least partly explained by qualitative differences in peatlands. According to the definition in Forest Act, key habitat sites on peatlands mostly consist of hardwood-spruce mires with relatively high volume

Table 2

Comparison of mean areas and compensation sums in key habitat sites with nature reserves of similar types (Mann–Whitney U -test)

		Key habitat sites		All		Not protected free of charge	
				Nature reserves	P	Nature reserves	P
Peatlands	Area (ha)	4.4 ($n = 21$)		9.5 ($n = 40$)	0.44	12.0 ($n = 16$)	0.32
	€/ha	6615.10 ($n = 21$)		1173.00 ($n = 40$)	<0.001	2932.50 ($n = 16$)	0.01
Nutrient-poor Ecosystems	Area (ha)	6.4 ($n = 16$)		2.9 ($n = 14$)	0.11	3.3 ($n = 6$)	0.37
	€/ha	2661.30 ($n = 16$)		1251.90 ($n = 14$)	0.03	2921.10 ($n = 6$)	0.37
Herb-rich forests	Area (ha)	2.46 ($n = 18$)		6.9 ($n = 75$)	0.02	5.05 ($n = 46$)	0.02
	€/ha	4760.60 ($n = 18$)		2569.40 ($n = 75$)	0.001	4189.30 ($n = 46$)	0.30

Columns 4 and 5: comparison with all reserves in the three comparable habitat types. For the analysis in columns 6 and 7, reserves protected free of charge have been omitted.

Fig. 3. Distribution of compensation sums: (a) key habitat sites; (b) nature reserves. Notice the uneven scale of x-axis and the different scales of y-axis. Figures are based on information provided by Ministry of agriculture and forestry, as well as Uusimaa and Häme Regional Environment Centres.

and value of timber. In contrast, nature reserves included peatlands of all types—also open, treeless types with low volume of growing stock. Consequently, the difference in compensation levels reflects these quality distinctions.

5. Discussion

5.1. Economic and social factors related to conservation contracts

At the first glance environmental grants paid for preserving key habitat sites seemed to provide landowners with remarkably higher monetary sums per hectare than compensation paid for establishing nature reserves. However, this interpretation is undermined by the fact that half of the landowners had not even demanded compensation for putting their land aside as nature reserves. For the rest of reserves, the average compensation per hectare was as high as the compensation for key habitat sites, provided that the quality of sites was similar in both categories. The geographical differences must, nevertheless, be remembered here: the

nature reserves are situated in the most productive part of the country but the mean cost of saving them was not higher than the corresponding sum for key habitat sites, the distribution of which extended further north. The grounds for calculating environmental grants appear thus to be somewhat more favourable for landowners than the principles used in computing compensations for nature reserves. However, exact information on volume of timber or other nature resources on the sites in question would be needed to ascertain this argument. The compensation for a nature reserve is, in any case, a lump sum payment while the environmental grant for a key habitat site is determined for 30 years at a time (Maa-ja metsätalousministeriö, 2000), after which a new grant may be applied if the site remains in natural state. Therefore, environmental grants will be more profitable for landowners, either immediately or in the long run.

Besides being relatively cheaper for the society, nature reserves truly increase the protected area. Environmental grants are meant for financing preservation of key habitat sites that must, according to the law, be saved or carefully managed at any case (Forest Act, 1093/96; Act on Financing of Sustainable Forestry, 1094/96) while establishing nature

reserves always brings new sites under protection. In some cases nature reserves even cover remarkable land areas, as the six exceptionally large reserves in this data showed. Their share was only 3% of the total number of reserves and still they covered as much as 30% of the total reserve area: a couple of exceptional cases may have more remarkable effects than dozens of average reserves together.

In spite of the right to get compensation for setting up a nature reserve, one half of the landowners had protected their lands without payment. According to [Karppinen \(1998\)](#) the majority of Finnish forest owners appreciate also non-timber, recreational and amenity aspects of their forests besides monetary income from timber sales. Protection without payment may thus reflect willingness of landowners to secure the non-material and aesthetic values of their forests also in the future. In addition to non-monetary goods, protection often provides landowners with certain monetary benefits not appearing as compensation sums. In Finland, establishing a nature reserve on forestland exempts the landowner from acreage taxation of the protected forest stand ([Kiviranta, 1997](#)) while exemption from real estate taxes comes into play on certain habitat types of low productivity ([Viherkenttä, 1993](#)). The motives leading to establishment of a nature reserve may, thereby, include a complex mixture of interests—both monetary and non-monetary.

For those landowners who are not willing to protect their lands, the cultural or emotional importance of landownership and intentions to utilise forests economically in the future are central arguments ([Karppinen and Hänninen, 2000](#); [Sairinen, 2000](#)). Antipathy against statutory conservation tools may be manifested as loss aversion, the tendency of an owner of a good to overestimate its monetary value ([Tversky and Kahnemann, 1991](#)). The minimum compensation demanded for a good, i.e. willingness to accept, may rise disproportionately high for such private goods that are not easy to substitute (e.g. [Shogren et al., 1994](#); [Shogren and Hayes, 1997](#)). Landownership, or in this case the right of decision concerning one's lands, have no close substitutes since cultural values attached to land cannot be replaced. As preservation of key habitats is a form of top-down regulation (ordered by the Forest Act), it may be expected to cause loss aversion. However, even statutory conservation tools may become somehow acceptable for landowners if compensation sums are high enough ([Vehkala and Vainio, 2000](#)). This point is in line with field observations: payment of an environmental grant often encourages a landowner to save larger areas around key habitat sites than directly required by the law (M. Kallioinen, personal communication).

In any case, the property rights of landowners must be taken into account and evaluated in relation to their duty to secure the continued existence of biodiversity ([Polasky et al., 1997](#); [Knight, 1999](#)). The willingness to protect can be expected to rise if landowners do not need to fear losing the right of decision concerning their lands. A recent study by [Lehtonen et al. \(2003\)](#) has shown this expectation to be correct: Finnish citizens tended to favour such con-

tracts in which a landowner takes an initiative of protection and receives a subsidy for a fixed-period of time. Even though the use of voluntary contracts for predetermined periods as defined in Nature Protection Act (1096/96) has not broken through in the Finnish practice yet, parallel experiences from Austria are encouraging. In the Austrian Natural Forest Reserve Programme forest owners themselves propose areas to be set under protection for periods of 20 years after which they have a right to elongate the contract or to terminate protection. The ecological quality of programme sites is secured by surveys by experts, the compensation fee is calculated cease-specifically, and contract violations are extremely rare ([Frank and Müller, 2003](#)). The idea of implementation of statutory restrictions or orders in management of any forest, like the order to save key habitat sites, has also been tested internationally. In England such restrictions have been found to effectively complement the results achieved by voluntary approaches and policies aiming at strictly protected sites ([Kirby, 2003](#)). In all, the findings from Finland give support to the recent international ideas emphasising the importance of choosing a well-balanced combination of voluntary and statutory approaches connected to a possibility to receive fair remunerations (e.g. [Doremus, 2003](#)). However, the role of truly voluntary protection in Finland—protection with no demand for payments—must not be underestimated. Together the sites protected with no payment cover remarkable areas, and the interest of landowners to establish such areas should be encouraged.

5.2. *Ecological aspects of conservation contracts*

The data used in this study do not admit of evaluating the relative importance of nature reserves and key habitat sites to the occurrence of forest species and populations, not to mention dispersal, extinctions or other ecological processes. Despite adoption of the practice of preserving key habitats in boreal forests, comprehensive understanding of their role and basic functions or the preferred ways to manage them is still lacking ([Hansson, 2001](#)). However, some fairly new studies conclude in favour of saving key habitats and even paying for preserving them. [Gustafsson et al. \(1999\)](#) showed that red-listed lichens and bryophytes occurred in the majority of studied key habitat sites in Sweden. Key habitat sites may also be richer with indicator and red-listed lichens than regular production forests ([Johansson and Gustafsson, 2001](#)). Moreover, species number was highest in such key habitat sites which were preserved as legal habitat protection areas, the owners of which achieved monetary compensation ([Gustafsson et al., 1999](#)). The preliminary results from Finland ([Kotiaho et al., unpublished data](#)) similarly indicate that the number of epiphytic bryophyte species and the volume of decaying wood tend to be higher next to brooks preserved as key habitats than by brooks with no key habitat status or in adjacent control forests. These results suggest that definition and selection of key habitats have been successful.

However, occurrence of certain species or communities in a key habitat site or in a nature reserve at one moment does not secure their existence in the future. Their long-term persistence is affected by the quality and management of matrix forests, as well as the total area, fragmentation and connectivity of habitat types in question (Hanski, 2000; Komonen et al., 2000; Hansson, 2001). On the other hand, the whole approach of protecting small nature reserves or key habitat sites have sometimes been questioned (Simberloff, 2001). Ecosystem or landscape management, e.g. by mimicking natural disturbance regimes, has been recommended as an alternative. The goal of such management is to maintain all species in any forest (Simberloff, 1998, 2001).

5.3. *Conclusions and questions for further research*

Determining the ecological and economic efficiency of paying environmental grants for key habitat sites as opposed to establishing nature reserves is a complicated task. Proportioned to the preserved area, an average nature reserve will in the long run cause lower conservation costs for the society than a key habitat site for which the landowner receives an environmental grant. However, paying environmental grants may have a favourable effect on species or habitat diversity in regular production forests by helping the forest owners to accept preservation of key habitat sites and by encouraging them to set aside larger areas than without grants. In order to assess the long-term ecological effects of these practices comprehensive monitoring projects are needed on the dynamics of populations and communities living in the preserved sites.

The role and utility of contracts that are both voluntary and made for fixed-periods also remains to be studied in Finland. To assess their feasibility in establishment of new private nature reserves the motives of all key actors must be taken into account. Current international experiences and ideas, at any case, favour approaches aiming at a wide selection of several possible conservation tools from which to choose suitable ones in every specific situation. Monitoring and experimentation with different reserve and management designs combined with different policy and compensation options are necessary to determine the best selection of approaches in the Finnish circumstances. However, the willingness of several Finnish landowners to protect their lands even without payment is notable and should be born in mind when implementing conservation policies in the future.

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