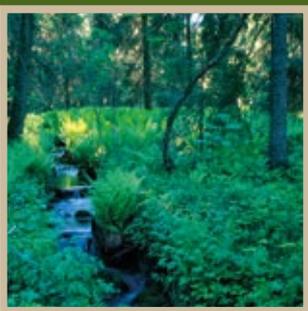


# Integration of Nature Protection in Forest Policy in Finland

INTEGRATE Country Report



Markus Lier

Jari Parviainen



EUROPEAN FOREST INSTITUTE  
CENTRAL EUROPEAN REGIONAL OFFICE AND THE  
OBSERVATORY FOR EUROPEAN FORESTS – EFICENT-OEF

**METLA**



# Integration of Nature Protection in Forest Policy in Finland

Markus Lier  
Jari Parviainen

Markus Lier  
Prof. Jari Parviainen  
Finnish Forest Research Institute (Metla)  
Joensuu Unit  
PO Box 68 (Yliopistokatu 6)  
FI-80101 JOENSUU (Finland)  
<http://www.metla.fi>

*Citation:* Lier, M. & J. Parviainen 2013. Integration of Nature Protection in Forest Policy in Finland. INTEGRATE Country Report. EFICIENT-OEF, Freiburg.

The authors would like to thank two anonymous reviewers for careful review and valuable comments on the report.

Pictures cover: Erkki Oksanen/Metla

EFICIENT-OEF, Freiburg, 2013

## Table of Contents

Table of Contents	I
List of Abbreviations	III
1 Introduction	1
2 Forests, forest management and nature conservation	3
2.1 Historical development	3
2.2 Forest management	3
2.3 Facts and figures about forests and biodiversity	5
2.3.1 Forests and forestry at a glance	5
2.3.2 Forest sector	6
2.3.3 Nature protection and biodiversity	13
3 Forest functions	24
3.1 Ecosystem services	24
3.2 Safeguarding wood production	25
3.2.1 Legislation	25
3.2.2 Forest programmes	26
3.2.3 Financial instruments	26
3.2.4 Forest planning	27
3.2.5 Production of information	27
3.3 Safeguarding and increasing services and non-wood products	28
3.3.1 Legislation	28
3.3.2 National programmes	28
3.3.3 Economic incentives	29
3.3.4 Forest planning	29
3.3.5 Monitoring, research and advisory services	30
3.4 Maintenance and increasing of the protective functions of forests	30
3.4.1 Timberline forests	31
3.4.2 Protective forests – infrastructure and managed natural resources	31
3.4.3 Impacts of forest management on waters	32
3.5 Maintenance of health and vitality of forests	34
3.5.1 Legislation, national programmes and other instruments for the protection of forests	34
3.5.2 Monitoring systems	35
3.6 Maintenance of cultural and spiritual values	36

## Table of Contents

3.6.1 International conventions and commitments	36
3.6.2 National legislation and programmes	37
3.6.3 Other steering instruments	38
4 Biological diversity of forests in Finland	39
4.1 International and national agreements and programmes	39
4.2 Legislation	40
4.3 Financial instruments	41
4.4 Active information services	42
5 Strategies and action plans	44
5.1 National Forest Programme	44
5.2 Other forest-related programmes	44
6 Certification	46
7 Monitoring and planning tools	47
7.1 National Forest Inventory	47
7.2 Forest planning	47
8 Potential impact of climate change on forests	49
References	51
Sources	53
List of Figures	55
List of Tables	57

## List of Abbreviations

CBD	Convention on Biological Diversity
CLRTAP	Convention on Long-Range Transboundary Air Pollution
FSC	Forest Stewardship Council
FFCS	Finnish Forest Certification System
GDP	Gross Domestic Product
IPCC	Intergovernmental Panel on Climate Change
MCPFE	Ministerial Conference on the Protection of Forests in Europe
METSO	Forest Biodiversity Programme for Southern Finland
NFP	National Forest Programme
PEBLDS	Pan-European Biological and Landscape Diversity Strategy
PEFC	Programme for the Endorsement of Forest Certification schemes
TEKES	Finnish Funding Agency for Technology and Innovation



## 1 Introduction

Forest management oriented to the biological diversity by mitigating the natural development cycle of forests has been a statutory requirement in Finland for 15 years, ever since safeguarding biological diversity was enshrined as a parallel goal with wood production in the Forest Act of 1997. At the same time, the production of information about biodiversity and related research, discussion and consultation have been an important key area, with broad participation by forest owners and other actors and interest groups in forest management.

The main methods for safeguarding biological diversity in commercial forests are the protection of valuable habitats and biotopes, favouring of mixed tree stands in the management, and increasing the amount of decayed wood. The selected new forest management policy has brought measurable positive changes to commercial forests. The rate of decline of certain forest species has slowed down in Finland, or in some cases even stopped since the 1990s, although it has not been possible to halt the decline in forest species overall. An evaluation of threatened species conducted in 2010 showed that the decline has slowed down or stopped for 81 forest species but continued for 108 species. Retention trees at felling sites have been particularly important in curbing the decline trends.

Unlike in other European countries, strict forest protection is emphasised in Finland. Under various protection programmes and decisions, the area of protected forests has been tripled over the past 35 years. The total area of protected forests is currently 2,2 million hectares, or 9,6% of all forest land. The total area of protected forests and forests under restricted use is almost 3 million hectares, or 13% of all forest land. The percentage of strictly protected forests in Finland (5,2% of forest land) is the highest in Europe. In southern Finland, where the percentage of strictly protected forests varies between 1,0% and 3,6%, biological diversity and protection is being promoted through the Forest Biodiversity Programme for Southern Finland (METSÖ). The programme involves developing silvicultural methods, as well as voluntary measures by private forest owners to protect biodiversity, and restoration management of protected areas in State ownership.

Forest management in Finland is based on native tree species, and management measures are undertaken on a mosaic-like basis, followed the forest vegetation types formed by natural development. Each year, two thirds of the area of regenerated forest land (about 150.000 hectares, about 0,8% of all forest land) is planted with seedlings and one third is regenerated either naturally or by direct seeding.

The most immediate future challenges to forest biodiversity in Finland are: 1) the impact of an increased wood-based biomass extraction and its related effects on nutrient balance and small waterway systems, 2) the possible impacts of climate change and the related risk of mass proliferation of forest pests and 3) society's

increased need of financial means and valuation to promote forest ecosystem services such as carbon sequestration potential, landscape values and safeguarding the peace of the natural environment. In Finland the METSO programme has been proofed to be an effective voluntary measure for biodiversity protection and therefore it is important to guarantee financial means also in the future.

## 2 Forests, forest management and nature conservation

### 2.1 Historical development

The history of human influence on Finland's forests is long and varied. Game, berries and mushrooms used to provide an important source of food. The livelihood and cultural development of humans has been more dependent on forests than anywhere else in Europe: initially on hunting, slash-and-burn agriculture and tar burning, later on forestry and the forest industry, and more recently also on forest-based and wood-based bioeconomy and related businesses.

Agriculture was first introduced in the form of slash-and-burn cultivation 4.000 years ago and developed into permanent agriculture 3.500 years ago. Along with the spread of slash-and-burn cultivation, human settlements spread to central and eastern Finland, especially from the 16<sup>th</sup> century onwards. In the 18<sup>th</sup> and 19<sup>th</sup> centuries, forests in Finland were also used for tar production, to meet the needs of the mining and shipbuilding industries, for home use and construction, and also for agriculture and grazing within the slash-and-burn culture.

Between 50% and 75% of the forests in southern Finland, depending on the area, had been subjected to slash-and-burn cultivation by the beginning of the 20<sup>th</sup> century. Since then, the greatest impact on the structure of forests has come from use of wood as raw material for the forest industry. Owing to the various uses of forests, there are no completely untouched natural forests in Finland except for remnants of natural forests in certain protected areas in Lapland and eastern Finland. However, there are no intensively managed tree plantations either, because forest management in commercial forests makes use only of native tree species, and the development of mixed stands is actively promoted in management and harvesting.

### 2.2 Forest management

The aim of forest management is multifunctional: to safeguard the production of high-quality roundwood, the biological diversity of forests and the potential for the multiple functions and services derived from forests. Because forest owners have widely differing needs and expectations, the range of forestry options has been broadened in recent years, and further development is ongoing.

The basic unit for forest management in Finland is the stand. Forest stands are classified according to their naturally occurring plant communities, based on a forest site type classification developed by botanist A.K. Cajander in the early 20<sup>th</sup> century. The government surface vegetation at each individual site indicates the properties of the site and also the growth potential of trees. There are six main site types in southern Finland, and management and harvesting are directed according to their properties. The average size of managed stands in southern

Finland is about 1,2 hectares, which is about the same as the average in Germany, Austria and France.

The big picture in landscape terms is fragmented and mosaic-like due to differences between individual stands in tree species composition, age structure and the timings of regeneration and management procedures. The principal silvicultural requirement is that forest regeneration after felling must be ensured. This is often difficult to achieve without soil preparation because natural forest fires are prevented; the special characteristics of the tree species, other flora and climate of the boreal zone lead to the formation of a layer of humus over mineral soil, inhibiting germination. Stand-based forest management in Finland's boreal zone typically involves managing even-aged stands. Management is clearly divided into two phases, growth and regeneration. Depending on the tree species, geographical location and site characteristics, the recommended growth period varies from 50 to 120 years. At special sites, such as landscape areas and forest parks, cultural sites or forests dedicated for recreational use, uneven-aged management systems are also used. In uneven-aged management, different growth stages are concurrent, and stands are managed with single-tree selection.

In the growth phase, seedling stands are managed by cleaning and thinning. Young and advanced thinning stands are managed by intermediate fellings, which are carried out 1-3 times during the growth cycle of the stand. Each time, 25% to 30% of the then current growing stock in the stand is removed. The purpose of intermediate fellings is to direct the growth of the stand in favour of the best trees, to encourage their growth and thereby to produce harvesting income already prior to regeneration felling.

In the regeneration phase involving natural regeneration, seed or shelterwood trees are left standing to seed the site. Sometimes natural seeding may take place by trees on the forest edge surrounding the regeneration area, or several small regeneration clearings may be opened up by local felling in the stand. Artificial regeneration by seeding or planting is preceded by final felling that completely removes the growing stock. The success of regeneration is ensured by clearing the site and exposing mineral soil with mechanical soil preparation prior to regeneration, and ensuring that grasses will not endanger the early development of seedlings. The goal is to create a fully productive stand with a suitable species composition in a reasonable period of time. The majority of Finland's current forests have regenerated naturally; about 35% are planted or artificially seeded. However, even artificially regenerated stands have great numbers of naturally regenerated trees as well.

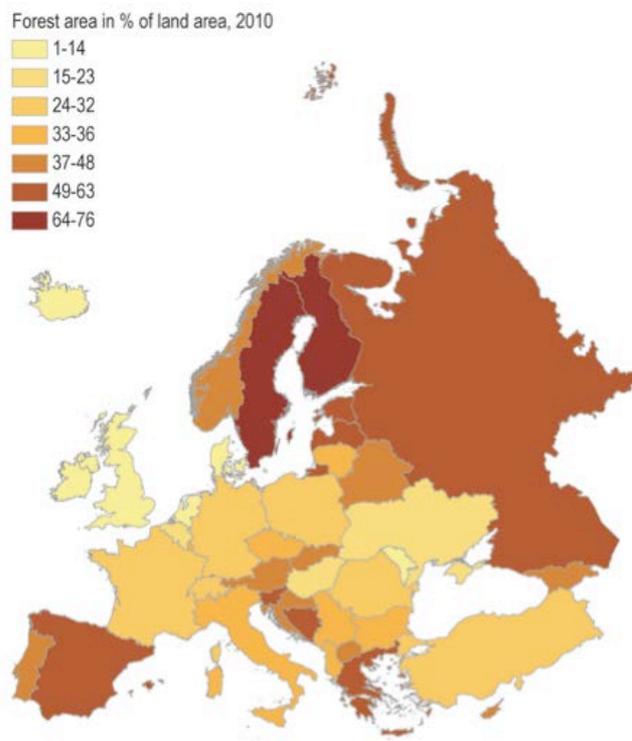
Biological diversity is promoted in fellings and other silvicultural measures by leaving dead, decayed and living retention trees in the forest and by managing valuable habitats in a way to preserve their natural characteristics. A mosaic-like variation in forest types at the landscape levels promotes biological diversity by creating habitats of different ages and at different stages of development.

Trees are for the most part harvested using the Nordic cut-to-length system (CTL): logs are debranched and cut to appropriate length on site, according to their use. Branches and crowns are left in the forest to maintain an even nutrient cycle. There is a new trend to harvest branches and crowns in spruce stand fellings and in thinnings of young pine stands and of broadleaved stands to be used as fuel. The CTL system of cutting is particularly suited to conditions in Finland, as the land is fairly level. Fellings are carried out all year round to ensure a steady flow of wood, but mostly in winter, when the ground is frozen and covered by snow to minimise any detrimental effects of felling on the soil and the trees left standing.

## 2.3 Facts and figures about forests and biodiversity

### 2.3.1 Forests and forestry at a glance

Three fourths of the land area of Finland, 22,8 million hectares, is covered by forests (forest land and low productive forest). In addition, there are 3 million hectares of treeless or sparsely stocked other land areas (open mires, rocky grounds, etc.) as well as 0,2 million hectares of other forestry land (forest roads, storage sites, etc.). The forest cover in Finland (76%) is more extensive than in any other European country (Fig. 1).



**Figure 1: Forest and other wooded land as percent of land area (State of Finland's Forest, 2011; FOREST EUROPE, 2012)**

Geographically, Finland lies in an intermediate zone between maritime and continental climates, belonging for the most part to the boreal vegetation zone. Because of the warming effect of the Gulf Stream, however, the climate of Finland is in many respects more favourable than in areas at similar latitudes in

Russia and Canada, for instance. Because Finland is over 1.100 kilometer long north to south, conditions for growth vary considerably between the southern and northern parts of the country. Towards the north, the climate gets increasingly colder and more humid, and precipitation exceeds evaporation.

The number of plant species in Finnish forests is low compared to the boreal zone in North America, for instance, or the temperate zone in central Europe. This is because of the high European mountain ranges running east-west, which prevented the return of plants to the north after the last Ice Age.

There are only four coniferous tree species native to Finland, and fewer than 30 deciduous trees and arborescent shrubs. Many sites are dominated naturally by just one species, such as pine in upland forests. Mixed stands and predominance of broad-leaves are common in fresh mineral soil sites and upland forests with grass-herb vegetation. The most common species growing in mixed stands is downy birch. Pine predominates on 65% of forest land, spruce on 24% and broadleaves on 10%. Broadleaves, which are important to forest biodiversity and the soil and grow mostly in mixed stands, account for 20% of the total volume of growing stock, which is clearly more than the total area of predominantly deciduous stands. Pure stands<sup>1</sup> account for 55% of all forest land, stands with some mixing<sup>2</sup> account for 31%, and actual mixed stands account for 13%.

### 2.3.2 Forest sector

*Ownership.* Finnish forestry is mainly in the hands of families, and the properties are mainly quite small. Private forest owners own 12 million hectares of forest land; the State, 5 million hectares; companies 2 million hectares; and others (municipalities, parishes and other public corporations) own 1 million hectares of forest land (Fig. 3, Table 1).

---

<sup>1</sup> Pure stand: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is over 95%.

<sup>2</sup> Stand with some mixing: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is between 75-95%. Mixed stand: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is below 75%.

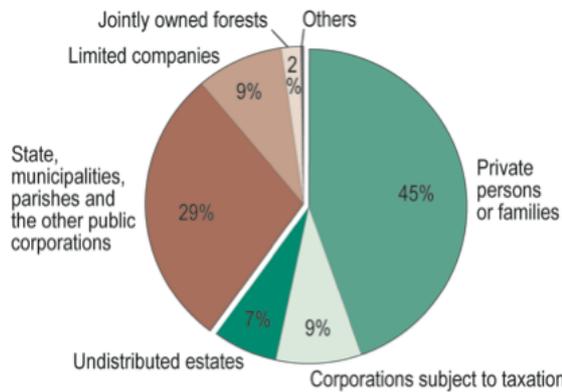


Figure 2: The share of forest land by forest ownership category (State of Finland's Forests, 2011)

Table 1: Forest land, growing stock, annual increment and commercial harvesting by forest ownership category (State of Finland's Forests, 2011)

Forest ownership category	Forest land area	Growing stock volume on forest and low productive forest land	Annual increment on forest and low productive forest land	Commercial roundwood removals
	2004-2008	2004-2008	2004-2008	2000-2009
	%			
Private	60	64	73 <sup>3</sup>	83 <sup>3</sup>
State	26	21	27 <sup>4</sup>	9
Companies	9	9	-	8
Other (municipalities, parishes, associations and societies)	5	6	-	-

In private forests, the number of forest property entities<sup>5</sup> of over two hectares is about 375.000, and the total number of owners of these entities, including the stakeholders of estates and partnerships, is almost 737.000. Some 74% of private forests are family-owned. The average size of a forest property entity is 30 hectares. The average size has not changed in recent years, but the size distribution has changed so that the number of both small (less than 10 hectares) and large (over 200 hectares) properties has increased.

Regional differences in the structure of forest ownership are high. The share of state-owned forests increases towards the north and east, whereas private ownership is more common in the southern parts of the country. For this reason, the importance of private forests in terms of roundwood production is higher than

<sup>3</sup> Private + other

<sup>4</sup> State + companies

<sup>5</sup> The number of forest property entities includes forest properties owned by the same forest owner across the country

might be concluded from their share of the total area. Moreover, a higher share of state forests are protected.

Long-term sustainable wood production in private forests has been secured by forest legislation since 1886. The obligation to regenerate the forest after final fellings has been and remains to this day the basic principle of the law. This principle – which in practice amounts to an injunction against the destruction of forests – has remained in place, even though forest legislation has been revised to accommodate new needs of society. Government actions, legislation, national and regional forest programmes as well as the actions of and cooperation among private forest owners have all supported the attainment of the goal of sustainability. The central government encourages forest owners to use good silvicultural practices in the management of their forests. Government support is available for safeguarding sustainable wood production, maintenance of forest biodiversity and improvement of the health of forests; recently it has also been made available for the harvesting of small-sized wood for bioenergy production.

*Growing stock, increment and drain* The total volume of growing stock in Finnish forests has increased since the 1960s. This is due to the creation of new productive forest land by drainage and by afforestation of agricultural land, increased growth, a decrease in the number of low yield stands, changes in the age structure of forests, and above all the fact that the increment has exceeded harvesting drain. In 2011, the growing stock volume was over 2,3 billion solid m<sup>3</sup> over bark. The annual increment of growing stock has exceeded the total drain by one fourth on average since the mid-1970s. The balance between increment and drain varies between tree species and by region. According to the latest forest inventory (NFI 10), the annual increment in 2011 was 104 million m<sup>3</sup> (Fig. 4).

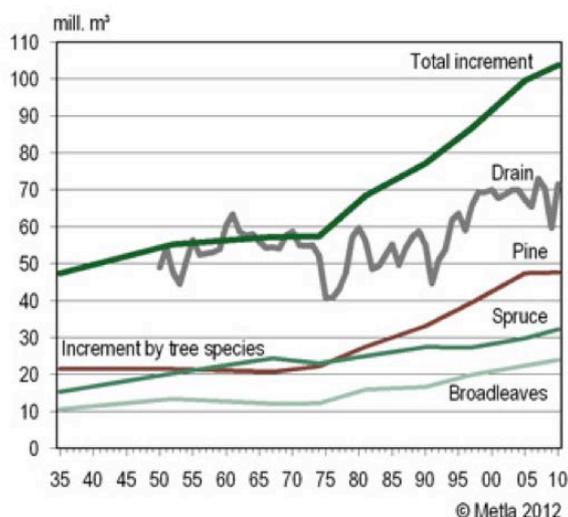
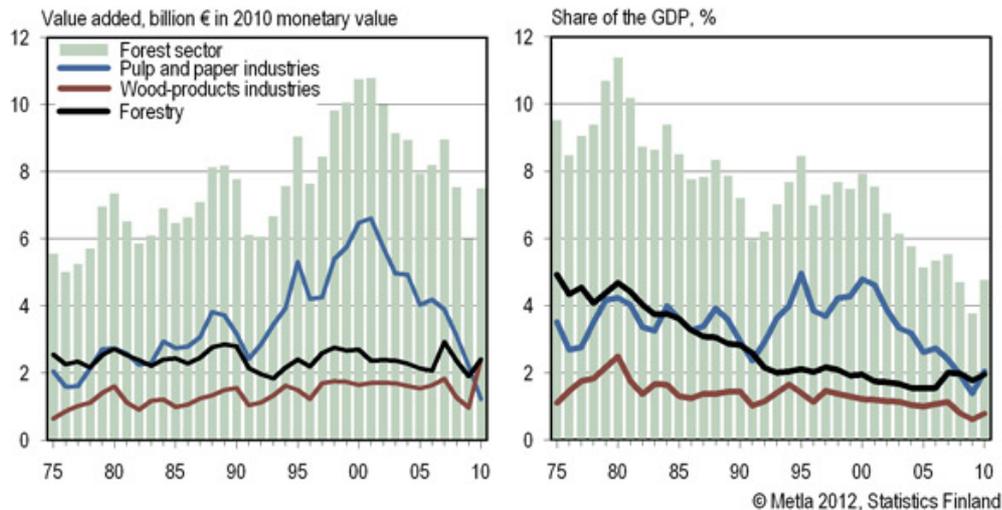


Figure 3: Annual increment of growing stock (1935-2010) and annual drain (1950-2010) in Finland (State of Finland's Forests, 2012)

*Forest industry.* The industrial use of forests for sawn timber and paper products began in the late 19<sup>th</sup> century. In 2010, forestry and the forest industry

contributed about 5% of the GDP (Fig. 5). Relative to its size, Finland is more dependent on forests and the forest industry than any other country in the world. As a consequence, Finland has accumulated an expertise in forestry and industrial manufacturing of forest products that is unique in Europe. For instance, the majority of Europe's paper industry engineers are trained in Finland, as are a considerable number of harvester drivers proficient in the Nordic CTL harvesting system.



**Figure 4: Value added in the forest sector and its share in gross domestic product (GDP), 1975-2010 (State of Finland's Forests, 2012)**

The pressures of internationalisation, a reorientation of production in the pulp and paper industry and an extensive need for new investments triggered an intense process of change in the field of forest industry in the early 1980s. Through acquisitions and mergers, this led to the creation of huge international forest industry corporations, some of them among the largest in the world. The three largest corporations account for more than 90% of all production in the paper and pulp industry between them; two decades ago, the corresponding figure was about 35%.

The worldwide recession and the decline in the demand for paper products in industrialised countries have led to a cut of almost 20% in pulp and paper industry production capacity in Finland since 2008. At the same time, the gross value of the forest industry's output dropped to about €16 billion. But whatever the economic situation, the forest sector is a key player in promoting sustainable development in Finland. Indeed, the ongoing structural change in the forest industry focuses not only on improving existing products but also on developing new bioproducts and energy solutions based on forest resources and wood. In the wood product industry, the use of wood in construction in particular is expected to be a significant growth area, since wood is a low-energy, renewable construction material throughout its life cycle while providing long-term carbon sequestration.

Most of the products of the Finnish forest industries are exported. The most important market is the European Union. Exports there account for nearly 70% of

the total exports of the sector. The major export countries are Germany, the UK, the USA, France and Spain.

A hundred years ago, forest industry products accounted for no less than 80% of Finland's total exports of goods; today, the figure is slightly about 20%. Products of the pulp and paper industries account for about three fourths of the exports of all products of the forest industry, while the percentage wood products industries is about 25%.

Owing to new technology and advanced production processes, the forest industry's discharges into air have been considerably reduced in the last 20 years, even though the volume of production has multiplied many times over during the same period. The emphasis on environmental factors has gradually shifted towards product life cycle issues, efficient use of natural resources, recycling and use of renewable energy. For instance, 70% of the paper used in Finland is recycled, which is a considerable achievement even in an international context, considering the low population density of the country: globally, the average recycling percentage for paper is 40% to 45%.

*Energy from wood.* In addition to reducing greenhouse gas emissions, the use of wood for energy has the effect of increasing self-sufficiency in energy production, promoting good silvicultural practices and improving the employment situation. The use of wood-based fuels in Finland has been increasing since the 1990s and now accounts for 20% of Finland's total consumption of energy (Fig. 6).

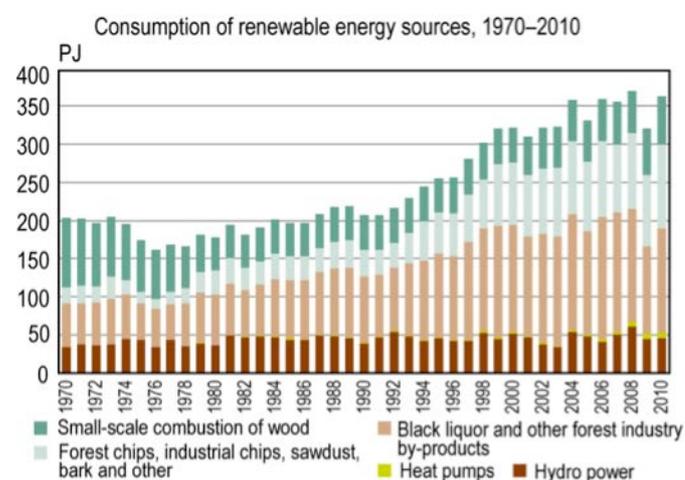


Figure 5: Consumption of renewable energy sources (State of Finland's Forests, 2012)

Finland aims to increase the percentage of renewable energy sources in energy consumption from the present 28% to 38% by 2020, as per the renewable energy requirements of the EU. This will mean a substantial increase in the use of wood-based fuels; the use of forest chips will have to be more than doubled from the present annual level of 6 million m<sup>3</sup> to 13,5 million m<sup>3</sup>.

Of the total consumption of energy by the forest industries, 75% comes from wood-based fuels. The majority of forest industry plants produce their own

energy using bark, sawdust and chippings as well as logging residue from thinning and regeneration fellings and waste liquors from industrial processes, which makes them energy self-sufficient. On the whole, however, the forest industry is a highly energy-intensive industrial sector: it consumes about one third of Finland's total electricity production.

Wood is also used increasingly in rural areas and population centres, especially for heating, either in individual heating systems for single homes or at district heating plants that convey heat to homes and other sites. The percentage of energy derived from wood is already quite high in some regions. In North Karelia Province, for instance, 70% of all energy consumed is wood-based. There has been a marked increase in recent years in research on the energy uses of wood for heating, electricity and biofuel production.

*Workforce in forestry and the forest industry.* The importance of forestry and the forest industry as a source of employment continues to be an important factor in maintaining the vitality of rural areas and regional economies, although the number of jobs provided by the forest sector has diminished in the past few decades.

In 2012, forestry and the forest industry employed about 3% of all employed people in Finland, or 69.000 persons, three fourths of whom work for the forest industry (Fig. 7). Forestry provides jobs for about 22.000 people, in addition to which a considerable part of silvicultural work in particular is done by private forest owners and their families. The forest sector continues to be male-dominated women accounting for only about 20% of all employees.

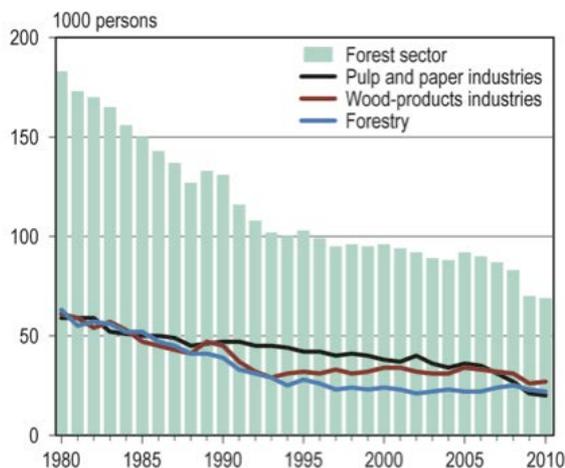


Figure 6: Employed persons in the forest sector, 1980-2010 (State of Finland's Forests, 2011)

*Recreation and non-wood products.* Forests are an important environment for recreation in Finland, especially as the population increasingly moves into population centres or towns. The most common forms of recreation in forests are hiking, camping, picking berries and mushrooms, orienteering and cross-country skiing. Forests also provide a setting for relaxation, meditation and communing with nature. Forest owners have developed an interest in a new range of forest

ecosystem services such as carbon sequestration potential, landscape values and safeguarding the peace of the natural environment.

Access to and recreational use of forests is free for all in Finland. 'Everyman's Rights' (rights of public access) guarantees everyone access to land owned by others to travel on foot, skis, bicycle or horseback, provided that they do not cause any damage. Other activities freely permitted on other people's land are temporary camping as well as picking wild, non-protected flowers, berries and mushrooms. The use of motor vehicles and making fire in forests, however, always require permission from the landowner. Everyman's Rights may not be exercised in such a way as to cause any disturbance or damage to the landowner.

The most important non-wood products which have economic value are game, berries, mushrooms and lichen. Game is of the greatest value in economic terms, particularly elk. The volume of nature tourism has increased in recent years and is of great economic significance particularly in Lapland. On the national scale, however, the economic value of non-wood products and services is small compared to the income from the sale of wood products (Fig. 8). Nevertheless, income from non-wood products and recreational services in forests may be substantial on a local scale and for individuals.

**Figure 7: Amount and value of various forest products for 2010 (State of Finland's Forests, 2012)**

Sources: Finnish Forest Research Institute; TNS Gallup Ltd. Food and Farm Facts; Finnish Game and Fisheries Research Institute; Reindeer Herders' Association; Boards of Customs				
Product	Amount	Unit	Value (€ mill.)	
<b>Wood from forests</b>				<b>Average 2002–2010</b>
Industrial roundwood	41,0	mill. m <sup>3</sup>	1.656	1.770
Household timber	1	"	49	
Fuelwood of small-sized residential housing	5,9	"	66	
Forest chips, amount and price in heating and power plants	5	"	180	
<b>Hand-picked nature products</b>				
Wild berries, purchased by companies	9,1	mill. kg	9	
Wild mushrooms, purchased by companies	0,9	"	3	
Lichen, exports	0,2	"	1	
<b>Game meat</b>				
Mammals	11,0	mill. kg	69	
Game birds	0,6	"	14	
Reindeer products				
Reindeer meat	2,5	mill. kg	17	
Christmas trees	1,4	mill. trees	25	

Some material forest products have been excluded from this table due to the lack of information, and some figures presented here are estimates. In this table, fuelwood includes roundwood and forest residues, and forest chips include only wood of Finnish origin. Information concerning wild berries and mushrooms are from companies trading them. A major part of outdoor market as well as picking for personal use are not included in the figures. The amount and value of this kind of use has been for berries 6-9 times, and for mushrooms 2-6 times that of commercial picking during the first decade of the 2000s.

### 2.3.3 Nature protection and biodiversity

*Tree species composition.* The number of indigenous tree species in Finland is small: four conifers and 27 broadleaved species of trees, bushes or small trees. Some of the broadleaves have a very narrow area of distribution. Many sites are dominated naturally by just one species, such as pine in upland forests. Mixed stands and predominance of broadleaves are common in fresh mineral soil sites and upland forests with grass-herb vegetation. The most common species growing in mixed stands is downy birch.

Pine predominates on 67% of forest land, spruce on 22% and broadleaves on 11%. Broadleaves, which are important to forest biodiversity and the soil and grow mostly in mixed stands, account for 20% of the total volume of growing stock, which is clearly more than the total area of predominantly deciduous stands.

Since the beginning of the 1950s, the share of pine-dominated stands has increased as a result of regeneration with pine. The most significant change is the reduction of the area of predominantly deciduous stands by a half in southern Finland. The species composition has changed less in terms of growing stock volume than in terms of species predominance.

Pure stands<sup>6</sup> account for 55% of all forest land, stands with some mixing<sup>7</sup> account for 31%, and actual mixed stands account for 13%.

*Regeneration.* Under the Forest Act, after regeneration felling a new economically viable seedling stand whose development is not directly threatened by other vegetation must be established in the area within a reasonable period of time. Reproduction takes the form of natural regeneration<sup>8</sup>, provided that the site has the potential for the production of natural seedlings. This is judged on the basis of growing stock, soil and surface vegetation. Otherwise, clear felling is used – all trees are removed and the site is seeded or planted with reproductive material of local origin.

In 2010, some 133.000 hectares of forest were regenerated. The total area of regeneration was the smallest in 30 years, which was partly due to the decrease in the amount of fellings. Fellings aiming at natural regeneration were carried out on 24.000 hectares, planting was used on 84.000 hectares, and 25.000 hectares

---

<sup>6</sup> Pure stand: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is over 95%.

<sup>7</sup> Stand with some mixing: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is between 75-95%.  
Mixed stand: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is below 75%.

<sup>8</sup> Forms of regeneration: In natural regeneration, the new generation of trees is established naturally from the seeds of seed trees or shelterwood left standing in the felling site, or from seed in the woods adjacent to the felling area. In artificial regeneration, the new tree generation is established by seeding or planting. Even in artificially regenerated stands there are lots of naturally grown trees.

were seeded. In the period 1996-2010, the total area of forest regeneration has varied from 141.000 to 178.000 hectares annually. The proportional share of natural regeneration of all forest regeneration was about one fourth, that of seeding one fifth, and planting more than a half.

Altogether about 35% of the present Finnish commercial forests are regenerated by seeding or planting. The rest are established either by natural regeneration or assisted natural regeneration. Even in artificially regenerated stands there are lots of naturally grown trees, promoting the formation of a mixed species composition.

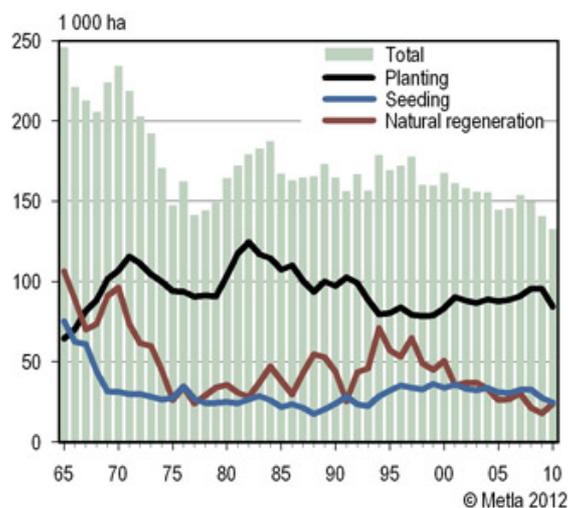


Figure 8: Natural and regeneration by planting and seeding (1965-2010) (State of Finland's Forests, 2012)

*Naturalness.* In the last twenty years, naturalness has developed into an international indicator of forest biodiversity. Human activities change the structure and species composition of forests. Naturalness is thus an indication of human impact in forests, as well as an indication of earlier, historical use of forests. When left unmanaged or actively restored, forests grow into stands whose structure resembles forests in their natural state. Unmanaged, strictly protected conservation areas can be used to gain information about the natural development of forests.

On the basis of their naturalness, forests are internationally (UNECE/ FAO 2002) roughly classified into three classes: 1) forests undisturbed by man<sup>9</sup>, 2) semi-natural forests<sup>10</sup>, and 3) plantations<sup>11</sup>. Due to differences in interpretation, there

<sup>9</sup> Undisturbed forests contain features belonging to the natural growth cycle of forests. Such features include natural species composition, deadwood, natural age structure and natural regeneration. The site is large enough to maintain natural succession. There are no recognisable signs of human activity in the area, or a sufficiently long time has passed from human intervention to allow the re-emergence of natural tree species composition and its development dynamics.

<sup>10</sup> A semi-natural forest displays all those characteristics, which are not included in forests undisturbed by man and plantations.

<sup>11</sup> Plantations are forest stands established by planting introduced species or intensively managed stands of indigenous species which meet the following criteria: one or two species at plantation,

is as yet no common, functioning European classification and measurement system for naturalness. The current classification allows also planted stands to be classified as semi-natural forests if they are left unmanaged for over 30-40 years. With the exception of Austria, no country-specific assessments of naturalness have been made so that they would correspond to the system of, for example, national forest inventories.

Owing to long-term human intervention, no extensive natural forests have survived in Finland, except for some small stands in certain conservation areas. According to the 9<sup>th</sup> National Forest Inventory, there were a total of 170.000 hectares of old forests resembling natural forests (forests over 140 years old with observed indicators suggesting naturalness) in the hemiboreal, southern and middle boreal zones. Of these, 40% were in conservation areas. In the northern boreal zone there were 716.000 hectares of such forests, 56% of them in conservation areas.

The structure of vegetation even in managed forests in Finland has remained largely similar to natural forests, thanks to forest management based on the natural site type classification and the use of indigenous species in regeneration. Monocultures are established only in the afforestation of fields (about one per cent of all forests), but in them, too, the species and their origin are Finnish. The total area of fields afforested during the last 25 years is about 100.000 hectares.

The naturalness of forest sites has been altered by peatland drainage. In wooded drained mires, however, the original tree species composition generally remains unaltered. Altogether 55% of all mires, or some five million hectares, have been drained. In the last 15 years, practically no new drainage projects have been carried out. Some of the drained mires revert to natural development, as it is not justifiable economically to maintain the network of drains.

An increasing number of stands in Southern Finland remain uncut. The number of forests exceeding 140 years of age and where no fellings have been done in the last 40 years has grown continuously.

*Introduced tree species.* Introduced tree species<sup>12</sup> change forests, their mix of species, structure and diversity. Introduced species have been planted in Finland only for research and experimental purposes, or as decorative trees and stands in arboretums, for example.

---

even age class, and regular spacing. The exception is stands which were established as plantations, but which have been without intensive management for a long time, allowing the stand to develop naturally. In Finland, only afforested fields are classified as plantations. Sites of normal forest regeneration are established at irregular intervals and, because of supplementary natural regeneration and thinnings, they usually develop into mixed stands containing a great number of naturally established trees.

<sup>12</sup> Introduced tree species are other than indigenous species occurring naturally in Finland. The Siberian larch and the hybrid aspen are treated as indigenous species.

There are about 9.500 hectares of forests in Finland composed of introduced species. Of these, 9.000 hectares are stands of lodgepole pine.

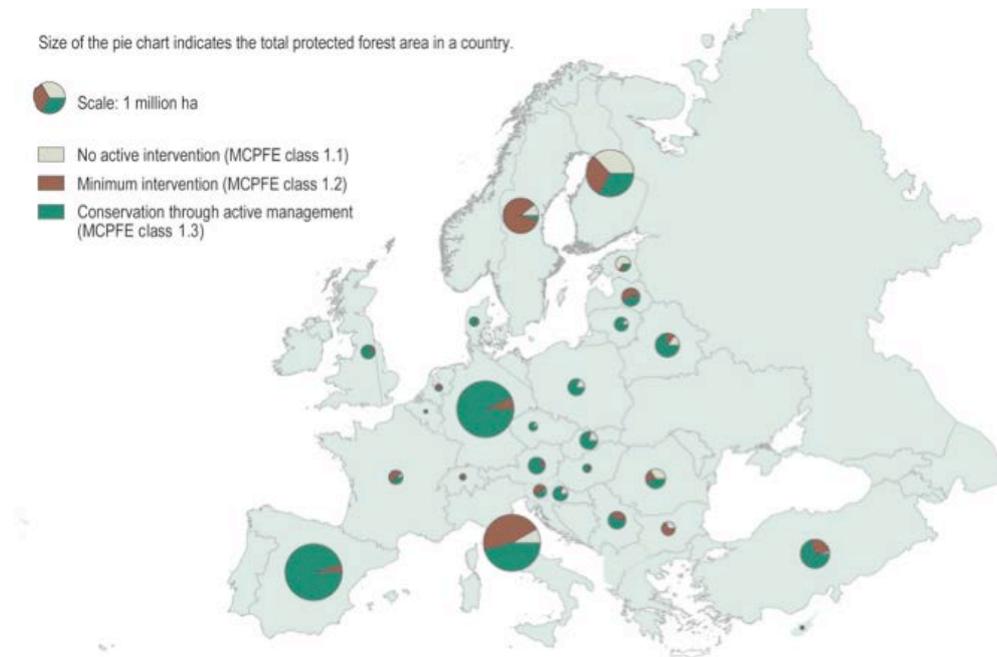
The number of stands with introduced species is not growing as the Forest Act and forest certification both require that, apart from special cases, only indigenous tree species must be used in regeneration. Siberian larch is considered an indigenous species. In the forest certification standards, the special cases in which introduced species may be used include the establishment of park forest stands, the production of Christmas trees and conifer twigs, stands and trees planted for landscape management, and the cultivation of hybrid aspens. Hybrid aspen is a crossbreed between Finnish and North American aspen, which has been cultivated in Finland already since the 1950s.

*Protected areas.* The protection of most valuable forests and ensuring biological diversity in commercial forests are issues which have attracted special attention since the 1990s. Owing to many protection programmes and decisions, the area of protected forests has tripled in Finland over the past 35 years. The total area of protected forests is currently 2,2 million hectares, or 9,6% of all forest land. The total area of protected forests and forests under restricted use is almost 3 million hectares, or 13% of all forest land (Table 2). The percentage of strictly protected forests in Finland is the largest in Europe (Fig. 11).

**Table 2: Protected forests and forests in restricted forestry use for 2008 (State of Finland's Forests, 2011)**

Forest protection category	Forestry land											
	Forest and low productive forest				Total							
	Forest land		Low productive forest		Total		Waste land		Other		Total	
1,000 ha	%	1,000 ha	%	1,000 ha	%	1,000 ha	%	1,000 ha	%	1,000 ha	%	
Total land area	20,085	100.0	2,735	100.0	22,820	100.0	3,259	100.0	184	100.0	26,263	100.0
Protected forests and areas under restricted forestry use, total (1+2a+2b)	1,686	8.4	1,277	46.7	2,963	13.0	1,766	54.2	34	18.4	4,763	18.1
Protected forests(1+2a)	1,118	5.6	1,062	38.8	2,181	9.6	1,589	48.8	29	16.0	3,799	14.5
Strictly protected forests (1)	1,041	5.2	1,007	36.8	2,048	9.0	1,534	47.1	28	15.0	3,609	13.7
Protected forests where cautious fellings are possible (2a)	77	0.4	56	2.0	133	0.6	56	1.7	2	0.9	190	0.7
Areas under restricted forestry use (2b)	568	2.8	214	7.8	782	3.4	177	5.4	5	2.5	963	3.7

Conservation areas are in most cases established through legislation. They are areas where forests are allowed to develop naturally, or where fellings are severely restricted. Most nature conservation areas are on forestry land and are owned by the state.



**Figure 9: Total forest area protected (size of the pie) and the share of the protected area by MCPFE Classes 1.1-1.3 (1.1. no active intervention, 1.2 minimum intervention, 1.3 conservation through active management) for biodiversity by countries in Europe (1.000 hectares and percent). Germany and Spain: included Natura 2000 forest areas in the MCPFE Class 1.3 (State of Finland's Forests, 2011; FOREST EUROPE, 2011)**

Most of the protected areas are in northern Finland (Fig. 12). The biological diversity and protection of the forests of southern Finland have been methodically addressed in conjunction with the *National Forest Programme 2015* in the *Forest Biodiversity Programme for Southern Finland (METSO)* since the early 2000s. The programme involves developing voluntary forest conservation measures for privately owned forests. More sites safeguarding biological diversity will be set up in private forests, and conservation areas in State forests will be expanded. The goal is to increase the total of areas set for voluntary conservation by landowners by 96.000 hectares by 2020. The METSO programme also incorporates restoration and management measures in already established conservation areas to enhance their biological diversity.

Biological diversity in commercial forests is promoted by means of forest legislation, recommendations and instructions for best practices in forest management, as well as conservation agreements and forest certification. The Nature Conservation Act lists nine protected habitat types, three of which are found in forests. The Forest Act contains definitions of habitats of special importance (key biotopes) whose natural features must be conserved. According to surveys conducted by the Finnish Forestry Centre, at the end of 2010 key biotopes accounted for 102.000 hectares of forest land in private forests, 0,7% of the total.

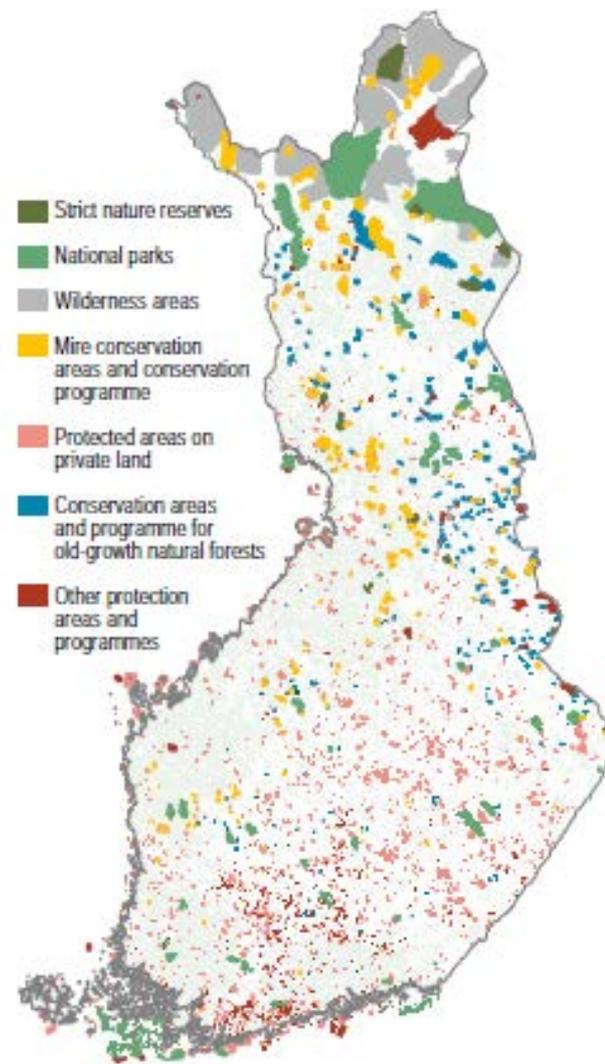


Figure 10: Nature conservation areas by forest vegetation zone (State of Finland's Forests, 2011)

Statistics on protected forests in Finland are prepared on the basis of the national classification. The assessment guidelines (MCPFE classification) used in the classifications and statistics on forest protection in Europe are compiled and accepted by FOREST EUROPE, the Ministerial Conference on the Protection of Forests in Europe (2010). When compared with other European countries, the area of strictly protected forest in Finland (5,2% of all forest land) is the highest of all. Active management of conservation areas to enhance biodiversity is emphasised in other European countries.

#### *Extensive statutory conservation areas*

The area of protected forests in Finland has tripled since the 1970s. The establishment of statutory conservation areas has been based on conservation programmes for national parks, strict nature reserves, mires, waterfowl habitats, eskers, herb-rich forests, shorelines and old-growth forests adopted by the Government in the 1970s-1990s. The first national parks and strict nature reserves in Finland were established in 1938. There are currently 37 national parks with a total land area of 799.000 hectares. Many national parks have

been extended in recent years. There are 19 strict nature reserves with a total area of 153.000 hectares. Wilderness areas (12 areas, total 1,4 million hectares) were established in Lapland in 1991. The Natura 2000 network in Finland is almost complete.

An international team of experts carried out an assessment of the management of Finnish nature conservation areas in 2004. The assessment concluded that the level of management of conservation areas was good and, apart from a few exceptions, the aims of safeguarding biodiversity were achieved.

#### *Other statutory forest protection areas*

The Forest Act lists habitats of special importance for forest biodiversity, whose natural features must be preserved in the management. A total of over 120.000 of such small sites have been found in surveys of private forests. Their total area is about 102.000 hectares, which is 0,7% of the area of private forestry land. In their surveys, the forest industry companies have found about 11.000 hectares of habitats of special importance listed in the Forest Act, and Metsähallitus has found about 43.000 hectares of such habitats.

A preliminary survey suggests that there is a total of 674 hectares of protected wooded biotopes listed in the Nature Conservation Act (wild woods rich in noble broadleaves, hazel woods and common alder woods).

The Forest Biodiversity Programme for Southern Finland (METSO) lists several voluntary measures for the conservation of forest biodiversity in private forests. As a result of the programme, a total of 1.300 new protected areas were established in private forests in 2005-2011. Their total area is about 13.700 hectares, and most of these areas are permanently protected. The combined value of the land and growing stock of the approximate area of 10.000 hectares to be placed under protection is about EUR 35 million.

Under funding from the METSO programme, Metsähallitus has restored<sup>13</sup> a total of 31.000 hectares of heathland forests and drained peatlands located in the protected areas under its management by 2010.

*Dead wood.* Certain forest organisms rely on dead or decaying wood for their survival. Many of these species are threatened. According to the latest report on threatened species, published in 2010, the reduction in decaying wood is the main factor threatening the survival of 164 species, representing 11% of all threatened species.

---

<sup>13</sup> Restoration refers to a process where an ecosystem changed by human activity is restored as near to its natural state as possible. In the restoration of forest ecosystems, the primary goal is to restore natural tree species compositions, structural stand characteristics and ecological processes. The methods used in restoration are prescribed burning, production of deadwood, establishment of small open areas, and stopping up ditches.

According to NFI 10 (2004-2008), the average volume of dead and decaying wood with thickness exceeding 10 cm in forests (commercial forests and nature conservation areas) is 3,3 m<sup>3</sup> per hectare in southern Finland and 9,0 m<sup>3</sup> per hectare in northern Finland (Table 3). Compared to the previous inventory (NFI 9, 1996-2003), the amount of decaying wood has increased in southern Finland and decreased in northern Finland. Old-growth forests in natural state may have 60-120 m<sup>3</sup> of dead and decaying wood per hectare, but the amount varies a great deal depending on the fertility of the site, the development state of the forest and natural disturbances.

**Table 3: Volume of deadwood in forest and low productive forest for 2008 (State of Finland's Forests, 2012)**

Regional districts of the Finnish Forestry Centre	Dead trees								
	Standing (m <sup>3</sup> /ha)			On the ground			Total (m <sup>3</sup> /ha)		
	Conifers	Broadleaved	Total	Conifers	Broadleaved	Total	Conifers	Broadleaved	Total
Whole country	1,3	0,3	1,7	3,5	0,6	4,2	4,8	0,9	5,9
Southern Finland	0,9	0,3	1,2	1,6	0,4	2,1	2,5	0,7	3,3
Northern Finland	1,8	0,4	2,2	5,9	0,7	6,8	7,7	1,1	9,0

The amount of deadwood in forests will increase as retention trees are left standing in regeneration sites to maintain biodiversity and the amount of decayed wood in the forest. In 1995-2009, the average total volume of green trees left standing in regeneration fellings in private forests and the forests of the forest industry companies was 3,1 m<sup>3</sup> per hectare. The volume of deadwood in felling sites varied from 1 to 1,4 m<sup>3</sup> per hectare. An average of 11 green retention trees were left standing in each felling site.

Under forest certification criteria, at least 5-10 dead or live retention trees with a breast height diameter of over 10 centimetres must be left standing in certified regeneration sites. Also individual fallen trees are nowadays often left in the forest. Broadleaves of slight economic value are left uncut in all fellings. Certification also involves many other measures designed to increase biological diversity, such as increasing prescribed burnings and maintaining waterways.

*Threatened forest species.* Monitoring of threatened<sup>14</sup> species yields information about changes in forest ecosystems. It is estimated that there are about 45.000 species living in Finland, about half of which have their habitat in the forest. In the latest evaluation from 2010, 21.400 species were assessed. About one tenth of

<sup>14</sup> Endangerment refers to the probability of the species becoming extinct. Anthropogenic and non-anthropogenic causes of endangerment are not distinguished in the assessment of endangerment. All threatened species are classified as critically endangered, vulnerable and endangered.

them – 2,247 species – were classified as threatened. This percentage has not changed significantly from the previous evaluation, conducted ten years earlier.

Forest is the primary habitat for 814 threatened species, 36% of the total (Table 4). Of the threatened forest species, 82% live in herb-rich forests and old-growth heathland forests. The taxonomic groups with the greatest number of threatened forest species are invertebrates and fungi. Changes in the forest habitat, especially the reduction in decaying wood, is the most common threat for forest species.

**Table 4: Number of threatened forest and mire species (State of Finland's Forests, 2011)**

Primary habitat of species	Vertebrates		Invertebrates		Vascular plants		Cryptogams		Fungi and lichens		Total		
	Year	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Number of species													
Species, grand total		383		26,600		3,200		5,900		6,906		43,000	
The data was considered sufficient for evaluation of threatened species		346		8,599		1,208		901		4,027		15,081	
Threatened species, total		50		759		180		142		374		1,505	
Forests		12	14	252	476	35	32	15	18	250	274	564	814
Old heathland forests		4	2	69	80	-		1	8	70	76	144	166
Other heathland forests		3	4	10	37	3	4	1		24	18	41	63
Old herb-rich forests		1	1	58	66	-	1	8	7	32	32	99	107
Other herb-rich forests		2	1	64	140	26	21	4	3	120	112	216	277
Old-forest, general				4						8		12	
Esker forests		-		15	104	6	6	-		-	2	21	112
Forest-fire areas		-		29	6	-		-		-	4	29	10
Birch stands in mountains					2								2
Other forests		2		7		-		1		4		14	
Forests general			6		37					22		65	
Peatlands		1	6	14	46	18	21	25	18	9	13	67	104
Fens		-		3	14	17	19	13	12	4	8	37	53
Bogs		1	4	2	8	1	2	1	2	2	1	7	17
Pine mires		-	1	5	13	-		-		1	1	6	15
Spruce mires		-		2	5	-		9	3	2	3	13	11
Other peatlands		-		2		-		2		-		4	
Peatlands general			1		6			1				8	
Watercourses		20		48		11		21		3		103	
Shoreline areas		5		98		37		9		13		162	
Exposed bedrock		-		11		14		56		44		125	
Fells		6		16		15		16		10		63	
Man-made environments etc.		6		320		50		-		45		421	

The Finnish evaluation of threatened species is among of the most extensive assessments in the world. Similar evaluations have been made only in Sweden and Norway. The evaluation of 2010 made – for the second time – use of the international classification of threatened species, the IUCN classification. Based on the two consecutive, comparable evaluations carried out between a period of 10 years, comparison of development was possible for the first time.

The rate of decline of certain forest species has slowed down in Finland, or in some cases even stopped since the 1990s, although it has not been possible to halt the decline in the forest species overall. Actual taxonomic changes in the number of threatened forest species between 2000 and 2010 demonstrate that positive changes in threatened status had occurred in 81 species. About half of these are beetles, many of which have benefited from retention trees at harvesting sites, particularly aspen.

*Genetic resources.* The purpose of protecting the natural genetic resources of forest trees<sup>15</sup> is to safeguard the internal diversity of the species and the capacity of stands to adapt to changes in the environment. Genetic diversity is taken into account in tree breeding, the production of forest reproduction material, regeneration and forest management.

The natural genetic resources of the main tree species in Finland – pine, spruce, silver birch and downy birch – are maintained in gene reserve forests<sup>16</sup>, which have been selected to represent the variability of the species within their distribution area. The network of gene reserve forests is almost completed. The genetic resources of rare species are protected in gene banks<sup>17</sup> established specifically for the purpose. Nature conservation areas also contribute to the safeguarding of the genetic diversity of forest trees.

Genetically improved seed produced in seed orchards<sup>18</sup> is mainly used in forest tree nurseries for seedling production. The use of improved seed in seeding pine trees in forests has increased in recent years. In addition to seed orchard production, seeds are collected in forests in connection with fellings in commercial forests selected by forestry professionals. Registered seed collection forest stands are of minor importance nowadays. Pine seed from seed collection areas<sup>19</sup> is mainly used for stand seeding.

No forests are established in Finland of clones from a single individual tree, as the reduction of genetic variability would weaken the survival of tree species as the climate changes.

*Forest cover.* In the long term, the development of forest species depends on the forest cover, i.e. whether it is preserved or whether unbroken cover is fragmented permanently as a result of other land use. Observation of land use on the landscape level produces information on the integrity of forests, their size, form and location. Landscape-level observation also enables us to assess what kinds of habitats are available for forest species.

The dominant landscape element in Finland is forest. About 78% of the total area of Finland is forest or forestry land. Mires account for 34% of the land area. The

---

<sup>15</sup> The genetic resources of forest trees comprise their genetic variability, the various species and varieties, and intra-species variation.

<sup>16</sup> A gene reserve forest (in situ conservation) is a living gene bank, which is allowed to develop under evolutionary pressure. Gene reserve forests are usually regenerated naturally and are managed following the regular good silvicultural practices.

<sup>17</sup> Genetic resource archives (ex situ conservation) contain genetic material from several different stands. The archive is tended with intense management.

<sup>18</sup> Seed orchards are tree plantations established specifically for the production of seed. The trees in a seed orchard are plus trees, the best individuals selected from natural populations using the methods of tree breeding.

<sup>19</sup> Seed collection areas are natural stands which have been selected for the purpose of collecting seeds. The stands are of high-quality growing stock and suitable for seed production both in terms of the age and management history of the stand.

second most dominant landscape element is lakes and other small water bodies. There are more than 180.000 lakes or ponds that are at least 500 m<sup>2</sup> in area. Their total area is 3,4 million hectares, which is 10% of the total area of the country. The rest, i.e. 12% of the total area, is agricultural land, constructed areas, traffic areas, or other open land areas.

No major changes have taken place in the relative share of forest cover in Finland over the past few decades. Changes in forest cover on the landscape level have mainly been caused by construction and changes in agriculture, such as the afforestation of abandoned meadows and fields or the conversion of drained peat-lands into wooded land. Because of dispersed settlement patterns, the permanent road network in Finland is rather dense. However, the majority of roads are narrow and do not pose much of an obstacle to the spreading of species.

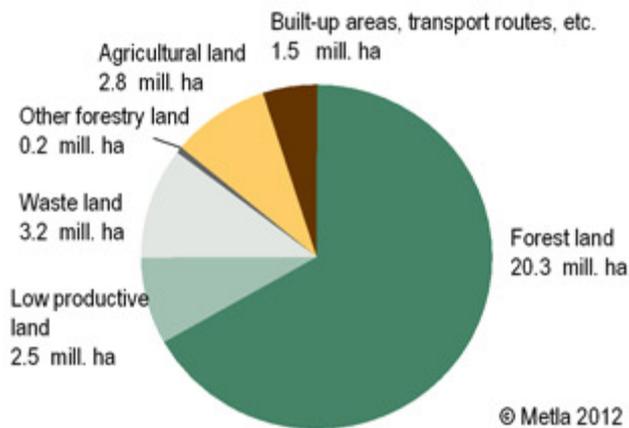


Figure 11: Land use in Finland for 2010 (State of Finland's Forests, 2012)

### 3 Forest functions

#### 3.1 Ecosystem services

Forests yield not only wood but also other material and immaterial benefits for human needs. In Finland, unlike in many other countries, forests are open to everyone every day under *Everyman's Rights*<sup>20</sup> for recreation and as a source of a variety of non-wood products. Forest products that can be collected on the basis of Everyman's Rights include wild berries, mushrooms and herbs. By contrast, e.g. collecting lichen, hunting, cultivating Christmas trees and burning tar are all activities based on land ownership.

The material and immaterial products and services gained from forests are now internationally being grouped together under the heading of 'ecosystem services'. Ecosystem services are divided into provisioning services, regulating services, cultural services and supporting services. Examples of ecosystem services available in Finnish forests are:

##### *Provisioning services*

- Wood
- Bioenergy
- Berries, mushrooms and other natural produce
- Game
- Trees and wild plants as a source of raw materials for the food, medicine and cosmetics industries
- Pure water

##### *Regulating services*

- Combating climate change, carbon sequestration
- Water purification and breathable air
- Prevention of flooding, storm damage, erosion
- Maintaining soil fertility
- Noise abatement
- Plant pollination services
- Disease and pest control

##### *Cultural services*

- Landscape
- Hiking, recreation and nature tourism
- Education and training

---

<sup>20</sup> Everyman's Rights refers to the right of everyone staying in Finland, foreign nationals included, to roam freely in the countryside and in forests regardless of who owns the land. Everyman's Right bestows the right to move freely on land by foot, ski or bicycle, stay temporarily in areas where roaming is allowed, pick wild berries, mushrooms and flowers, fish with a rod and line or a jig, travel on water, swim or wash in inland waters and the sea, and move on ice. Despite Everyman's Right one may not cause disturbance or damage to the land or landowner.

- Forests in art
- Cultural heritage

*Supporting services*

- Photosynthesis, cycle of nutrients, carbon and water, soil conditioning

Non-wood forest products and forest-related services offer opportunities for additional income and business. Forest-related marketable services at the moment include hunting, the maintenance of recreational areas and related services, and nature tourism. Forest-related public goods include scenery and recreation benefits. Public goods benefit society as a whole, and their value is usually demonstrated in public debate or in political decisions rather than on the market.

Ecosystem services often have great local and regional importance for employment, the wellbeing of the population and the permanence of habitation. Also, local natural products and the immaterial values in natural resources contain substantial potential for increasing wellbeing. There is an increasing demand for services derived from natural beauty, purity, silence, health impacts, etc., as the standard of living rises and the amount of available leisure time increases.

Determining the financial value of ecosystem services is a key current research topic. This research requires methodological development, but on the other hand it should be noted that the value of ecosystem services is determined by agreement, based on the goals set by society at large. For example, the value of carbon sequestration by forests is largely dependent on the international carbon trade, and as such is determined relative to the promotion of various forms of energy production and support and taxation mechanisms.

### 3.2 Safeguarding wood production

The basic requirement of sustainable forest management is to safeguard the continuity and profitability of wood production while taking into account the biological diversity of forests as well as other forest products and services. It is also important to safeguard the health and growth potential of forests as well as the infrastructure required for harvesting and management, such as the network of forest roads and their condition.

#### 3.2.1 Legislation

Wood production is governed and steered by the Forest Act, the Act on the Financing of Sustainable Forestry, the Act on Trade in Forest Reproductive Materials, the Forest Insect and Fungi Damage Prevention Act, the Act on the Environmental Impact Assessment Procedure and the Act on the Organisation of Water Management.

The *Forest Act* stipulates that after regeneration felling, a new economically viable seedling stand must be established in the area within a reasonable period

of time. Thinnings must be made in such a way that a sufficient number of trees is left to the harvesting area to guarantee satisfactory growth potential. The Forest Act defines habitats of special importance to forest biodiversity, areas whose natural features must be conserved.

*The Act on Trade in Forest Reproductive Materials* ensures that the seeds and seedlings used in silviculture are of appropriate origin for the site, of good quality and healthy. The purpose of the Forest Insect and Fungi Damage Prevention Act is to avoid damage to trees growing in forests by insects and fungi; it includes provisions for instance on the storage of timber and on the removal of damaged trees.

The *Act on the Environmental Impact Assessment Procedure* applies to projects that may have a significant adverse impact on the environment, such as first drainage projects with an area of more than 200 hectares. The *Act on the Organisation of Water Management* aims to protect, improve and restore waterways so as to prevent the deterioration of both surface water and groundwater and to keep them in good condition at the least.

### 3.2.2 Forest programmes

Forest programmes specify policies to steer wood production and use. The *National Forest Programme 2015 (NFP)* (section 5.1) sets concrete quantitative and qualitative goals for instance for the annual production of roundwood, the use of forest chips and forest management investments. The *Forest Biodiversity Programme for Southern Finland 2008-2016 (METSU)* (section 5.2), which is ongoing alongside the National Forest Programme, involves several measures to promote voluntary forest conservation.

A *Regional Forest Programme* (section 5.2) sets out the needs and aims for forest growth, management and use; forest-based business operations; and multiple use and protection of forests for the Forest Centre Area. It also sets out the measures and funding to attain the goals.

### 3.2.3 Financial instruments

Private forest owners are eligible for public funding for some silvicultural and forest improvement measures. The funding is justified by the social benefits gained from supporting the least profitable investments in private forestry, investments which will only yield earnings in the next generations. Silvicultural works covering large areas which are carried out jointly by forest owners are also supported. In addition to silvicultural aims, other factors affecting funding include employment and environmental issues. Public funding for forestry is today based on the *Act on the Financing of Sustainable Forestry*. Other measures supported under the Act on the Financing of Sustainable Forestry include the maintenance of forest biodiversity and the management of forest ecosystems.

A new *Act on energy* support for low-grade timber was enacted in 2011, replacing the former energy wood harvesting and chipping support in the Act on the Financing of Sustainable Forestry. This support is available to parties other than private forest owners too, but not to the state-owned forests. Energy support will be granted for harvesting energy wood from seedling stands, young stands or first thinning sites.

Forest owners pay taxes on the basis of their stumpage revenues. Taxation is calculated on the basis of real income and expenses. The difference between earnings and expenses is treated as capital income, and is taxed at the general rate for capital income, 29% (2012). Work performed for the delivery sales of timber by the forest owner or his/her family is regarded taxable earned income insofar as the volume of wood gathered from the forest exceeds 125 m<sup>3</sup> per year.

### 3.2.4 Forest planning

Forest planning is the most important practical tool for implementing sustainable forest management, taking into account harvesting potential, the safeguarding of biological diversity and other goals that forest owners may have for their forests. Baseline information on forests is needed for comparing calculations based on various scenarios in planning. Forest planning is undertaken at many levels: by individual holding, by region, by municipality, by parish, by forests owned by Metsähallitus and the forest industry companies, or for the entire country. The completed forest plan is a document usually spanning 10 years in Finland.

### 3.2.5 Production of information

In a forest management regime based on private forests, it is important that forest owners have access to sufficient information about methods and practices for safeguarding the welfare of their forests. Forest advisory services and information are important factors in ensuring that the changing group of forest owners have sufficient information about the significance and potential of their forests.

Private forestry organisations and research institutions producing information have in recent years increased their efforts to provide advisory services for private forest owners and to publish information about forest management. Issues which affect the safeguarding of wood production are also key research topics. Recommendations and manuals for practical silviculture have been produced.

Environmental and quality assurance systems are used to improve the quality of silvicultural works and to mitigate negative environmental impacts. Forest industry corporations and Metsähallitus have adopted a certified environmental management system based on the international ISO 14001 standard.

The Programme for the Endorsement of Forest Certification schemes (PEFC) and Forest Stewardship Council (FSC) forest certification systems promote sustainable

forest management by committing actors in forestry to act in compliance with requirements. Certification criteria include several requirements that promote sustainable wood production.

### 3.3 Safeguarding and increasing services and non-wood products

#### 3.3.1 Legislation

The freedom to move in forests and to collect berries and mushrooms in Finland derives from what are known as Everyman's Rights. Everyman's Rights are an established and accepted practice, even though not provided for by law. The *Off-Road Traffic Act* governs motorised vehicle traffic in forests. The Outdoor Recreation Act governs the setting up and management of recreational routes, State hiking areas and camping areas.

Under the *Forest Act*, forests that are valuable in terms of scenery, multiple use or scientific research can be managed in a way that suits the particular characteristics of the site. The various uses of forests are reconciled in zoning based on the *Land Use and Building Act*. Recreational areas as well as primarily agricultural and forestry areas in need of recreational supervision are indicated in the land use plans, as well as the needs for transportation between areas.

The *Hunting Act* specifies the times for the hunting seasons for game animals and the procedure for granting hunting permits. Hunters are required to pass a hunting examination. Hunting rights belong to the landowner. However, inhabitants in the Lapland region and in certain municipalities in the Province of Oulu have free hunting rights on State land within their municipality of residence.

With certain restrictions, reindeer herding in the reindeer herding area defined in the *Reindeer Husbandry Act* is permitted on all land regardless of the ownership of the land. The Act also includes provisions on the prevention of and compensation for damage done by reindeer, and on the maximum permitted number of reindeer. Rights relating to reindeer husbandry are also addressed in the Skolt Act. The *Act on the Financing of Reindeer Husbandry and Natural Economy Industries* supports the livelihoods and living conditions of persons engaged in reindeer husbandry and natural economy industries.

#### 3.3.2 National programmes

The *National Natural Resources Strategy (2009)*, headed by the Finnish Innovation Fund (Sitra) and compiled by an extensive group of experts, looks at the big picture in the use of natural resources and seeks to find new operating models for business, politics and everyday life. A report entitled Building an Intelligent and Responsible Natural Resource Economy, based on the National Natural Resources Strategy, was published in 2010.

The Natural Resources Strategy of the Ministry of Agriculture and Forestry includes objectives pertaining to the use of game animal populations, products

collected from forests and forest landscapes in the development of business activities and by households.

The *National Forest Programme 2015* also addresses non-wood forest products and envisages growing opportunities for economic activity in nature tourism and natural products, among other things. The commercialisation of intangible commodities available from forests as well as research and development initiatives relating to wellness and health benefits will be promoted.

The *Rural Policy Programme 2009-2013* rests on the diverse use of natural resources in the development of rural areas, placing a special emphasis on the networking of different actors, such as natural resources entrepreneurs. Under the Rural Policy Committee composed of representatives of the various administrative sectors, there are several theme groups which also promote the multiple use of forests.

The purpose of the Sitra Landmarks Programme in 2010-2014 is to identify interest in the countryside and changes therein, and to conduct local experiments to generate new business.

### 3.3.3 Economic incentives

The collecting of wild berries and mushrooms is encouraged by exempting income from their sales from tax. The further processing of products collected from forests is supported through many funding channels. The agri-environmental support scheme compensates farmers for costs and loss of income incurred through environmental protection and landscape management measures. Measures qualifying for compensation include the management of filter strips and riparian zones. Special support is available for establishing wetlands, filter strips and sedimentation ponds and for preserving traditional biotopes and landscapes.

In granting business support for setting up enterprises based on natural produce and nature tourism, related investments and product development are considered on a par with those of other small and medium enterprises. Various funding channels are available for educational and network development projects, as well as village development projects. Funding is granted primarily by the regional Centre for Economic Development, Transport and the Environment. Other major funding bodies include the Finnish Funding Agency for Technology and Innovation (TEKES); Regional Councils, which have an interest in emphasising regional development; and the Rural Policy Committee.

### 3.3.4 Forest planning

Non-wood products and services are covered in all national and regional programmes and action plans on forests, and also in the natural resources plans of Metsähallitus. The multiple uses of forests are coordinated not only in forest

planning but also in zoning. The certification criteria for forests also promote the multiple use of forests and facilitate reindeer husbandry.

### 3.3.5 Monitoring, research and advisory services

The Finnish Forest Research Institute studies non-wood forest products in several of its projects and also monitors the supply and demand of recreational use and nature tourism. An extensive inventory, the National inventory of recreational use of nature (LVVI), was conducted in 1998-2002 and again in 2008-2011. Regional forecasts for berry and mushroom harvests are prepared by the Finnish Forest Research Institute in the summer in cooperation with 4-H organisations and trained berry and mushroom consultants. Metsähallitus monitors the recreational use of state lands and keeps relevant statistics.

The Finnish Game and Fisheries Research Institute and the Finnish Museum of Natural History study questions relating to game management, compile nationwide statistics on game bags, and evaluate the development of game populations together with the National Game Management Centre. Elk and reindeer husbandry are studied at the Finnish Game and Fisheries Research Institute and the Finnish Forest Research Institute.

Sustainable management of game in Finland is the responsibility of the Ministry of Agriculture and Forestry. Hunting licences are also granted and monitored by State Provincial Offices and on State land by Metsähallitus. The National Game Management Centre and the 15 game management districts under it are also statutory authorities in this field. Local game management associations provide education and advisory services regarding hunting and game management. Their work is funded by the game management fees paid by hunters. Matters relating to hunting and game management are also dealt with in hunting associations and national hunting organisations, whose membership is voluntary.

Many educational institutions and voluntary organisations promote the use of natural resources by organising training events and courses and by producing educational material. Increasing nature tourism has also increased training in this area. There are numerous trained wilderness guides who work as private entrepreneurs and in the growing tourism businesses.

## 3.4 Maintenance and increasing of the protective functions of forests

Owing to the flatness of the topography and the lack of mountainous areas, forests in Finland do not have the same kind of protective function against erosion and avalanches as they do in many other European countries. Therefore, protective functions mostly focus on protective forests in the timberline area in Lapland. In the protective forest zone<sup>21</sup>, the special aim of forest management is

---

<sup>21</sup> The protective forest zone consists of the municipalities of Enontekiö and Utsjoki in their entirety, and areas in the municipalities of Inari, Kittilä, Kolari, Muonio, Salla, Savukoski and Sodankylä whose boundaries are marked in the terrain in the land survey operation.

to prevent the retreat of the timberline and to maintain the vitality of forests in the area.

Under the *Forest Act*, forests in the protection zones must be managed with special care to prevent the timberline from retreating further south.

Under the Government Decision on Protective Forests, the Finnish Forest Research Institute (Metla) is required to monitor the regeneration of forests in the protective zone and in the highaltitude areas in the Provinces of Lapland and Oulu.

The supreme administrative and executive powers in matters pertaining to protective forests belong to the Ministry of the Environment. Policies are implemented by Metsähallitus and the Finnish Forestry Centre. The Finnish Forest Research Institute (Metla) monitors the regeneration of the protective forest zone and the high-altitude forests in the Provinces of Lapland and Oulu, and prepares a report on these every ten years for the Ministry of Agriculture and Forestry.

Environmental protection is taken into account when planning the management of protective forests. In the protective zone, fellings for any other purposes than household use are only permitted if covered by harvesting and regeneration plans specifically approved by the relevant Forestry Centre.

### 3.4.1 Timberline forests

The total area of the protective forest zone in the north is about 3,3 million hectares, of which State forests administered by Metsähallitus account for 2,8 million hectares. 380.000 hectares of State forests are under commercial management without any felling restrictions.

According to the latest report by the Finnish Forest Research Institute, published in 2003, the regeneration of forests in the protective zone has been fairly successful. Unless the climate changes suddenly, no changes are expected in forest regeneration.

**Table 5: State forestry lands in the protected forest zone (State of Finland's Forests, 2011)**

	1.000 ha		
	In forestry use	In forestry	Total
Forest land	211	382	593
Low productive forest land	79	896	973
Waste land	90	1.143	1.233
Total	380	2.421	2.801

### 3.4.2 Protective forests – infrastructure and managed natural resources

As regards topography, Finland is a level country. Agricultural land only covers 8,9% of the total area and field parcels are small and surrounded by forests,

which is why there is hardly any need to establish hedges or wooded zones on fields as windbreaks.

Forests have local significance in mitigating the damages caused by traffic. Major arteries are generally routed through forests far away from population centres, and even in built-up areas residential districts are set off from traffic routes with wooded buffers as wide as possible. Trees are efficient in capturing dust and exhaust fumes. For a noise barrier, a wooded band several dozen metres wide is needed, depending on the structure of the wood. The visual barrier trees present has also been observed to reduce the subjective experience of noise disturbance.

Wooded protective areas in communities are planned in conjunction with land use planning. For example, green belts along busy roads which shelter adjacent areas from the damaging effects of traffic and which cannot be used for recreation because of their location are marked as such in local and master plans.

### 3.4.3 Impacts of forest management on waters

Because of the great number of lakes, rivers, small water systems and peatland forests in Finland, issues relating to water systems receive special attention in forest management.

The greatest impacts of forest management on waters are caused by ditch cleaning and supplementary ditching, regeneration fellings and related soil preparation, as well as fertilisation. The environmental load from forest management weakens the condition of otherwise clean headwaters, brooks and other small water bodies. Important groundwater areas are taken into consideration in forest management and fellings, and the quality of groundwater is not compromised.

The national water protection programme, *Guidelines for water protection to 2015*, specifies some targets for the reduction of the environmental load on waters from forestry. The measures for the implementation of the policy guidelines for water protection are defined and targeted in detail in water management plans. Forest management measures included in water management plans include the increased use of surface runoff fields, submerged dams, drainage dams and wetlands in ditch cleaning and supplementary ditching and in the combating of erosion in forests (nature management projects); enhanced waterway protection planning; training for contractors and planners; and advisory services for forest owners in water protection issues.

Forest management measures must be planned so that they do not adversely affect the condition of small water systems, and small water systems whose natural values have declined must be restored. A small water system restoration programme is to be drawn up with reference to implementing water management plans, and this will involve forest management measures too.

Finland's National Forest Programme 2015 sets out targets for the reduction of the environmental load on waters from forestry. Under the *Act on Environmental Impact Assessment Procedure*, the environmental impacts of large-scale peat production and drainage projects must be assessed.

According to the *Act on the Financing of Sustainable Forestry*, measures for water management which receive funding must be based on a duly prepared plan. A water protection plan must always be included in plans concerning ditch cleaning and supplementary ditching.

Guidelines and recommendations on water and soil protection in forest management have been prepared by private forestry organisations, Metsähallitus and forest industry companies in co-operation with environmental authorities. In 2011, the Regional Centre for Economic Development, Transport and the Environment of Central Finland will be coordinating the launch of a broad-based three-year project piloting water protection nationwide in peat production and forestry, known as the TASO project. The purpose of this project is to generate new information at the national level and to find practical solutions for the management of water protection problems in peat production and forestry.

Water protection is also addressed in the forest certification standards: an unbroken riparian zone must be retained along waterways and small bodies of water, natural mires are not drained, a water protection plan is drawn up in conjunction with ditch cleaning and supplementary ditching, no chemical pesticides or fertilisers are used in groundwater areas, and the use of chemical pesticides is avoided in general.

In harvesting and silvicultural work, riparian zones with an unbroken forest cover are left along waters, digging breaks and sludge sumps are established in soil preparation, and felling residue is handled so that no nutrients are washed into ditches or waters. Logging roads are planned so as to ensure that no channels for water are created between ditches and small water bodies.

Since 1995, the quality of water protection in harvesting and soil preparation works in private forests and forests of the forest industry companies and Metsähallitus has been monitored by Forestry Development Centre Tapio in conjunction with the assessment of the quality of nature management in commercial forests. The quality of waters is also monitored by the environmental administration. Statistics on the nutrient load, runoff into waters, etc. are compiled by the Finnish Environment Institute.

Water protection in conjunction with harvesting and soil preparation improved during the monitoring period 1995-2010. In 2010, the quality of water protection in private forests was rated either excellent or good in over 95% and over 83% of the assessed roundwood harvesting sites and soil preparation sites, respectively. On average, the quality of water protection has been good or excellent in over 90% of the harvesting and soil preparation sites.

### 3.5 Maintenance of health and vitality of forests

Forest health is affected by several factors simultaneously. Forest health can decline due to abiotic agents such as atmospheric pollutants, exceptional weather conditions or careless harvesting or timber storage. Deteriorating health can also be due to biotic agents such as diseases caused by fungi and insects. Climate change is expected to increase the risk of local damages caused by snow, storms and insects.

International treaties for reducing atmospheric pollutants and for curbing climate change Atmospheric pollutants present a global problem, because they are transported far and wide across borders and have a detrimental effect on many things, including the vitality of forests. The *Convention on Long-Range Transboundary Air Pollution* (CLRTAP) entered into force in 1983. It seeks to reduce the emissions of substances that have deleterious effects, such as sulphur, nitrogen, heavy metals, volatile organic compounds and persistent organic pollutants, or to restrict their use.

In 2002, the Finnish State adopted the *Air Pollution Control Programme 2010* implementing EU Directive 2001/81/EC on national emission ceilings for certain atmospheric pollutants.

At the Earth Summit in Kyoto in 1997, an agreement was reached on the reduction of greenhouse gas emissions. Finland also participates in the work of the Intergovernmental Panel on Climate Change (IPCC), the body of climate experts established in 1988. The EU Climate and Energy Legislative Package adopted by the European Parliament in December 2008 contains several legislative decisions pertaining particularly to reductions in emissions of greenhouse gases.

International climate policy has significantly helped the environment recover from acidification. However, climate change places additional demands on research and monitoring, as global warming will cause complex new trends in the natural environment and ecosystem balance.

#### 3.5.1 Legislation, national programmes and other instruments for the protection of forests

The *Act on Protection of Plant Health (702/2003)* provides for measures aimed at maintaining a good state of plant health and preventing the use and spreading of herbicides. The Act applies to forests and forest trees too.

The *Forest Insect and Fungi Damage Prevention Act (1991)* restricts the storage of coniferous timber in forests and other permanent outdoor storage areas in the summer. It also stipulates that damaged coniferous trees must be removed from the forest whenever their amount exceeds a certain minimum, and it provides for the possibility to control damage caused by insects and fungi in conjunction with fellings and the tending of seedling stands. The Ministry of Agriculture and

Forestry is revising the legislation on forest insect and fungi damage prevention during 2011. The Forest Insect and Fungi Damage Prevention Act working group appointed for this purpose is exploring issues such as how energy wood harvesting and the fact that insect swarming is occurring earlier in the spring because summers are now warmer will be taken into account in legislation.

The *Act on Trade in Forest Reproductive Material (2002)* applies to the production, sale, import and export of seedlings and seeds of forest tree species. The Act requires producers and marketers of forest reproductive material to give forest owners sufficient information on the origin and characteristics of such material.

The importance of using indigenous tree species in forest regeneration after harvesting is stressed in the Forest Act. Seeds and planting stock must be suitable for the intended site in terms of their species and origin, as well as viable and otherwise suited to the purpose. Under the *Act on the Financing of Sustainable Forestry*, funding can be granted for forest remedial fertilisation, afforestation of areas suffering from natural catastrophes, and for the control and prevention of root-rot fungus in risk areas.

Under decisions of the EU Commission (2001-2009), efforts are made to prevent the spread of pine wood nematode (PWN) from Portugal and from outside the EU along with imports of coniferous wood products, sawn wood or coniferous packing material. Under the decision, all coniferous goods imported into the territory of the EU are inspected by the plant inspection authorities of the Member States. Finland has been granted a derogation concerning the inspection of coniferous wood coming from the European part of Russia. Coniferous wood coming from that area is inspected by taking samples from at least 3% of the goods.

The *National Plant Protection Strategy 2004-2013* includes an estimate of the current status of plant protection as well as changes and development needs in the operating environment. The Strategy provides the basis for the setting of protection goals for forest trees as well as determining actions for their attainment.

The moose population is regulated regionally under a system of hunting permits. Under the Hunting Act, moose populations must be kept at a level where the damages caused by the animals to traffic, agriculture and forestry remain moderate. The income from game management and hunting permits is used by the Ministry of Agriculture and Forestry to compensate damages to traffic, agriculture and forestry.

### 3.5.2 Monitoring systems

The Finnish Meteorological Institute has 14 stations that monitor long-term changes in air quality, and the Finnish Environment Institute has 29 stations for observing the quality of precipitation and depositions. Since 1985, Finland has participated in the International Co-operative Programme on Assessment and Monitoring of

Air Pollution Effects on Forests (ICP Forests). In the EU countries, monitoring is based on EU regulations (Forest Focus programme). In 2007, Forest Focus was converted into a monitoring programme (FutMon), which in addition to forest health also monitors biodiversity indicators and is eligible for Life+ funding. Continuation of the monitoring is being explored. The EU Standing Forestry Committee set up a working group in 2011 to find out what forest-related information it would be feasible to compile for the needs of the EU and how information collecting and reporting could be harmonised. The Finnish Forest Research Institute (Metla) conducts annual inventories of the health of individual trees in about 850 permanent sample plots following internationally agreed methods. The effects on forest health of atmospheric pollutants as well as other stressors are studied in detail in 18 stands across Finland.

Forest health is also monitored continuously in the National Forest Inventories. The Finnish Forest Research Institute (Metla) prepares annual forecasts on changes in the populations of certain insect pests and voles, and provides expert assistance in matters involving forest damage.

### 3.6 Maintenance of cultural and spiritual values

Forests play an important part in the construction of the Finnish identity. The settlement of Finland and the emergence of Finnish culture were based on forests. The identification of the cultural heritage<sup>22</sup> and landscape values of forests and their preservation are therefore important for future generations. By taking cultural values into account it is possible to ensure that the traditional ways of using and tending forests are passed on to future generations. Forest culture can also be used in commercial operations and leisure activities.

#### 3.6.1 International conventions and commitments

The sustainable management of natural resources and the preservation of cultural and landscape values are also included in the aims of the UN Convention on Biological Diversity (CBD 1992), the Pan-European Biological and Landscape Diversity Strategy (PEBLDS 1995), and the European Landscape Convention (2000).

The Ministerial Conference on the Protection of Forests in Europe in Vienna in 2003 recognised social and cultural dimensions of forests in the separate resolution. The Convention Concerning the Protection of the World Cultural and Natural Heritage is an international convention adopted by UNESCO in 1972.

---

<sup>22</sup> Cultural heritage consists of the immaterial and material heritage created by human activity. Material cultural heritage can be movable (e.g. books and objects) or fixed.

### 3.6.2 National legislation and programmes

Cultural heritage, landscapes and the associated values are extensively taken into account in Finnish legislation. Local planning based on the Land Use and Building Act can be used to issue instructions for planning, protection and construction that take cultural, historical and landscape values into account. In land use planning, the cultural impacts of the plan must be assessed. According to the Land Use and Building Act, actions altering the landscape may not be taken without a permit. A landscape work permit may be required in master plans instead of the Forest Use Declaration set down in the Forest Act. Trees in areas covered by a detailed land use plan may not be felled without a permit.

According to the *Forest Act*, forests must be managed in an economically, ecologically and socially sustainable way. The act provides for the opportunity to manage forests in a way which takes into account the special characteristics of sites in terms of landscape, multiple use and research.

Under the *Antiquities Act*, antiquities are automatically protected. Prehistoric and historic relics must be taken into account in all land use. This requirement is also incorporated in forest certification. The National Board of Antiquities has, together with organisations in the forest sector, produced guidelines for forest management in areas containing antiquities.

The *Nature Conservation Act* allows the establishment of landscape conservation areas for the conservation and management of the natural or cultural beauty of the area, its historical characteristics or other special values.

Other statutes linked to cultural and landscape values of forests are: the Act on Wilderness Reserves, the *Land Extraction Act*, the *Act on Environmental Impact Assessment Procedure*, the *Act on the Assessment of the Impacts of the Authorities' Plans*, Programmes and Policies on the Environment, the *Act on the Financing of Sustainable Forestry*, and decrees on agricultural support systems.

The objectives of *Finland's National Forest Programme 2015* include strengthening the aspects of forests that promote human wellbeing and culture. Cultural and landscape functions of forests are also covered in the Natural Resources Strategy of the Ministry of Agriculture and Forestry, in agricultural policy programmes and sectoral programmes for agriculture, as well as in various regional and local development and environmental programmes. In addition to forestry and regional policy programmes, the main strategic instruments governing the management of forest landscapes and land use changes are the Government Resolution on national land use guidelines (VAT 2000) and the Government Resolution on nationally valuable landscape areas and development of landscape management (1995).

Metsähallitus has drawn up a cultural heritage strategy for its Natural Heritage Services for the period 2007-2015.

### 3.6.3 Other steering instruments

The management and use plans for national parks, wilderness areas and nature conservation areas promote not only nature conservation but also the management of landscapes and cultural heritage in these areas. Many nationally valuable landscape conservation areas are also covered by management and use plans. Regional management plans are prepared also for heritage landscapes, i.e., traditional biotopes. Regional and municipal programmes on the cultural environment basically govern the planning, protection and management of the built environment and landscape, but they can also include aims that involve forests.

Agricultural and forest areas of special environmental value are designated as such in land use plans. Scenically valuable fields should not be afforested or allowed to grow over. Nationally and regionally valuable cultural landscape areas and sites are also marked in land use plans. Only recommendations on forest management may be given in the plans.

Forests near settlements, cultivated areas and shorelines are taken into account in management plans if the forest owner so wishes. The *Act on the Financing of Sustainable Forestry* can be applied to finance joint nature management plans which take landscape values into consideration and extend to the area of several holdings. Under the *Rural Development Programme*, farmers are eligible for special support to offset the cost of managing wooded heritage landscapes or loss of income caused by such management. Management recommendations for forest landscapes are issued in the Forest Landscape Management manual published by Tapio and Metsäteho Oy. Metsähallitus is conducting an inventory of the cultural heritage sites in State forests in 2010-2015. This ongoing inventory is the most extensive inventory of cultural heritage sites in Finland, and it is one of the targets of Finland's National Forest Programme 2015.

## 4 Biological diversity of forests in Finland

The biological diversity of forest ecosystems encompasses 1) the abundance and diversity of different forest habitats, communities of organisms, and ecosystems; 2) the abundance and diversity of forest organisms; and 3) the diversity within the genotype of each organism.

The principal instruments for safeguarding biodiversity are protection of the most valuable forest ecosystems through the establishment of protected areas, and the management of forests at stand and regional level in a way that takes biological diversity into account.

### 4.1 International and national agreements and programmes

Finland has ratified several international conventions whose signatories are committed to promoting the protection of biological diversity and sustainable management. These conventions include the Convention on the Conservation of European Wildlife and Natural Habitats (Bern convention 1979), the United Nations Convention on Biological Diversity (CBD 1992), the Pan-European Biological and Landscape Diversity Strategy of the co-operation process between European environmental ministries (PEBLDS 1995), and the resolutions of the Ministerial Conferences on the Protection of Forests in Europe from 1993 to 2011 (FOREST EUROPE).

The first extensive national programme addressing biological diversity was the National Action Plan for Biodiversity in Finland 1997-2005. The *National Strategy for the Conservation and Sustainable Use of Biodiversity in Finland 2006-2016* was adopted by the Government in 2006. One of the aims of this strategy is to halt the decline of biodiversity in Finland and establish a favourable development of biodiversity in the long term. The strategy was updated in 2011.

Since the 1970s, the Government of Finland has adopted seven programmes for the conservation of nature covering national parks and strict nature reserves, mires, waterfowl habitats, eskers, herb-rich forests, shorelines and old-growth forests. The programmes set out the objectives for the establishment of conservation areas. The degree of implementation of the programmes varies: the programme for national parks and strict nature reserves is almost completed, while there is still work to be done on, for example, the old-growth forest conservation programme. Compensation issues concerning private lands and conservation programmes have been almost fully resolved. In the next decade, programme sites in State ownership and earmarked for protection will be converted into statutory conservation areas totalling about 0,7 million hectares, or 16% of the overall area target for conservation programmes.

The Natura 2000 network safeguards the biotopes and habitats of species defined in the Habitats and Birds Directives of the EU. The European Commission

has accepted the Natura 2000 areas of Finland: the alpine zone areas in 2003 and those of the boreal zone in 2005. With the exception of the northernmost parts of Lapland, the majority of areas in Finland belong to the boreal zone. The majority of the Natura areas – 97% – are nature conservation areas established under national decisions, or they are part of national conservation programmes or areas protected in some other way.

The *Forest Biodiversity Programme for Southern Finland 2008-2016* (METSU programme) is implemented along with establish the positive trend of forest biodiversity by conservation methods voluntary for forest owners. The total target for areas voluntarily offered for conservation by the landowners is 96.000 hectares by 2020. Moreover, the total area of sites safeguarding biodiversity in private forests will be increased by 82.000 to 173.000 hectares, including 400 to 800 nature management projects.

## 4.2 Legislation

The administrative and executive powers in safeguarding biological diversity belong to the Ministry of the Environment and in part also to the Ministry of Agriculture and Forestry. The practical execution is the responsibility of the Regional Centres for Economic Development, Transport and the Environment, as well as the Finnish Forestry Centre. In matters pertaining to biodiversity, all these centres are under the performance guidance of the two ministries mentioned above.

The central legal instruments safeguarding forest biodiversity are the Nature Conservation Act, the Act on Wilderness Reserves and the Forest Act.

The *Nature Conservation Act* aims to achieve and maintain a favourable level of protection for habitats and wild species. To achieve this aim, nature conservation areas can be established to conserve protected habitats, three of which are forests: wild woods rich in noble broadleaves, hazel woods and common alder woods. The act also includes provisions on threatened species, their protection and international trade in them.

Under the *Act on Wilderness Reserves*, 12 wilderness areas have been established in northern Finland. Some of the areas are completely protected from harvesting, while limited forestry is allowed in others.

The *Forest Act* defines habitats of special importance to forest biodiversity – areas whose natural features must be conserved. These habitats are clearly delimited and generally fairly small areas in natural or semi-natural state, including the following: 1) the immediate surroundings of springs, brooks, rivulets constituting a permanent water flow channel, and small ponds; 2) herb-rich and grassy hardwood-spruce swamps, ferny hardwood-spruce swamps, eutrophic paludal hardwood-spruce swamps, and eutrophic fens located to the south of the Province of Lapland; 3) fertile patches of herb-rich forest; 4) heathland forest islets in undrained peatlands; 5) gorges and ravines; 6) steep bluffs and the

underlying forest; and 7) sandy soils, exposed bedrock, boulder fields, peatlands with sparse tree stand and flood meadows which are less productive than nutrient-poor heathland forests.

According to the national land use guidelines (VAT 2000) adopted by the Government under the *Land Use and Building Act*, land use planning is used to promote the conservation of the biodiversity in areas which are important for nature and susceptible to damage. Another aim is to preserve ecological corridors between conservation areas. One particular aim is to prevent the fragmentation of large forest areas by other land use without a special reason.

Under the *Act on Environmental Impact Assessment Procedure* and the *Act on the Assessment of the Impacts of the Authorities' Plans, Programmes and Policies on the Environment*, the impacts of certain plans, programmes and policies on biological diversity must be assessed.

The *Act on Metsähallitus* defines the tasks of Metsähallitus as including the sustainable and profitable management, use and conservation of natural resources and other property under its care. There are various possible uses for State land, including nature conservation, forestry, recreational use, nature tourism, property development and land extraction. The use of land and water areas under the care of Metsähallitus is planned in regional natural resources planning (see the fact box on Forest planning).

### 4.3 Financial instruments

The Forest Biodiversity Programme for Southern Finland 2008-2016 (METSO) offers voluntary measures for forest owners to protect their forests or to enhance natural values of the forests by management and receive compensation for these activities. The options the METSO programme offer are permanent protection, temporary protection and management of forest habitats. Permanent protection can be implemented by establishing a private conservation area, by selling the area to the State or by exchanging the area with the State. If protection is agreed on a temporary basis, an environmental support agreement is made for the area in accordance with the *Act on the Financing of Sustainable Forestry* for a period of ten years at a time.

Typical sites covered by environmental support include valuable habitats protected under the *Forest Act*. With the help of the support, the area protected can form a more extensive entity than what is protected by the law. Temporary protection can also be implemented under the *Nature Conservation Act*, in which case the maximum term of the protection agreement is 20 years. Management of forest habitat can be maintaining or enhancing natural values, or restoring the forest to a more natural state. The management work is planned in cooperation with the forest owner, and the management will not cause costs to the forest owner.

The *Act on the Financing of Sustainable Forestry* promotes sustainable forest management by granting government support for private forestry measures which aim at the maintenance of forest biodiversity and ecosystems. Financing is also used to support projects for the management of forest ecosystems. These include ecosystem surveys, management and restoration of habitats extending over the area of several forest holdings, and landscape management projects.

Special support under the agri-environmental support system for sites other than agricultural land is available for farmers who undertake to maintain traditional biotopes, wetlands, or forest edges bordering on fields.

Under the Nature Conservation Act, landowners are compensated for the establishment of conservation areas on their lands. A conservation area can be established in three ways: 1) by establishing a private conservation area under the Nature Conservation Act, in which case the area remains property of the landowner, who receives compensation which corresponds to the economic loss caused by conservation; 2) by purchasing the area for the State; or 3) by exchanging the area for an area owned by the State.

#### 4.4 Active information services

Safeguarding forest biodiversity receives special emphasis in all forest management recommendations and guidelines prepared for the various actors in forestry. Along with promoting wood production, safeguarding biodiversity is an integral part of forest planning undertaken on different levels and in different ways. The requirements regarding voluntary forest certification also contain several measures designed to safeguard biodiversity, such as increasing the number of prescribed burnings, leaving retention trees in forests and safeguarding the characteristic features of valuable habitats.

A National evaluation of threatened species has been conducted four times by the Ministry of the Environment, in 1983-85, 1987-91, 1997-2000 and 2007-2010. The last two evaluations are based on the IUCN criteria by the International Union for Conservation of Nature, and therefore the results from these evaluations are comparable. The evaluations produce information about the number of threatened species, the causes of decline, risks, and proposals for improving their protection.

One key way of safeguarding forest biodiversity outside conservation areas is to maintain the natural characteristics of valuable habitats. Habitats protected under the Nature Conservation Act have been mapped by the regional Environment Centres. Surveys of habitats of special importance mentioned in the Forest Act and of other forest habitats are conducted by Forestry Development Centre Tapio, the Finnish Forestry Centre, Metsähallitus and the forest industry companies. A nationwide report was completed in 2005.

Finland's first assessment of natural habitat types was conducted by the Finnish Environment Institute in 2008. The purpose of this assessment was to find out how

habitat types had changed due to human action or other reasons over the past 50 years. Two thirds of the 76 forest habitat types were considered to be threatened on the basis of qualitative or quantitative changes. These habitat types are typically small in size. The Nature Conservation Act and the Forest Act specifically list the habitat types and habitats identified as having special importance that must be left untouched in forest management. The expert groups also compiled the first list of the habitat types for which Finland has a particular international responsibility.

The preservation of biological diversity in private forests, forest owned by corporations and those administered by Metsähallitus has been monitored regularly since 1995 in conjunction with the monitoring of the quality of nature management in commercial forests by Forestry Development Centre Tapio. The National Forest Inventories conducted by the Finnish Forest Research Institute (Metla) also produce data on forest biodiversity.

Forest tree breeding and the management of the genetic resources of forest trees are the responsibility of the Finnish Forest Research Institute. The Institute maintains a register on forest genetics which covers information about selected trees and plus trees, experimental plantations, gene reserve forests and gene resource archives. The purpose of long-term forest tree breeding programmes is to identify and enrich genes that influence desirable properties in tree species, and also to maintain a sufficient level of genetic diversity in the material being bred. Compliance with the *Act on Trade in Forest Reproductive Material* is monitored by the subsection for forest reproductive material of the Finnish Food Safety Authority Evira to ensure that the basic genetic material used to produce reproductive material for forests is of a high quality.

In addition to universities, forest biodiversity is studied in research institutes operating under the Ministry of the Environment and the Ministry of Agriculture and Forestry. The principal research organisations are the Finnish Forest Research Institute (Metla) and the Finnish Environment Institute (SYKE).

Steered by the Ministry of Agriculture and Forestry, the *Biodiversity and Monitoring Programme MOSSE* was implemented in 2003–2006, and it contributed to the informational needs during the preliminary phase of the METSO programme (2002-2007). The research programme of deficiently known and threatened forest species (PUTTE) was coordinated by the Ministry of the Environment, and it was implemented during 2003–2007. The second stage of this programme started in 2009, and it includes 10 research projects. A large research programme of the Finnish Forest Research Institute (Metla), Safeguarding forest biodiversity – policy instruments and socio-economic impacts (TUK, 2005–2010), was completed in 2010, but the Institute continues to monitor the METSO programme and related research with help of separate funding.

## 5 Strategies and action plans

### 5.1 National Forest Programme

The most recent forest programme is the National Forest Programme (NFP) 2015, which has been adopted by the Government. Because of rapidly progressing changes in the operating environment, NFP 2015 was revised and adopted for implementation by a Government Decision in December 2010. The purpose of NFP 2015 is to support the development of the forest sector into a pioneer in the bioeconomy field and to create an operating environment where livelihoods based on forests and wood are competitive and profitable yet where biological diversity and other environmental benefits are taken into account.

The new programme differs from its predecessors specifically in that it brings forest products and services considered to offer the greatest potential for success to the forest sector onto a par with the ensuring of sustainable forest management, i.e. ensuring basic production of forest resources. The National Forest Programme was prepared in extensively broad-based cooperation with interest groups and drawing on the operating strategies of those interest groups. The work was supported by the Forest Foresight project funded by the Ministry of Agriculture and Forestry.

### 5.2 Other forest-related programmes

Apart from the National Forest Programme, the Forest Biodiversity Programme for Southern Finland 2008-2016 (METSO) is also ongoing. The aim of the METSO programme is to consolidate the favourable trend in forest biodiversity by improving the maintenance of habitats and structural features of forests vital to the survival of threatened species. New areas and networks of areas that support forest biodiversity are being created, and the biodiversity of existing conservation areas is being improved. The principles of new protection methods are voluntary participation by forest owners, preservation of ownership and full compensation of economic losses. The current programme was preceded by a METSO pilot phase (2002-2007), the positive experiences from which motivated a continuation of the programme by a Government Decision in 2008.

Regional Forest Programmes are development plans for the forest sector in the districts of the Forest Centres. These are revised regularly in accordance with the policies outlined in the National Forest Programme. A Regional Forest Programme sets out the needs and aims for forest growth, management and use; forest-based business operations; and multiple use and protection of forests. It also sets out the measures and funding to attain the goals. They provide an overall view of the status and development needs of forests and forest management in the domain of each Forestry Centre. The programmes are prepared and reviewed by the Finnish Forestry Centre in cooperation with the forest owners and other

interest groups in the region. These programmes were most recently revised in 2011.

The following is a selective list of other national programmes and strategies related to forests and directly impacting forestry:

- Finland's National Strategy for Sustainable Development (2006)
- National strategy and action plan for conservation and sustainable use of biodiversity in Finland (2006-2016)
- National Climate and Energy Strategy (2008) and the related Foresight Report on Long-term Climate and Energy Policy (2009) and 'renewable energy obligation package' (2010)
- Finland's National Strategy for Adaptation to Climate Change (2005; to be revised 2011-2013)
- Natural Resource Strategy (2009), Sitra
- National Strategy on Invasive Alien Species (2011)
- National strategy for sustainable and responsible use and protection of mires and peatland (2011).

## 6 Certification

Forest certification is a voluntary instrument for market actors. It serves as an adjunct to the implementation of sustainable forest management, ensuring the commitment by the actors to silvicultural instructions and standards. In forest certification, an independent third party grants a certificate (sustainable forestry certificate) vouching for the sustainable management and use of the forest holding in accordance with an agreed standard. The major international certification systems are the Programme for the Endorsement of Forest Certification schemes (PEFC) and the Forest Stewardship Council (FSC).

Finland has its own national certification system, the Finnish Forest Certification System (FFCS), designed in the 1990s for family forestry. The system was accepted as part of the PEFC in 2000. Finland's PEFC forest certification standards have been updated twice since acceptance in 2000. Today, 95% (22 million hectares) of Finland's forests are certified under the PEFC system.

Finland's FSC certification standards were completed and approved by the international FSC in 2010. The number of forest holdings certified under the FSC system is expected to increase in Finland in the near future.

## 7 Monitoring and planning tools

### 7.1 National Forest Inventory

The development of forest resources in Finland is monitored over a wide range in the National Forest Inventory (NFI) maintained by the Finnish Forest Research Institute (Metla). The first systematic inventory of forests was conducted as far back as in 1921–1924, and as a result Finland has exceptionally long time series on the development of forest resources. The forest resource data in the inventory are based on diverse on-site surveys conducted on test plots selected on the basis of a systematic statistical sample. There is a regular network of such test plots covering the entire country. When surveys are combined with satellite images and numerical data, findings can be calculated for smaller areas such as individual municipalities or discrete forest areas. Today, the NFI generates annually updated information on trends in forest resources and the state of the forests.

### 7.2 Forest planning

Forest planning is the most important practical tool for implementing sustainable forest management, taking into account harvesting potential, the safeguarding of biological diversity and other goals that forest owners may have for their forests. Baseline information on forests is needed for comparing calculations based on various scenarios in planning. Forest planning is undertaken at many levels: by individual holding, by region, by municipality, by parish, by forests owned by Metsähallitus and the forest industry companies, or for the entire country. The completed forest plan is a document usually for 10 years in Finland.

*Forest planning tools and levels in Finland.* Management plans for individual forest holdings help and guide private forest owners in management and use of their forest holdings. The plans are always based on the forest owner's objectives and the characteristics of the stands in question. Individual forest management plans include data on the current status of the forest, opportunities for harvesting, silvicultural needs and their economic effects, as well as forecasts on the development of growing stock and comprehensive maps. Forest management plans are also available online. Management plans for individual holdings are usually prepared for a period of 10-15 years and they are updated after the silvicultural works have been performed in the forest. The new airborne laser altimetry method has speeded up the collecting of forest data and also helps reduce planning costs because fewer ground surveys are required.

Forests owned by the state and by forest industry companies, and some jointly-owned forests are all covered by planning which corresponds to individual forest management plans, even though in terms of area they may be up to 1.000 times larger than private holdings.

Regional forest management plans are prepared for larger uniform areas which consist of several individual private forest holdings, for example, forests within the area of a village, municipality or other coherent area. Regional management plans for private forests are usually drawn up by the Finnish Forestry Centre. The planning data are used in estimating the forest resources or work goals of a Forestry Centre, a Forest Management Association or a local authority. Information on individual forest owners cannot be read from regional calculations.

There are various expectations regarding the state lands and waters administered by Metsähallitus, which places great demands on planning in these areas. The most extensive planning process for lands, forests and waterways administered by Metsähallitus is the regional natural resources planning process, which is where protection and recreational use and the extent of forestry measures undertaken are decided. Local interest groups participate in natural resources planning. Management and use plans are drawn up for nature reserves, wilderness reserves, outdoor recreation areas and Natura 2000 areas administered by Metsähallitus. Their purpose is to coordinate the aims of nature conservation, recreational use and other use. The geographical information system of Metsähallitus contains all of the above planning data and also data on the terrain, the tree stock and the management measures required for the tree stock.

The National Forest Inventories prepared by the Finnish Forest Research Institute (Metla) provide information on the current state of Finland's forests, and national and regional trend forecasts for forest resources are derived from them. The forecasts, calculated using MELA software, are based on assessments of the current state of forests and on alternative scenarios on how forest resources, increment of growing stock and potential for wood production may develop, given various options in the management of forests and their protection programmes. Alternative trends in national forest resources have been calculated for instance for the National Forest Programme and for Regional Forest Programmes.

## 8 Potential impact of climate change on forests

The mean annual temperature is projected to increase by 2°C to 6°C, and rainfall by 5% to 25%, by the year 2100 compared with the past 30-year period. It is also assumed that various extreme weather phenomena such as storms, hot dry spells in summer and heavy snowfall and rainfall will become more common.

Gradual change may be measured by when trees begin their growth phase in the spring. The opening of buds on coniferous trees and flowering now occurs 3 to 11 days earlier in Finland than it did at the beginning of the last century, 100 years ago. However, the most serious immediate threats to forest development are extreme weather phenomena. Drought, forest fires, storms and snow damage may cause widespread tree destruction, preventing forest regeneration, in addition to which the resulting large amounts of deadwood may prompt a massive proliferation of forest pests in surrounding healthy forests.

Research and long-term experiments with the transfer of tree species provenances from the north to the south lead to the following conclusions regarding future impacts of climate change in the boreal zone:

- The growing season will lengthen, and forest growth may actually increase. This increase could be as much as 20% to 50%, depending on the tree species. The increase will be greatest in the north and in mires.
- Wind damage will probably become more common, although due to Finland's geographical location the impact of winds coming in from the Atlantic is not as pronounced as it is in southern Sweden, Denmark or central Europe. Wind damage may be widespread in Lapland, and local and occasional in southern Finland. The spruce is the tree most susceptible to wind damage.
- As the climate becomes warmer and local forest damage occurs, the risk of mass proliferation of pests such as the large European spruce bark beetle (*Ips typographus*). Insect pests are expected to migrate north from the temperate zone, possibly causing massive damage.
- In forests along the timberline, climate change may cause the timberline to shift up or north, thereby precipitating the gradual extinction of certain species.

Forest management according to experience-based best practices is the principal means for helping forests adapt to climate change. Managing seedling stands in a timely manner, carrying out first fellings and avoiding excess density in the growth phase help secure the vitality of forests, along with genetic resource protection and tree breeding. Most of Finland's forests are under continuous management, which is why their productivity and vitality remain good.



## References

- Finnish Statistical Yearbook of Forestry. 2012. Finnish Forest Research Institute Metla. 472 p.
- FOREST EUROPE, UNECE, FAO. 2011. State of Europe's Forests 2011. Status and Trends in Sustainable Forest Management in Europe.
- Parviainen, J. & Västilä, S. 2011. State of Finland's Forests 2011. Based on the Criteria and Indicators of Sustainable Forest Management. Ministry on Agriculture and Forestry & Finnish Forest Research Institute (Metla). 99 p.
- State of Finland's Forests. 2012. State of Finland's Forests 2012. Based on the Criteria and Indicators of Sustainable Forest Management. Internet presentation: <http://www.metla.fi/metinfo/sustainability/index.htm> [Last accessed on 08.11.2012]



## Sources

Finland's National Forest Programme:

<http://www.mmm.fi/en/index/frontpage/forests/nfp.html>

The Forest Biodiversity Programme for Southern Finland (METSO) 2008-2016:

<http://www.ymparisto.fi/default.asp?contentid=274911&lan=fi&clan=en>



## List of Figures

FIGURE 1: FOREST AND OTHER WOODED LAND AS PERCENT OF LAND AREA (STATE OF FINLAND'S FOREST, 2011; FOREST EUROPE, 2012)	5
FIGURE 3: THE SHARE OF FOREST LAND BY FOREST OWNERSHIP CATEGORY (STATE OF FINLAND'S FORESTS, 2011)	7
FIGURE 4: ANNUAL INCREMENT OF GROWING STOCK (1935-2010) AND ANNUAL DRAIN (1950-2010) IN FINLAND (STATE OF FINLAND'S FORESTS, 2012)	8
FIGURE 5: VALUE ADDED IN THE FOREST SECTOR AND ITS SHARE IN GROSS DOMESTIC PRODUCT (GDP), 1975-2010 (STATE OF FINLAND'S FORESTS, 2012)	9
FIGURE 6: CONSUMPTION OF RENEWABLE ENERGY SOURCES (STATE OF FINLAND'S FORESTS, 2012)	10
FIGURE 7: EMPLOYED PERSONS IN THE FOREST SECTOR, 1980-2010 (STATE OF FINLAND'S FORESTS, 2011)	11
FIGURE 8: AMOUNT AND VALUE OF VARIOUS FOREST PRODUCTS FOR 2010 (STATE OF FINLAND'S FORESTS, 2012)	12
FIGURE 10: NATURAL AND REGENERATION BY PLANTING AND SEEDING (1965-2010) (STATE OF FINLAND'S FORESTS, 2012)	14
FIGURE 11: TOTAL FOREST AREA PROTECTED (SIZE OF THE PIE) AND THE SHARE OF THE PROTECTED AREA BY MCPFE CLASSES 1.1-1.3 (1.1. NO ACTIVE INTERVENTION, 1.2 MINIMUM INTERVENTION, 1.3 CONSERVATION THROUGH ACTIVE MANAGEMENT) FOR BIODIVERSITY BY COUNTRIES IN EUROPE (1.000 HECTARES AND PERCENT). GERMANY AND SPAIN: INCLUDED NATURA 2000 FOREST AREAS IN THE MCPFE CLASS 1.3 (STATE OF FINLAND'S FORESTS, 2011; FOREST EUROPE, 2011)	17
FIGURE 12: NATURE CONSERVATION AREAS BY FOREST VEGETATION ZONE (STATE OF FINLAND'S FORESTS, 2011)	18
FIGURE 13: LAND USE IN FINLAND FOR 2010 (STATE OF FINLAND'S FORESTS, 2012)	23



## List of Tables

TABLE 1: FOREST LAND, GROWING STOCK, ANNUAL INCREMENT AND COMMERCIAL HARVESTING BY FOREST OWNERSHIP CATEGORY (STATE OF FINLAND'S FORESTS, 2011)	7
TABLE 2: PROTECTED FORESTS AND FORESTS IN RESTRICTED FORESTRY USE FOR 2008 (STATE OF FINLAND'S FORESTS, 2011)	16
TABLE 3: VOLUME OF DEADWOOD IN FOREST AND LOW PRODUCTIVE FOREST FOR 2008 (SOURCE?)	20
TABLE 4: NUMBER OF THREATENED FOREST AND MIRE SPECIES (STATE OF FINLAND'S FORESTS, 2011)	21
TABLE 5: STATE FORESTRY LANDS IN THE PROTECTED FOREST ZONE (STATE OF FINLAND'S FORESTS, 2011)	31