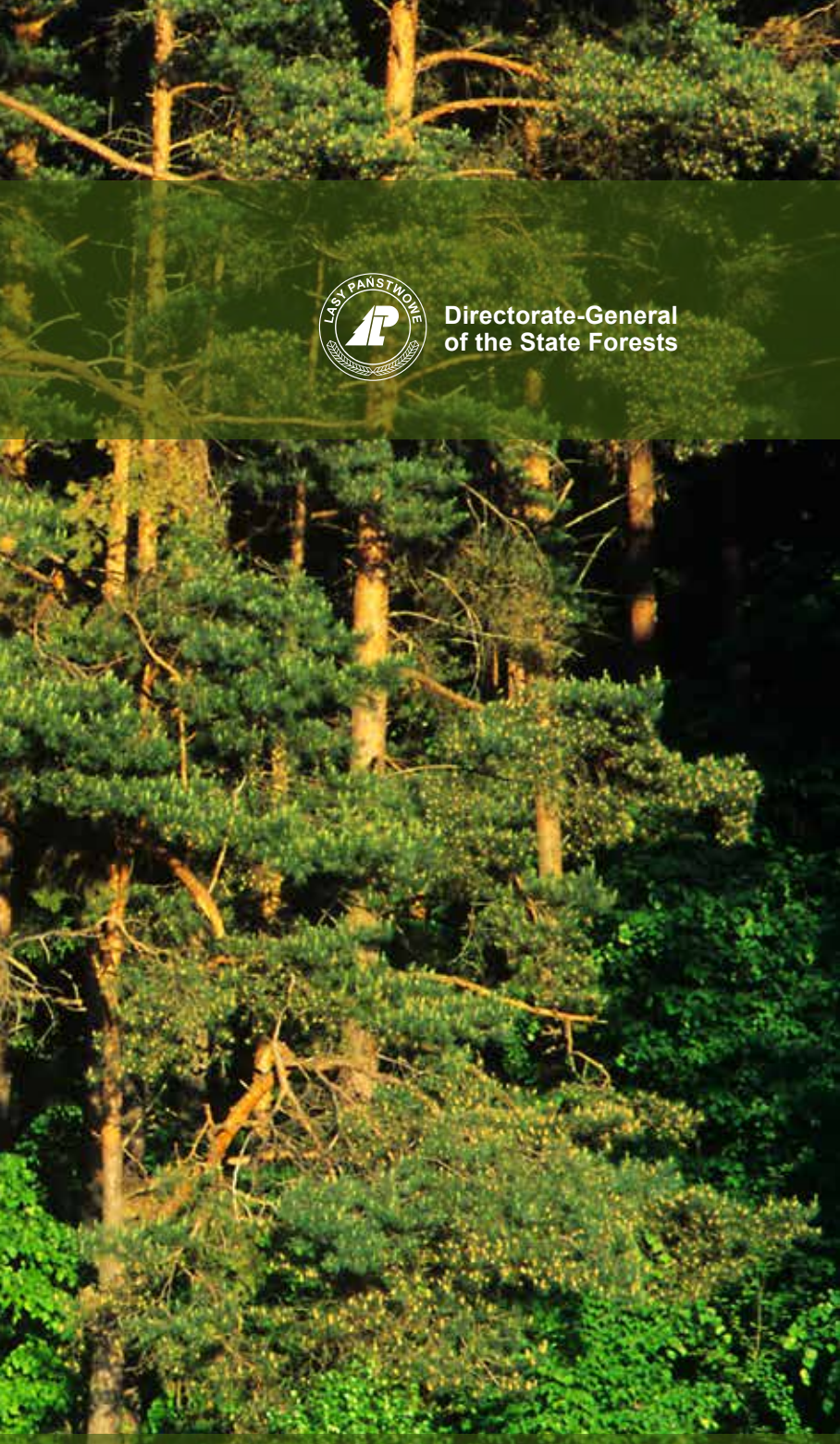
POLAND

THE STATE FORESTS IN FIGURES 2017

LASY PAŃSTWOWE

State Forests



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of the State Forests

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THE STATE FORESTS – ORGANISATION

LEGEND:

SF REGIONAL DIRECTORATES

FOREST DISTRICTS

NATIONAL PARKS

FOREST COMPLEXES

TERRITORIES of forest districts and regional directorates of the State Forests

The State Forests National Forest Holding (the State Forests) is an organisation which does not have legal personality and administers the state property on behalf of the Treasury. It is responsible for the management, on a self-financing basis, of all state-owned forests, with the exception of national parks, land under the administration of the Agricultural Property Agency and forests leased under perpetual lease agreements. Its aims are to manage forests according to the principles of universal protection of forests, their sustainability, continuous use of all forest functions and the augmentation of forest resources. These aims are implemented in agreement with forest management plans drawn up for each forest district for a ten-year period.

The State Forests, whenever natural, social and economic conditions permit, fulfil the tenets of international agreements which include: the Forestry Principles and Agenda 21 adopted in 1992 at the Earth Summit in Rio de Janeiro; the Declaration of European Forestry Ministers with regard to the protection of European forests (Strasbourg 1990, Helsinki 1993, Lisbon 1998, Vienna 2003, Warsaw 2007, Oslo 2011, Madrid 2015), and the Kyoto Protocol of 2005 concerning the role of forests in carbon sequestration. Since Poland's accession to the European Union on 1 May 2004, the State Forests have been implementing, within their remit, the programme Natura 2000.

The State Forests National Forest Holding operates in accordance with legal provisions of the Forest Act of 28 September 1991 (Journal of Law 2015, item 2100 as later amended), the Ordinance of the Council of Ministers of 6 December 1994 on the principles of financial management in the State Forests National Forest Holding (Journal of Law no 134, item 692), the Accounting Act of 29 September 1994 (Journal of Law 2013, item 330 as later amended), and other statutory ordinances and regulations resulting from the Forest Act.

This brochure is based on the annual *Report on the Condition of Forests in Poland 2016*, which was commissioned by the Directorate-General of the State Forests and compiled by the Forest Research Institute, and on the annual *Financial and Economic Report of the State Forests National Forest Holding 2016*.

THE STATE FORESTS IN FIGURES 2017

State Forests
Information Centre

AIMS AND OBJECTIVES OF THE STATE FORESTS

In accordance with the provisions of the Forest Act of 28 September 1991 (with later amendments) and the regulations and ordinances issued under this act, the main aims of the State Forests National Forest Holding are: to manage forests according to the principles of universal protection of forests, to maintain their permanence, to use all forest functions in a continuous, sustainable way, and to augment forest resources. These aims are pursued through sustainable multifunctional forest management in accordance with forest management plans developed for each forest district for a ten-year period. Each plan sets out silvicultural and protective objectives for specified fragments of forests (tree stands) and methods of achieving them.

The State Forests administer forests owned by the Treasury

The State Forests administer all forests owned by the State Treasury, with the exception of national parks and the land administered by the Agricultural Property Agency or leased under perpetual lease agreements. This involves forest management and administration of land, real estate, and movable properties, as well as keeping an inventory of the property owned by the State Treasury. The State Forests continually monitor the condition of forests, keep and update data on the size of forest area and timber resources, observe and forecast the level of fire hazard and the occurrence of tree pests and diseases.

The State Forests fund scientific research which contributes to the advancement of forestry and forest management methods. Whenever natural, social and economic conditions allow, the State Forests implement the international agreements as laid down in:

- the Forestry Principles and Agenda 21 adopted in 1992 at the Earth Summit in Rio de Janeiro;
- the Declaration of European Forestry Ministers concerning the Protection of European Forests (Strasbourg 1990, Helsinki 1993, Lisbon 1998, Vienna 2003, Warsaw 2007, Oslo 2011, Madrid 2015);
- the Kyoto Protocol (2005) concerning the role of forests in carbon sequestration.

Since Poland's accession to the European Union on 1 May 2004, the State Forests have been implementing, within their remit, the guidelines of Natura 2000 programme.

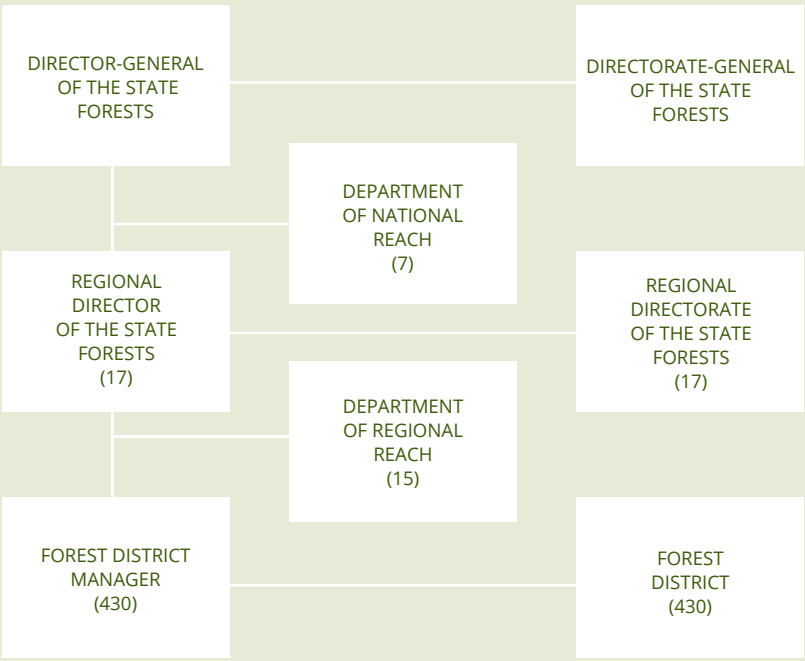
Other important objectives of the State Forests are to make forests accessible to society and to increase environmental awareness by providing forest and nature education.

ORGANISATIONAL STRUCTURE AND EMPLOYMENT

Organisational structure

The State Forests are a state organisational entity which administers property on behalf of the State Treasury and does not have legal personality; it operates on a self-financing basis.

The State Forests are headed by the Director-General who is assisted in his work by the directors of regional directorates.



THE THREE-TIER STRUCTURE OF THE STATE FORESTS
(as of 31 December 2016)

As of 31 December 2016, the State Forests comprised the following organisational units:

- Directorate-General of the State Forests (DGSF);
- 17 regional directorates of the State Forests (RDSF);
- 430 forest districts;
- 15 organisational units (departments) with regional authority reporting to the regional directors of the State Forests (3 storage complexes, 2 fisheries, 2 transport and logistics, 3 service and production, 2 forest transport, 2 forestry services, 1 training and recreation centre);
- 7 organisational units (departments) with country-wide authority reporting to the Director-General of the State Forests: the Research and Implementation Centre in Bedoń, the Forest Culture Centre in Gołuchów, the State Forests Information Centre in Warsaw, the Forest Technology Centre in Jarocin, the State Forests IT Department in Sękocin, the Coordination Centre for Environmental Projects in Warsaw, and the Forest Gene Bank Kostrzyca in Miłków.

There are **430** forest districts within the State Forests

The remaining integral parts of the Directorate-General of the State Forests comprise 9 forest protection teams and 11 regional inspectorates of the State Forests.

The fundamental organisational unit in the State Forests is a forest district. Each is led by a forest district manager who independently manages the area according to the forest management plan and who is responsible for the condition of the forest. In 2016, as in the previous year, there were 430 forest districts with an average area of 17.5 thousand ha.

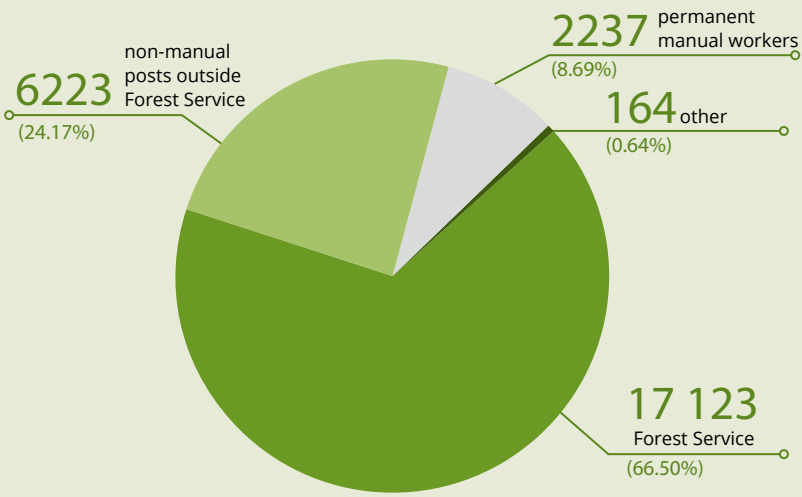
Employment

The average monthly employment in the State Forests in 2016 was 25 747 people, which was 245 more than in 2015. The employment structure was as follows (in number of staff):

1. permanent employees	25 583
• including non-manual employees	23 346
2. employees on fixed-term contracts	164

The average monthly employment within the system of statutory units of the State Forests was as follows:

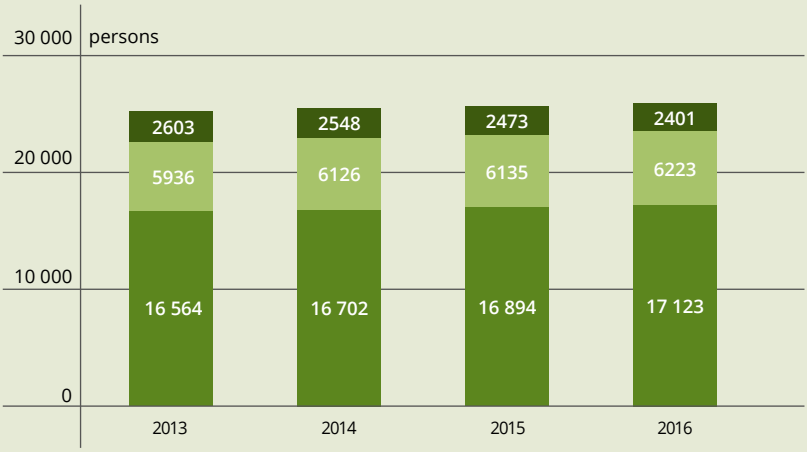
1. In forest districts	23 401
including:	
• Forest Service	16 347
• non-manual posts outside Forest Service	5 132
• manual posts	1 922
2. In departments	1 019
• including non-manual posts	592
3. In the Directorate-General and in regional directorates (with Forest Protection Teams)	1 327
• including Forest Service	766



EMPLOYMENT STRUCTURE IN THE STATE FORESTS in 2016 (DGSF)

The analysis of average employment in the State Forests in the period 2013–2016 shows the increase in total employment in comparison with 2013.

As of 31 December 2016, a total of 25 980 people were employed in the State Forests, an increase of 371 persons as compared with the last day of 2015.



LEGEND:

FOREST SERVICE | NON-MANUAL POSTS OUTSIDE FOREST SERVICE | ALL MANUAL WORKERS

EMPLOYMENT IN THE STATE FORESTS in 2013–2016 (DGSF)

Research

Research commissioned by the Directorate-General of the State Forests in 2016 was significant for the development of all areas of forestry. Most research was carried out at the Forest Research Institute.

In total, 101 research projects were pursued in 2016, costing 50 028.42 thousand PLN provided by the forest fund. Of these, 61 projects were conducted at the Forest Research Institute, costing 38 452.36 thousand PLN, and 40 projects involved universities and other institutions at a general cost of 11 576.06 thousand PLN.

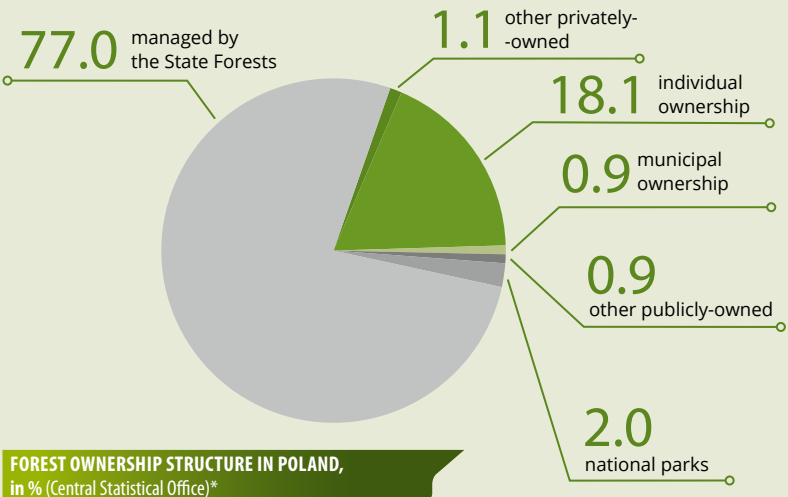
The results of the research studies were shared with the relevant units of the State Forests and other organisations outside the SF for further implementation.

In 2016 the State Forests commissioned **101** research projects

RESOURCES OF THE STATE FORESTS

Forests in Poland

The forest area in Poland amounts to 9230 thousand hectares (as of 31 December 2016, Central Statistical Office), which puts the forest cover at 29.5%. The majority of forests are publicly-owned (80.8%), including those administered by the State Forests (77.0%).



FOREST OWNERSHIP STRUCTURE IN POLAND, in % (Central Statistical Office)*

* Data does not add up to 100%, due to rounding.

Land use structure

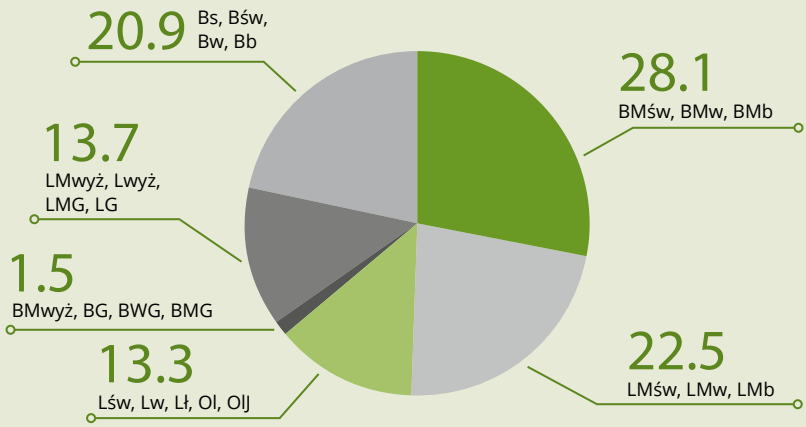
As of 31 December 2016, the total area of land administered by the State Forests amounted to 7 606 060.13 ha and it was structured as follows:

• forests, total	7 303 542.12 ha
including: afforested land	6 982 160.00 ha
non-afforested land	122 494.09 ha
• agricultural land	137 070.72 ha
• wasteland	96 727.34 ha
• waters	8 897.25 ha
• trees and shrubs outside the forest	12 087.01 ha

Area structure of habitats and dominant species

Forests in Poland mainly occur on the poorest soils, which is reflected in the structure of forest habitat types. Coniferous forest habitats predominate as they account for 50.5% of the total forest area, while the broadleaved sites account for 49.5%. Additionally, in both groups upland habitats occupy 6.5% of the forest area and mountain sites 8.7% of the total area of forests.

Geographical distribution of habitats is largely reflected in the spatial structure of dominant tree species. Apart from the mountain regions where spruce, fir and beech have a larger share in species composition, in most of the country pine is a dominant species in the majority of stands.



AREA SHARE (in %) of forest habitat types in Poland (National Forest Inventory 2012–2016)

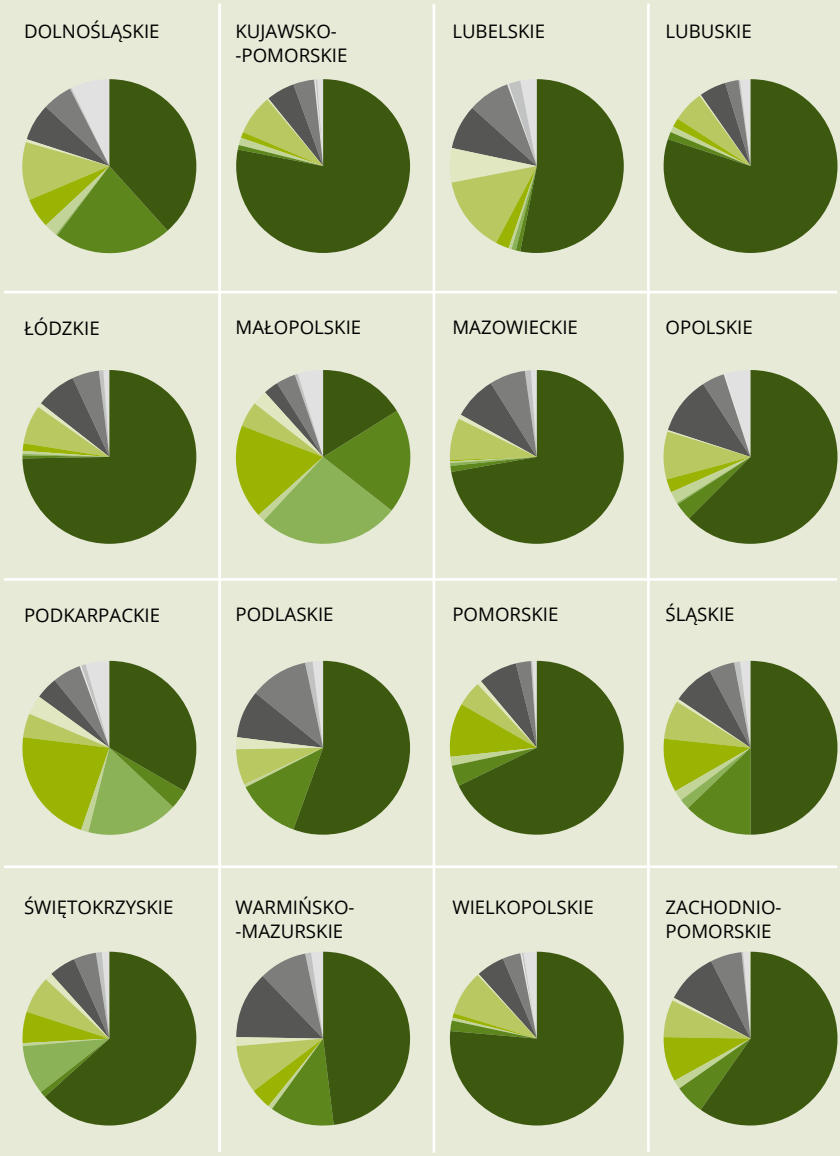
LEGEND:

Bb	– swamp coniferous forest	Ll	– riparian forest
BG	– montane coniferous forest	LMb	– swamp mixed broadleaved forest
BMb	– swamp mixed coniferous forest	LMG	– montane mixed broadleaved forest
BMG	– montane mixed coniferous forest	LMśw	– fresh mixed broadleaved forest
BMśw	– fresh mixed coniferous forest	LMw	– moist mixed broadleaved forest
BMw	– moist mixed coniferous forest	LMwyż	– upland mixed broadleaved forest
BMwyż	– upland mixed coniferous forest	Lśw	– fresh broadleaved forest
Bs	– dry coniferous forest	Lw	– moist broadleaved forest
Bśw	– fresh coniferous forest	Lwyż	– upland broadleaved forest
Bw	– moist coniferous forest	Ol	– alder forest
BWG	– high-mountain coniferous forest	Olj	– alder-ash forest
LG	– montane broadleaved forest		

Coniferous species are dominant in 68.5% of the area of Polish forests. Pine, which in Poland has optimal climatic and site conditions within its Euro-Asiatic natural range and has developed many valuable ecotypes (e.g. Taborska and Augustowska pines),

Coniferous forest habitats cover **51%** of the forest area in Poland

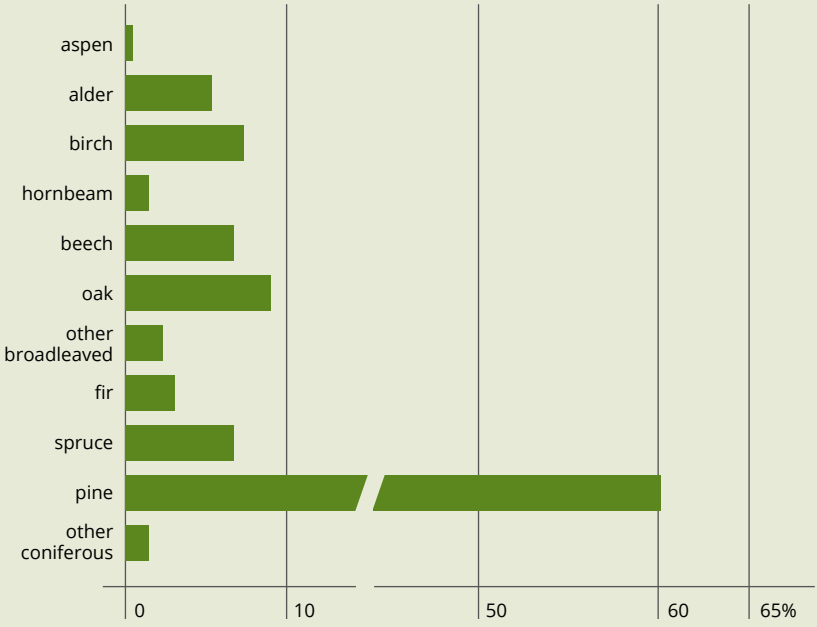
now accounts for 58.2% of the area of forests in all ownership categories, 60.1% of the area managed by the State Forests, and 55.0% in private forests (National Forest Inventory).



SPATIAL DISTRIBUTION OF TREE STANDS by dominant species and by province
(National Forest Inventory 2012–2016)

LEGEND:

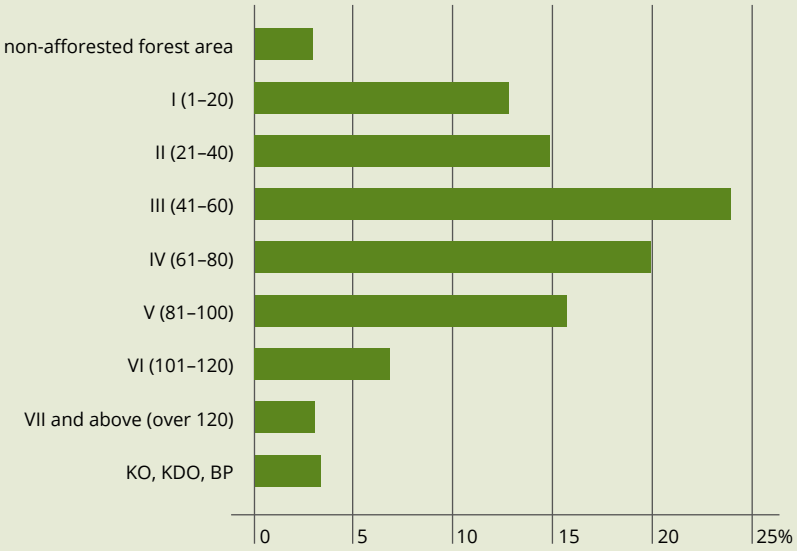
PINE	BEECH	BIRCH	ASPEN
SPRUCE	OAK	ALDER	OTHER BROADLEAVED
FIR	HORNBEAM	POPLAR	
OTHER CONIFEROUS			



AREA SHARE OF DOMINANT SPECIES in the forests administered by the State Forests (National Forest Inventory 2012–2016)

Age structure

Stands representing age classes III and IV prevail in the age structure of forests and cover 24.9% and 19.4% of the forest area, respectively. Stands older than 100 years including stands in restocking class (KO), class for restocking (KDO) and with selection structure (BP), account for 12.7% of the forest area managed by the State Forests. Non-afforested land in the State Forests constitutes 2.8%.



AREA SHARE STRUCTURE OF STANDS by age class in the State Forest (National Forest Inventory 2012–2016)

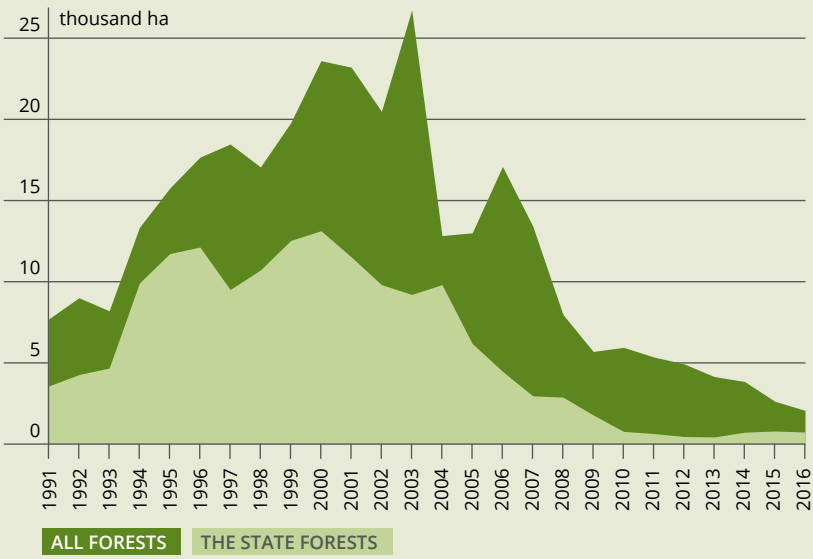
Afforestation

The basis for all afforestation in Poland is the National Programme for the Augmentation of Forest Cover (National Forest Programme – NFP) commissioned by the then Ministry of Environment, Natural Resources and Forestry. The programme was developed by the Forest Research Institute and recommended by the Council of Ministers on 23 June 1995. The programme was modified in 2002. The main objectives of the programme are to increase the forest cover of the country to 30% by the year 2020 and to 33% by 2050, as well as to ensure an optimal spatial and temporal distribution of all afforestation.

Artificial afforestation carried out in 2016 covered 2011 ha of land in all ownership categories. The afforestation area was smaller by 259 ha (by 10%) as compared with the previous year. The drastic decline in afforestation (from 16 933 ha in 2006 to 2011 ha in 2016, i.e. by 88%) is largely a result of changes made to the criteria by which private agricultural land is designated for afforestation within the framework of the rural development programme, as well as attractive subsidies for agricultural production.

A similar substantial decrease in the size of afforested areas was observed in the State Forests, where in 2016 only 687 ha were artificially afforested, as compared with 9.7 thousand ha in 2004. This was a result of a rapid decline in the area of post-agricultural and uncultivated land transferred to the State Forests by the Agricultural Property Agency.

The NFP objective is to increase forest cover to 33% in 2050

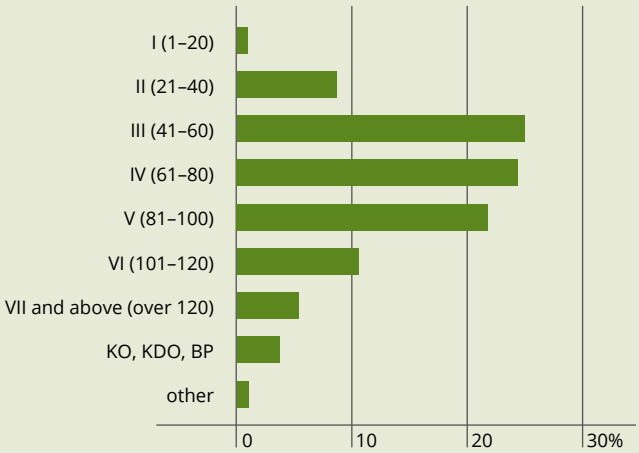


SIZE OF AFFORESTATION (artificial) in Poland in 1991–2016 (Central Statistical Office)

Timber resources

The main source of information about the volume of timber resources in Poland is the National Forest Inventory. According to the data collected in the years 2012–2016, and based on the forest area as it stood at the end of 2015, the timber resources in Poland amounted to 2550 million m^3 of gross merchantable timber, of which 2005 million m^3 were in the State Forests.

Almost half (51.4%) of timber resources in the State Forests are stands in age classes III and IV. The volume of timber resources in stands aged over 100 years including restocking class (KO), class for restocking (KDO), and selection structure (BP) accounts for 19.3%.



VOLUME STRUCTURE OF TIMBER RESOURCES by age class in the State Forests (National Forest Inventory 2012–2016)

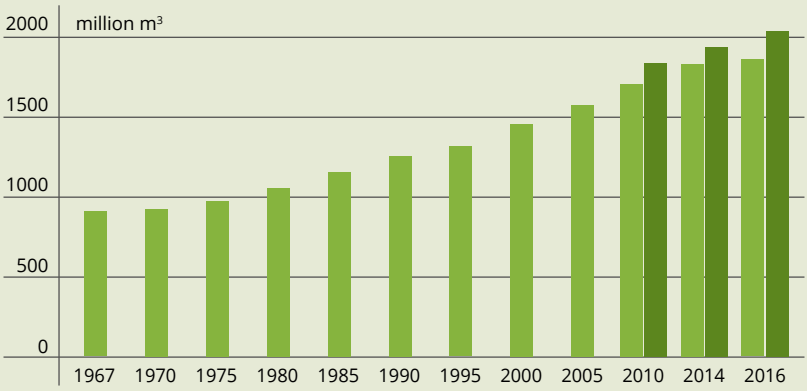
According to the results of the National Forest Inventory 2012–2016, the average volume of growing stock in Poland's forests is 277 m³/ha, whereas in the forests managed by the State Forests this value is 285 m³/ha. Pine accounts for 56.6% in volume structure of timber resources in all ownership categories. In the State Forests this share is 58.5%.

Since 1967, when the first update of timber resources in the State Forests was made, there has been a steady growth in the volume of timber. In the last 20 years, from January 1996 to January 2016, the increment of gross merchantable timber in forests administered by the State Forests amounted to 1239 million m³. During that period 710 million m³ of merchantable timber was harvested, which means that 530 million m³ of gross merchantable timber, representing 43% of the total increment, remained to augment the volume of standing timber resources.

In the last 20 years, the timber resources in SF have increased by

530

million m³



LEGEND:

STATE FORESTS BY NFI*

STATE FORESTS (UPDATE)

* National Forest Inventory data for periods 2005–2009, 2010–2014 and 2012–2016

AMOUNT OF TIMBER RESOURCES IN THE STATE FORESTS in 1967–2016, in million m³ of gross merchantable timber (Bureau of Forest Management and Geodesy, National Forest Inventory)**; figures for 1 January**

FOREST FUNCTIONS

Forests fulfil diverse functions, either naturally or as a result of human activities, the main of which are:

ENVIRONMENTAL (PROTECTIVE) **FUNCTIONS**

having positive impact on the global and local climate, regulation of water cycle in nature, prevention of floods, avalanches and landslides, protection of soil against erosion and landscape against steppisation;

SOCIAL FUNCTIONS

providing health-enhancing and recreational conditions for society, contributing to the labour market and ensuring development of environmental awareness in society;

PRODUCTIVE (ECONOMIC) **FUNCTIONS**

which are mainly biomass renewable production, including wood and non-wood forest products, and effective management of hunting.

The State Forests have a legal obligation to operate according to the principles of sustainable forest management which is aimed at preserving the sustainability of forests and their continuous multifunctional use, as well as the augmentation of forests resources.

The very idea of sustainable forest management is based on the premise that forest ecosystems can fulfil a variety of functions. The State Forests have been developing this multifunctional characteristic of forests for many years, which is evident, for example, in the large proportion of protective forests in the total forest area under their administration.

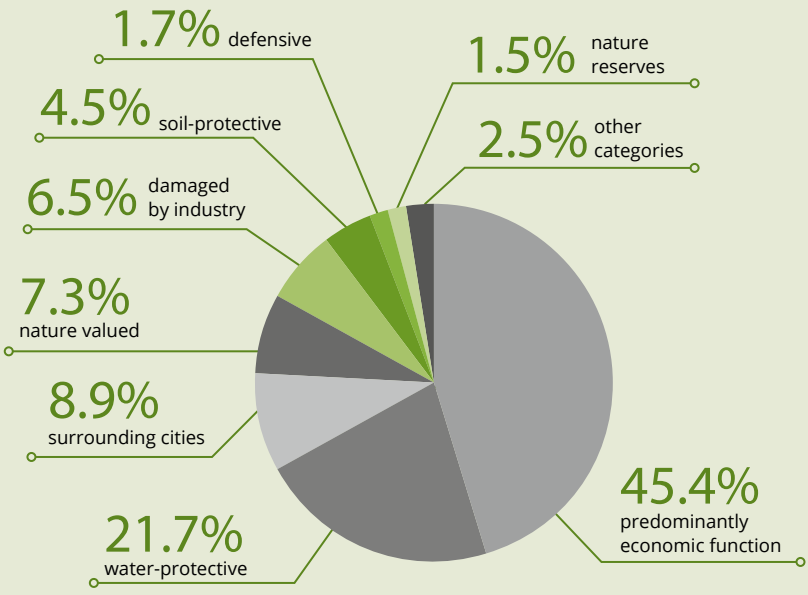
Environmental functions of forests

Protective forests

The earliest regulations on social and environmental forest functions, and especially on distinguishing a category of protective forests, were included in the first post-war *Instruction on Forest Management*, published in 1957. By the year 1975, a total of 1485 thousand ha of forests were designated as protective, which comprised 22.5% of the forest area administered by the State Forests at that time. As of 1 January 2016, the combined area of protective forests increased to 3776 thousand ha, which represents 53.2% of the entire forest area, or 54.6% including 103 thousand ha of nature reserves.

The share of protective forests in all ownership categories in the total forest area in Poland currently has reached 41.9%, and including the area of nature reserves – 43.0%.

Protective forests take **53.2%** of the total forest area within the State Forests



SHARE OF PROTECTIVE FORESTS in the State Forests, in 2016 (DGSF)

Protective forests are subject to different management practices, depending on their predominant function. These may include limited clear-cutting, raising the felling age, adjusting the composition of species to their function, creating recreational facilities, etc.

Carbon sequestration

Assessment of the amount of carbon absorbed by ecosystems (including forest) was, until recently, of almost exclusively scientific interest. The growing threat of climate warming caused by the increased amount of CO_2 in the atmosphere, and raised social awareness of this threat in particular, have brought about more practical dimension expressed in the Kyoto Protocol (in force since 16 February 2005). The value of forestry activities which foster increased carbon sequestration has been financially estimated and included in the overall balance of emission and absorption of greenhouse gases.

The general rules for assessing the amount of carbon sequestered by forests and the possibility to include this amount in the total balance for CO_2 emission are based on the decisions taken during the Conference of the Parties for Climate Change and the assumptions of the Kyoto Protocol. The last such conference took place in Marrakech in Morocco in November 2016. The binding of CO_2 by forest ecosystems was listed there as one of the most effective methods to slow down global warming.

Poland's position on methods of reducing emissions is also based on the use of renewable energy sources, including geothermal energy, and the use of forest areas for the absorption of CO_2. In practice, this means taking up activities related to increasing the forest area of the country, as well as the introduction of the second storey, fast growing species, sub-planting, the promotion of natural regeneration and the limitation of clear cuts. As a result, this will lead to the increase in the amount of plant biomass accumulated in forest ecosystems.

Forests in Poland absorb over **30 million tonnes** of CO_2 per year

Beginning in 2016, the State Forests have launched the pilot project of Forest Carbon Farms, which aims to increase the absorption of CO_2 and other greenhouse gases by forests as a result of additional activities in forestry. Other activities undertaken by the State Forests, related to the promotion of building houses from the wood raw material (which is a kind of coal storage) will serve the above-mentioned aims.

The data concerning timber resources show that the amount of carbon stored in the wood biomass in Poland has been estimated at 822 million tonnes, including 685 million tonnes of the standing volume and 137 million tonnes in the underground part; the amount of carbon in dead wood has been assessed at 32 million tonnes (*SoEF* 2015). The annual amount of CO_2 absorbed by the forests (including forest use and absorption of the gas by soils), according to the data calculated for 2015, has been estimated at 30.6 million tonnes, which approximately equals 8.4 million tonnes of coal.

The State Forests, by subsidising research projects have undertaken actions in order to strengthen knowledge on carbon dioxide balance in managed forests,

and to develop methodology for obtaining necessary data to measure carbon sequestration by forest areas. Efforts are also made to test the possibility of introducing Removal Units (RMU) into domestic market, which would be 'produced' and shared by the State Forests with the external entities and within the framework of the so-called additional activities in forestry.

Social functions of forests

Forest education

Forests are a natural place for recreation and leisure, particularly for the inhabitants of large conurbations. Forests are a popular destination for excursions, mainly organised by schools, which give young people an opportunity for direct contact with nature. Recreation in forest is an excellent opportunity for forest education.

Forest education in all parts of the State Forests is based mainly on the Ordinance No. 57 of 9 May 2003, issued by the Director-General of the State Forests, concerning the directions of the development of forest education in the State Forests and the guidelines for creating forest education programmes in forest districts. The general objectives of forest education are: to disseminate in society the knowledge on forest environment and sustainable forest management, to raise social awareness on reasonable and responsible use of all forest functions and to build trust in foresters' professional activities. Educational activities are carried out by qualified teaching staff, whose competence is constantly enhanced by specialist training.

Over **3.7 million** participants in educational programmes in SF

Various educational programmes organised by the State Forests attracted over 3.7 million participants in 2016. Among the events and activities offered were usual outdoor lessons and guided tours, classes in forest education chambers, meetings with foresters at schools, meetings outside schools, educational exhibitions, forest competitions, fairs and many others.

The largest group of participants in didactic activities were primary school children. The educational events were also attended by students and adults.

Such a variety of educational activities was possible because of the commitment of over 9 thousand foresters who devoted part of their time to forest education. They were supported by an attractive and varied teaching infrastructure which includes: forest education centres (66), educational chambers (278), educational shelters called 'green classes' (595), educational trails (1039), educational points (1998), other facilities (2946), and also overnight accommodation.

Nearly **28 million PLN** spent by SF on forest education

Educational activity of the State Forests is financed mainly from the forests districts' own resources, from the relevant Regional Fund for Environmental Protection and Water Management and the National Fund for Environmental Protection and Water Management. In 2016, approximately 30.3 million PLN were spent on forest education, out of which 27 926.1 thousand PLN (92%) came from the forest districts' own resources and 963.7 thousand PLN (3.2%) from the forest fund.

The unquestionable leaders of forest education are promotional forest complexes (PFCs) which attract about 30% of the participants in the educational programmes prepared by foresters. Qualified and experienced educators have at their disposal the best infrastructure which includes forest education centres (33), educational chambers (56), educational shelters (129), educational trails (230), educational points (533) and other facilities (564).

Promotional forest complexes are particularly important for science because the interdisciplinary research carried out within their areas is based on fully recognised forest environment. The study results allow for the improvement of forest management methods and for setting acceptable limits on economic (commercial) intervention in forest ecosystems. They are also an alternative to overcrowded national parks, where

PROMOTIONAL FOREST COMPLEXES in Poland, in 2016 (DGSF)

tourism is regulated by very strict rules. PFCs not only give the opportunity to learn about the principles of ecological forest management but they also ensure free access (also for the disabled) and unrestricted contact with nature.

The State Forests' policy on promoting sustainable forest management allowed to create 25 PFCs, located in all 17 regional directorates of the State Forests. The combined area of promotional forest complexes is almost 1274 thousand ha, out of which over 1200 thousand ha are located in the area administered by the State Forests (over 17% of their territory).

Tourism

The educational offer of the State Forests is integrated with a wide range of tourist attractions available to all ages and social groups. The visitors to forests have at their disposal a well-developed accommodation consisting of nearly 4.5 thousand beds available in recreation and training centres, also guest rooms and hunting lodges. There are over 20 thousand kilometres of walking routes, nearly 4 thousand kilometres of cycling routes and about 7 thousand kilometres of horse riding routes. Visitors have access to over 600 bivouac sites and camping places. Camp fires are permitted in 400 designated locations, either in the forest or nearby. Cars may be left at 3160 forest parking lots or vehicle parking places. Tourists may use 641 other facilities, also 60 training and recreation centres, about 130 hunting lodges and over 200 guest rooms. Current tourist offer provided by the State Forests can be found at **www.czaswlas.pl**.

Accommodation in SF is nearly **4.5 thousand** beds

Tourism is an important and dynamically developing branch of economy in the whole country, a vital factor for local development and the activation of regions. The State Forests want to contribute to this development, also by implementing the ongoing project *Great Forest Trail: Tourism, Recreation, History and Education*.

Littering is one of the consequences of the more intense tourism in the forest areas. Despite educational campaigns and provision of appropriate infrastructure, the cost of keeping forest clean is continually growing. In 2016, the State Forests spent nearly 17.7 million PLN on forest cleaning and over 120 thousand m^3 of litter were removed.

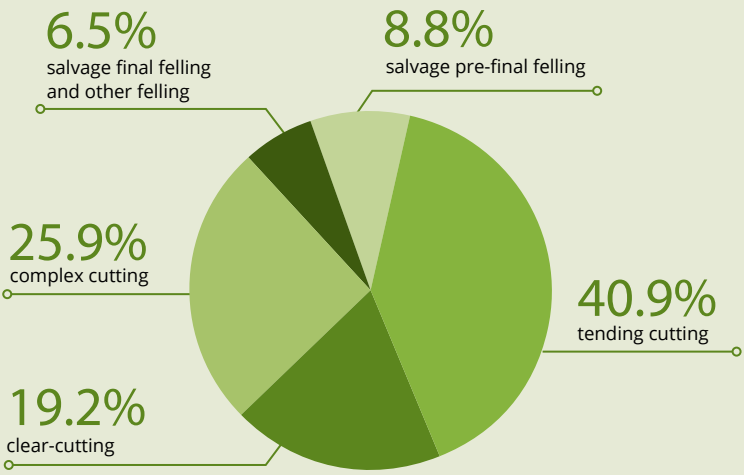
Productive functions of forests

Harvesting of timber

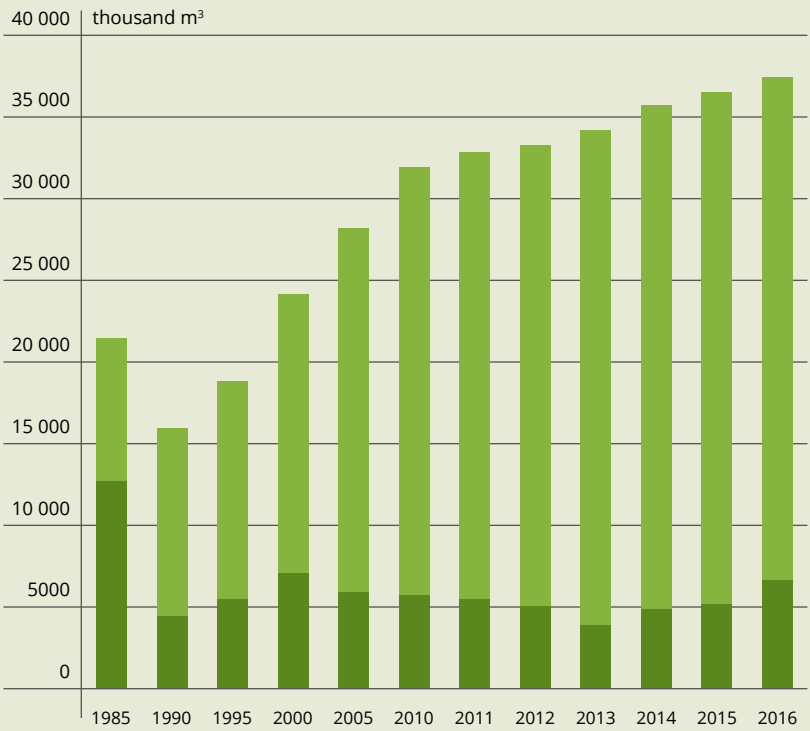
In 2016 SF harvested **37.4 million m³** of net merchantable timber

In 2016, the amount of net merchantable timber harvested in Poland was 39 129 thousand m³ (by 802 thousand m³ more than in 2015). In the State Forests the felling amounted to 39 165 thousand m³ of raw timber, including 37 405 thousand m³ of net merchantable timber (102.1% of the approximate prescribed cut by volume), of which 18 818 thousand m³ (97.4% of prescribed cut) were obtained in final felling, and 18 586 thousand m³ (107.3% of the prescribed cut) in pre-final felling.

The volume of timber harvested for sanitation reasons by clearing dead wood, broken or fallen trees damaged in natural processes, or by wind activity, gradations of insect pests, disturbances in water relations, air pollution and the anomalies of the weather, in 2016 amounted 6611 thousand m³, or 17.7% of the total harvest of merchantable timber; this value is slightly lower than the average in the last 10 years amounting 18.2%.



HARVEST OF MERCHANTABLE TIMBER by type of felling in the State Forests, in 2016 (DGSF)



LEGEND:

MERCHANTABLE TIMBER HARVESTED THROUGH TENDING AND RENEWAL CUTTINGS

MERCHANTABLE TIMBER FROM HARVESTED DEAD WOOD, BROKEN AND FALLEN TREES

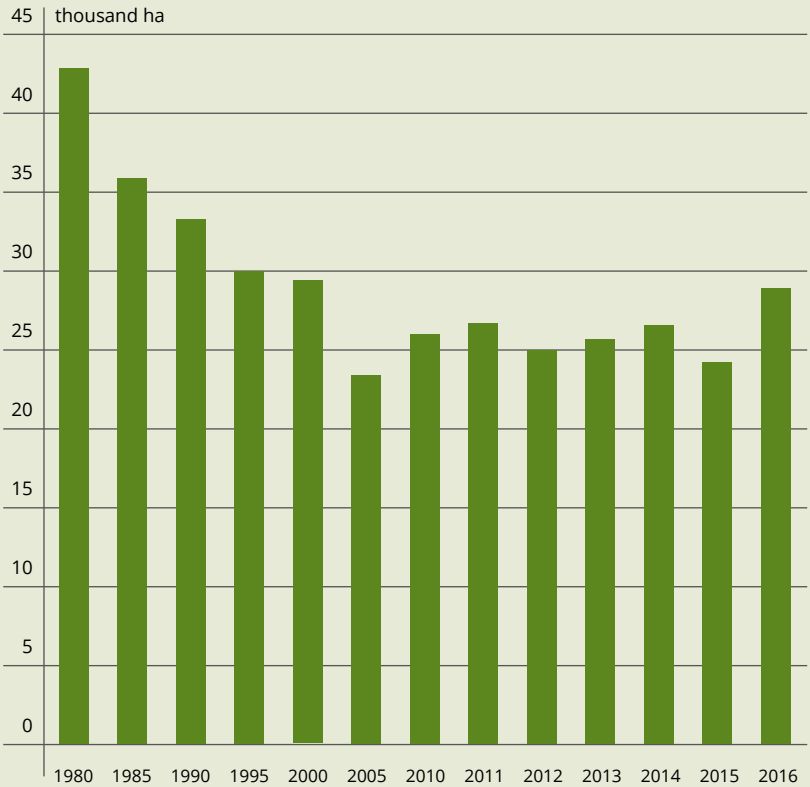
SHARE OF DEAD WOOD, BROKEN OR FALLEN TREES IN TOTAL HARVEST in the State Forests in 1985–2016, in thousand m³ of net merchantable timber (DGSF)

In SF the harvest of timber is about **57.3%** of current increment

The State Forests, during the last 20 years (1997–2015) utilised 94.0% of the prescribed cut in final felling, and 112.0% of the prescribed cut in pre-final felling (by volume) determined in forest management plans.

In the State Forests in 2016, under the clear-cut system, 7164 thousand m^3 of merchantable timber was harvested, which accounts for 19.2% of its total harvest. The clear-cut area amounted 28.9 thousand ha and was slightly larger than the average for the past two decades at 26.9 thousand ha. The gradual reduction in size of the clear-cut areas is indicative of the progress in implementing the sustainable forest management, however the clear-cuts are often necessary due to large-scale damages caused by wind and other abiotic factors, or forest diebacks caused by drought, fungal disease or insect gradation.

In the last five years, the size of timber harvest, expressed by the volume of net merchantable timber per one hectare of the forest area, has stabilised at 5.26 m^3/ha; in 2015 this indicator (calculated over a five-year period) was 5.14 m^3/ha. The size of harvest in the State Forests does not exceed the permitted level and, as of the data from the last 20 years, it constitutes 57.3% of current increment.



AREA OF CLEAR-CUTTING in the State Forests in 1980–2016 (DGSF)

SILVICULTURE

The aim of silviculture is to ensure the sustainability, continuity and development of forest ecosystems. The foresters achieve this by applying methods of stand regeneration and of profiling species and age structures, which are based on natural processes. These methods of renewal, tending and protection are used at all stages of stand development. Particular attention is paid to environmental conditions of a tree and a stand development and also the protection of near-natural ecosystems.

The most important forest management activities undertaken in the State Forests in 2016 were (in hectares):

1. Nursery production (total productive area of forest nurseries)	1 949
2. Restocking and afforestation (counting afforesting gaps and second storey planting)	58 215
including: • natural regeneration	6 916
• afforestation, in total	819
including: natural succession	176
3. Amendments and fill-in planting	4 087
4. Forest tending, in total	308 347
including: • planting understoreys	309
• soil cultivation and weed control	174 104
• early cleaning	51 914
• late cleaning	79 120
• other tending treatment (including pruning)	2 899
5. Thinning, in total	423 237
including early thinning	94 647
6. Land drainage, in total	64 128
including mineral fertilising of forests	36
7. Stand conversion, total	5 757

NATURE CONSERVATION

The State Forests, in compliance with the Forest Act and the state policy on forests, have for many years been maintaining an inventory of all statutory forms of nature protection, which is kept updated, e.g. while drawing up nature conservation programmes in forest districts.

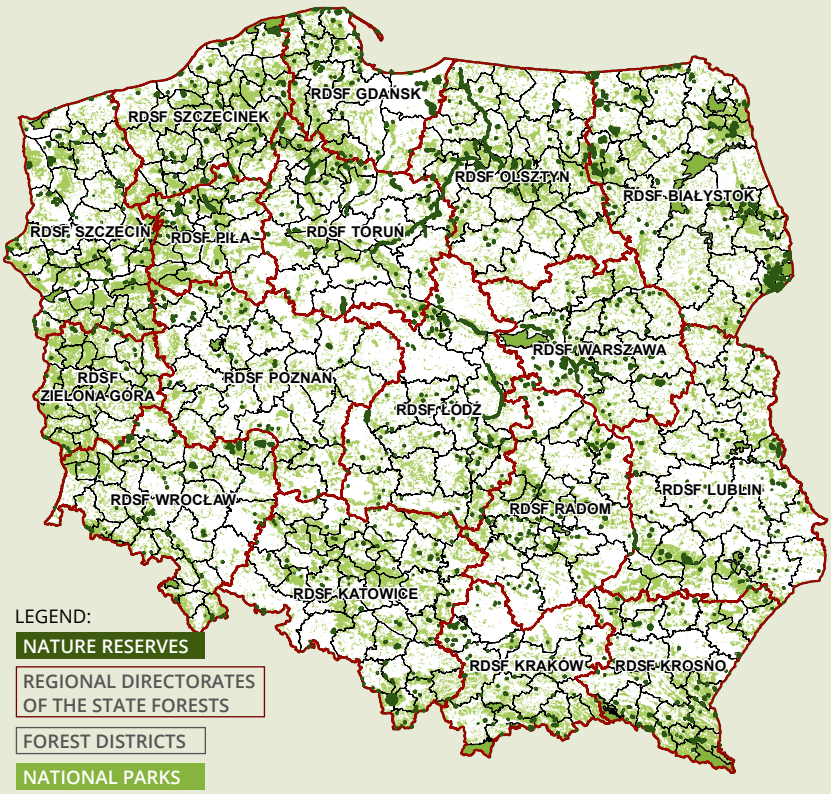
As of 31 December 2016, the State Forests inventory included the following:

- 1281 nature reserves with an area of 123.3 thousand ha;
- Natura 2000 sites covering a total area of 2891 thousand ha (38.0% of the State Forests territory), including: 133 special protection areas (SPA) for birds covering 2217 thousand ha (29.1%) and 707 sites of Community importance (SCI) with a combined area of 1678 thousand ha (21.8%);
- 10 988 natural monuments, including: 8611 individual trees, 1511 groups of trees, 133 tree avenues, 506 erratic boulders, 237 rocks, grottoes and caves, and 157 areas under monument protection (314 ha);
- 8965 areas of ecological use, in total 29 517 ha;
- 125 documentation sites with an area of 1155 ha;
- 136 nature and landscape complexes with a combined area of 37 235 ha.

Natura 2000 sites cover **38%** of the State Forests' area

In the State Forests, over 3539 protective zones for endangered species, which were officially approved, comprise a total area of 150 470 ha, of which over 21% is an area of all-year protection. Protected are refuges of birds (3147), mammals (4), reptiles (36), insects (12), plants (5), lichens (334) and other (1).

In order to preserve biological diversity and restore endangered species of flora and fauna, the State Forests also initiate their own programmes aimed at maintaining habitats and species at good condition. Among them are mainly the *Programme for the Preservation of Forest Genetic Resources*, and such projects as the *Programme for the Restitution of Fir in the Western Sudetes, Programme for the Restitution of Yew* and programmes focusing on reintroduction of capercaillie, black grouse, peregrine falcon, lynx, edible dormouse and European bison – also within own financial resources there are programmes of *in situ* and *ex situ* conservation of such species as wild service tree, smooth snake, hermit beetle, great capricorn beetle, stag beetle, hare, grey partridge and many others.



NATURE RESERVES IN POLAND within the lands administered by the State Forests (DGSF)

In forest districts there are also animal rehabilitation centres (8), botanical gardens (7) in Kudypy, Kaliska, Gryfino, Syców, Gdańsk, Karnieszewice and Marcule forest districts, and arboreta (4) in Tułowice and Supraśl forest districts, in the Forest Gene Bank Kostrzyca in Miłków, and in the Centre of Forest Culture in Gołuchów.

In order to increase the efficiency of management in forest areas characterized by a high diversity of species, with particular reference to Natura 2000 sites, the State Forests have launched a system of periodic universal inventories of plant and animal species and other organisms. In 2016, a project of a large-scale nature inventory was launched in the area of the Białowieża Forest and in Krosno RDSF.

Game animals, whose number in Poland is one of the highest in Europe, are indicative of the richness of species of the forest fauna. Population sizes of major species have remained at high level for several years so the great pressure on the forest environment from these animals results in damages. As compared with the previous year, the populations of most game animals in 2016 increased slightly. The largest increase was noticed in the size of a population of elk (by 8.1%), hare (by 6.1%) and mouflon (by 3.4%), and a decrease

The population of elk increased by over **8%** in 2016

in population of wild boar (by 5.5%) and grey partridge (by 2.4%). In the last decade, however, there was an increasing trend as far as most species are concerned. The significant increase was noted in the population of elk (by 334%), fallow deer (by 89%), mouflon (by 55%), hare (by 48%), deer (by 48%) and wild boar (by 41%). The reverse trend was observed only in the population of grey partridge (by about 25%) and fox (by nearly 8%).

The Białowieża Forest

The Białowieża Forest, covering the areas of the Białowieża National Park (10.5 thousand ha) and three forest districts: Białowieża, Browsk, and Hajnowka (52.6 thousand ha) is a very valuable forest ecosystem, recognized at national and international levels. This is the Biosphere Reserve which was also inscribed on the UNESCO World Heritage List, and this entire land constitutes the Protected Landscape Area "Białowieża Forest" and Natura 2000 Site PLC200004 "Białowieża Forest" .

In the Białowieża Forest and within SF area **1131** nature monuments have been established

By the year 2016, in the part of the Białowieża Forest managed by the State Forests there were created 21 nature reserves, including reserves of forest (14), fauna (4), flora (2) and peatland (1), with a total area of 12 028 ha. There were also established 1131 monuments of nature – mainly single trees, 110 sites of ecological use with a total area of 695 ha, 193 protection zones around the lung lichen (*Lobaria pulmonaria*) and nesting sites of birds with an area of 2727 ha. Under the provisions of the Forest Act, the area managed by the State Forests is at the same time the Promotional Forest Complex Białowieża Forest.

In addition to nature reserves, where all human intervention is subject to nature conservation, other protected areas have been created where human activity is reduced to various degrees. Additionally,

on 31 March 2016, the Director-General of the State Forests issued the Decision No. 52 on establishing detailed principles of forest management within the territorial scope of Białowieża and Browsk Forest Districts which introduced a reference area (5611 ha) with severe restrictions on forest management. In total, the reference areas and nature reserves cover 17.6 thousand ha, i.e. slightly over 33% of the combined area of Białowieża, Browsk and Hajnowka forest districts. This is 65.5% of their area, if the lands of limited use are taken into account. Therefore, commercial cuts are allowed only in 1/3 of the forest stands of the Białowieża Forest area being under the management of the State Forests.

Over **33%** of the territories of SF districts in the Białowieża Forest are reference areas

Through the decision of the Director-General of the State Forests, an inventory of the most important natural and cultural resources, including selected species of birds, insects, amphibians and one species of bat – western barbastelle, also rare and protected plants, as well as natural habitats and heritage objects was carried out in 2016 in the area of the Białowieża Forest. In addition, 665 surfaces were examined for the content of organic carbon in forest soils. This was the first inventory of selected components in the area of the Białowieża Forest that covered its entire territory and was done by systematic research.

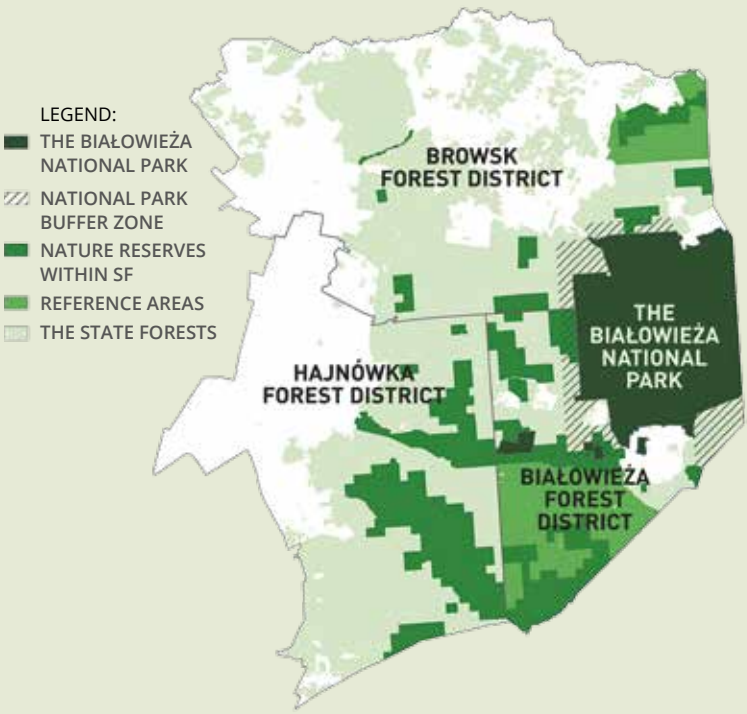
The inventory also allowed to determine the amount of dead wood in the Białowieża Forest, with particular emphasis on dead spruce which mainly comes from trees infested by the bark beetle. In the national park the average stock of dead wood amounts 109.4 m^3/ha, including 54.7 m^3/ha of spruce; in the area of the State Forests, the relevant values amount 54.5 m^3/ha and 26.7 m^3/ha, respectively. The total stock of dead wood remaining in the forest, both standing and lying, amounted to 3.8 million m^3, including spruce – 1.9 million m^3.

By the end of 2016 the bark beetle infested **379 thous.** spruces in the forest districts within BF

Began in 2012, the bark beetle gradation was still in progress in 2016. It resulted in 379 thousand infested spruce trees, most of which were in Białowieża Forest District – 199 thousand trees.

The only known effective way to fight the bark beetle gradation is to remove infested trees. However, their number, and therefore their volume, has already exceeded the allowable limits on logging as specified in the forest management plan for Białowieża Forest District. In order to save the remaining spruce stands and to avoid degradation of nature valued Natura 2000 areas, in March 2016 the Minister of the Environment approved an annex to the forest management plan prepared for Białowieża Forest District for the years 2012–2021. In the annex, the limit for harvesting wood coming mainly from infested trees was increased from 63 471 m³ to 188 000 m³. This action is supposed to stop the process of spruce dieback in the Białowieża Forest.

The economic activities undertaken by the State Forests in the administrative area of the Białowieża Forest under SF management are in line with the plan of protective tasks determined in November 2015 by the order of Regional Director for Environmental Protection in Białystok for the Natura 2000 site "Białowieża Forest".



BIAŁOWIEŻA FOREST – administrative division and forms of nature conservation

PROJECTS PARTLY FUNDED BY THE EUROPEAN UNION

The State Forests National Forest Holding is the beneficiary of three projects co-financed by the European Union under the Operational Program "Infrastructure and Environment" 2014–2020:

- *Comprehensive adaptation of forests and forestry to climate change – small retention and counteracting water erosion in lowland areas.*

The project is implemented by 113 forest districts from 17 regional directorates of the State Forests. The total cost of the project – 234 670.0 thousand PLN, subsidy from the European Union – 144 500.0 thousand PLN.

- *Comprehensive adaptation of forests and forestry to climate change – small retention and counteracting water erosion in montane areas.*

The project is implemented by 47 forest districts from 4 regional directorates of the State Forests. The total cost of the project – 206 652.0 thousand PLN, subsidy from the European Union – 127 500.0 thousand PLN.

- *Comprehensive forest and forestry adaptation to climate change – prevention, counteracting and reducing the risks of forest fires.*

The total cost of the implementation of the project in 136 forest districts from all 17 regional directorates of the State Forests is 43 096.7 thousand PLN, subsidy from the European Union – 25 500.0 thousand PLN.

FOREST PROTECTION

Types of stress factors

Forests in Poland are among the most threatened in Europe which is mainly because of the country's location on the border of two climates, i.e. continental and maritime. As a consequence, the simultaneous and constant impact of a number of factors have detrimental effect on the health condition of forests. These negative phenomena, often described as stress factors, can be classified into three broad categories with respect to their origin: **abiotic**, **biotic** and **anthropogenic**.

The influence of stress factors on forest environment is very complex and often based on synergy. Additionally, the reaction to the occurrence of an incentive may be delayed in time.

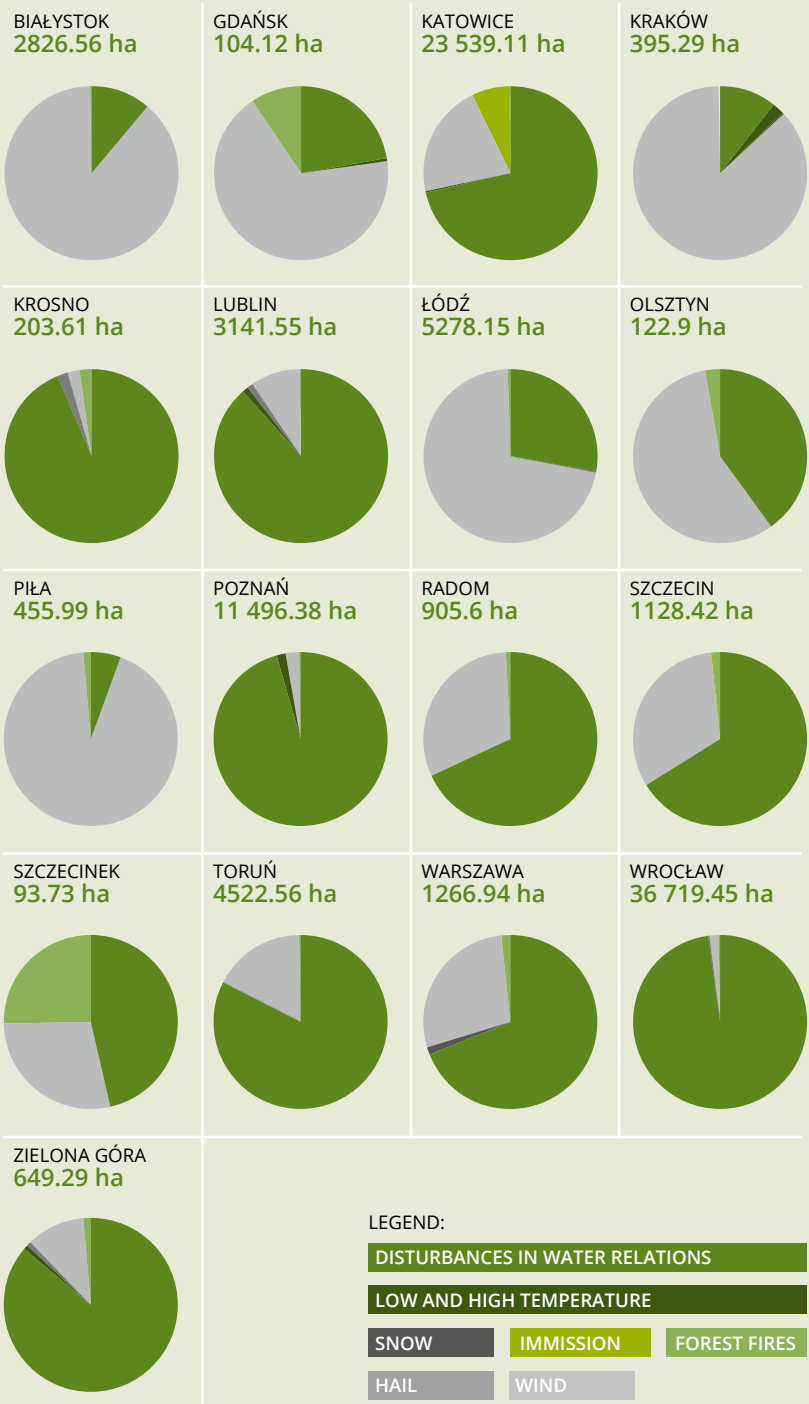
This creates a great difficulty in interpreting the observed phenomena, especially in relation to direct causal relationships. The research and observation carried out so far reveal that simultaneous occurrence of many stress factors highly and continually predisposes forest to disease and causes continuing processes of destruction in the forest environment. More intensive periodical occurrence of just one stress factor (pest gradation, drought, forest fires) may cause the collapse of the ecosystem's biological resistance and disastrous threats (local or regional).

Threats from abiotic factors

In 2016 drought and wind were major natural disasters in forests

In 2016, despite more precipitation in comparison with the previous year, the greatest natural disaster for the whole country was a strong drought which weakened both coniferous and broadleaved stands and increased their vulnerability to pests and pathogenic fungi. One of the abiotic factors of disastrous nature which affected the level of damage to trees were also hurricane winds.

There was noted nearly twofold increase in the area of stands damaged by abiotic factors. While in 2015 it amounted 48.5 thousand ha, then in the next year this acreage was 92.8 ha.



AREA OF STANDS aged over 20 years damaged to varying degrees by selected abiotic factors and anthropogenic factors in each RDSF, in 2016

Damage to forests caused by at least one abiotic factor was reported by 81% of all forest districts (44% reported one factor, 31% – two factors, 5% – three factors, 1% – four factors).

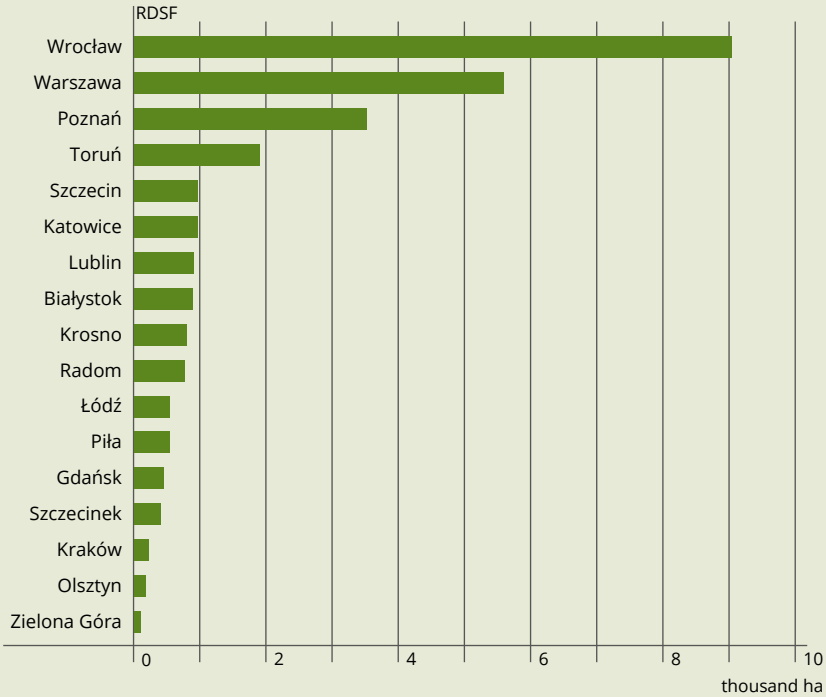
Damage caused by disturbances in water relations, mostly droughts (75 thousand ha in the area of 235 forest districts) and strong winds (15.3 thousand ha in the area of 173 forest districts), was reported on more acreage than the average. In 2016, the timber volume of broken and fallen trees of forest-forming species has slightly exceeded 3 million m^3.

Biotic threats

Threats to forests from primary insect pests

In 2016 control treatment was applied on about **28** thous. ha of forests

In 2016, in the forests administered by the State Forests, threat from insect pests was record low – the total area on which they occurred was 94 thousand ha. It was necessary to apply control treatment aimed to reduce populations of 45 pest species or groups. In 2016, the total area of forest stands subject to such treatment was nearly 28 thousand ha and was over three times smaller than in the previous year.



AREA OF POPULATION CONTROL TREATMENT for primary insect pests in individual RDSF, in 2016

Major pests damaging tree stands in 15 regional directorates of the State Forests were imagines of cockchafers. Control treatment was applied to nearly 15 thousand ha of stands in the area of 19 forest districts.

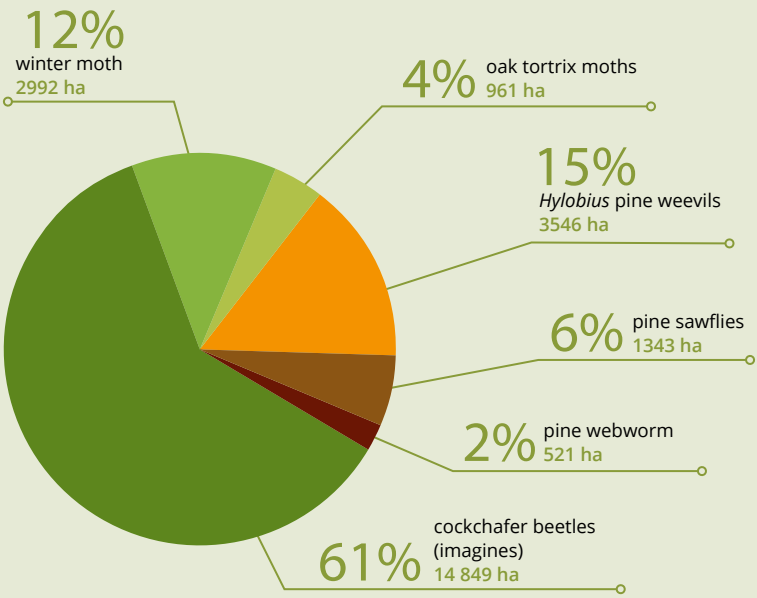
Apart from this group of insect pests, there were also other folivorous species that were subject to control treatment on the area exceeding to a slight degree 4 thousand ha. Control treatment was also applied to oak stands threatened by winter moth and its accompanying species. There also occurred oak tortrix which was combated in the area of 960 ha.

In 2016, the second group of insects causing most damage were pests occurring in nurseries, plantations and pine sapling stands. The total area subject to control treatment for this group amounted nearly 6.5 thousand ha.

Insect pests of nurseries, plantations and sapling stands were combated on nearly **6.5 thous. ha**

In 2016, in pine stands the control treatment was mainly applied against folivorous pests on an area of nearly 2 thousand ha, by 70% smaller than that in the previous year. Major pests were pine sawflies which were combated on 1.3 thousand ha.

In 2016, apart from three major groups of primary pests, the occurrence of many other species/groups of insect pests was also recorded, including pests of spruce, larch, fir and Douglas fir as well as root pests



(pests of pine stands are marked in brown, pests of broadleaved stands – in green, pests of nurseries, plantations and sapling stands – in orange)

AREA SHARE OF POPULATION CONTROL TREATMENT for major primary insect pests in 2016

of trees and shrubs, which continually damage Polish forests. The combined area of spruce, larch, and fir stands to which control treatment for insect pests was applied was 252 ha.

Control treatment for root pests of forest trees and shrubs was applied in nurseries and plantations in the area of 97 ha.

Threats to forests from secondary insect pests

In the State Forests **6.6 million m³** of timber were harvested as a result of sanitation cuttings

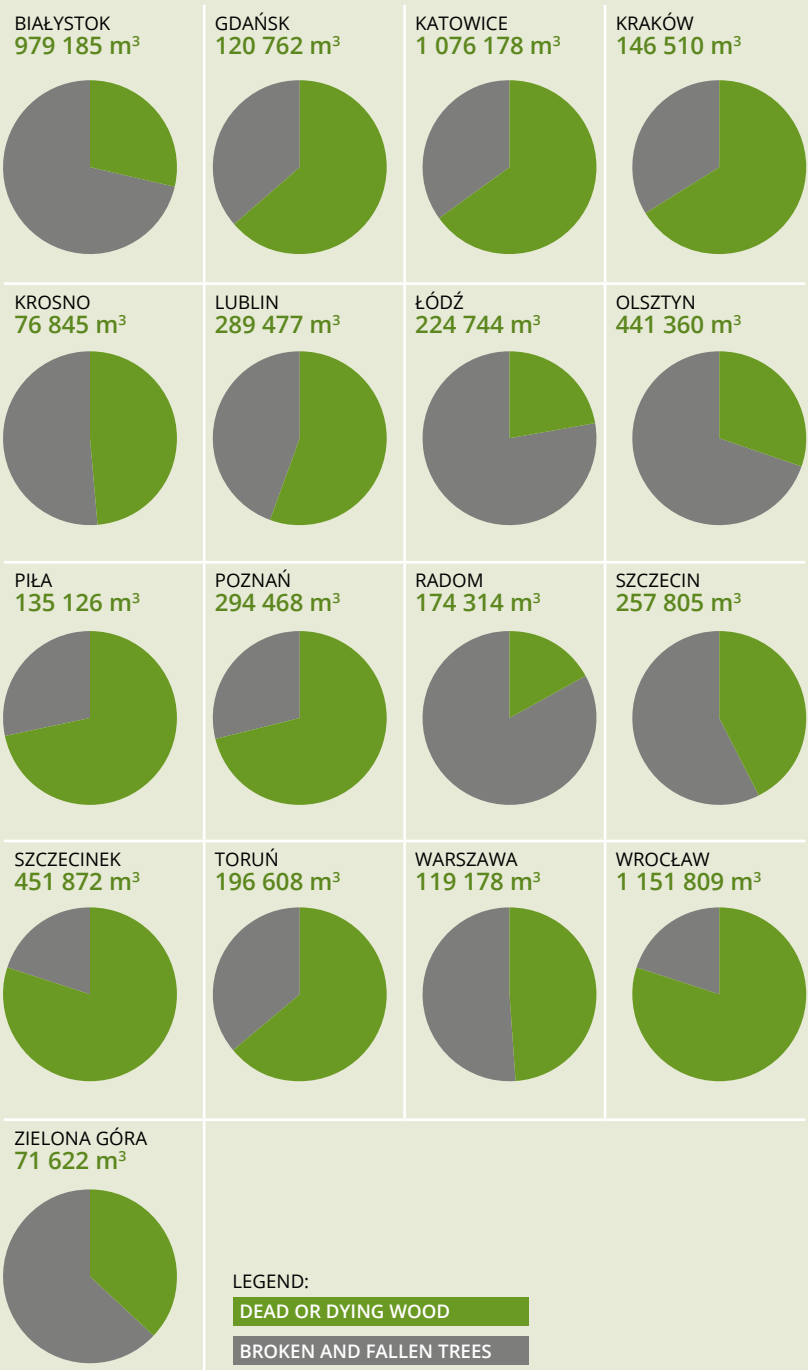
In 2016, the increased activity of secondary pests was recorded, which was caused by persistent drought since 2015. The timber harvest resulting from sanitation cutting was 6.6 million m³. About 1/3 of harvested dead wood (2 million m³) was populated by cambi- and xylophagous insects.

In 2016, coniferous stands were most threatened: 5.6 million m³ of wood were harvested, of which 41% (2.3 million m³) were broken and fallen trees. The volume of pine timber amounted 3.0 million m³, of which 53% were broken and fallen trees. Major secondary pests of pine stands were steelblue jewel beetle (*Phaenops cyanea*) and engraver beetle (*Ips acuminatus*), and also *Pissodes* pine weevils and *Tomicus* pine shoot beetles.

The amount of spruce timber harvested in sanitation cutting in 2016 amounted 2.4 million m³, of which broken and fallen trees were 25%. Major secondary pests of spruce stands in 2016 were European spruce bark beetle (*Ips typographus*) and its companion species: small spruce bark beetle (*Polygraphus polygraphus*) and six-toothed spruce bark beetle (*Pityogenes chalcographus*).

The size of sanitation cutting in broadleaved stands in 2016 was significantly smaller at 1.0 million m³, of which over 72% were fallen and broken trees.

The timber volume of oak harvested through sanitation cuttings amounted 0.2 million m³ (57% were broken and fallen trees), of birch – 0.3 million m³ (as much as 85% constituted broken and fallen trees), of ash – 0.1 million m³ (41% were broken and fallen trees).



VOLUME OF DEAD WOOD, BROKEN AND FALLEN TREES harvested in sanitation cuttings in each RDSF, in 2016

Threats to forests from infectious fungal diseases

In 2016 infectious diseases affected **0.2 million ha** of forests

In 2016, infectious diseases were reported over a combined area of 0.2 million ha of stands, an increase of 23 thousand ha (by 13%) as compared with 2015. This is the consequence of the increased risk from *Heterobasidion* root rot and drastic intensification of pine shoots dieback which covered 30 times as large area than that in 2015.

The area of oak stands with the symptoms of powdery mildew of oak increased by 30% in 2016. In case of other diseases occurring on needles or leaves, the size of an area under this threat was insignificant or remained at the level of the previous year.

The area of occurrence of pine gall rust decreased significantly (by 45%), also the occurrence of fungi causing inner cankers and rots of logs and whole stems was reported in an acreage smaller by 4.5 thousand ha (on 17 thousand ha). The total occurrence of root diseases was noted on an area larger by 12 thousand ha, however the area of damage caused by *Armillaria* root rot decreased by 3% whereas by *Heterobasidion* root rot increased by 18%.

The intensification of broadleaved stands dieback concerned beech, birch and alder and increased by 43%, 360% and 11%, respectively. However, in case of broadleaved stands with oak, ash and other tree species (sycamore, elm and fir) there was noted a decrease in the area of dieback by 38%, 23% and 26%, respectively. In 2016, health problems of poplar were recorded in a total area of 10 hectares.

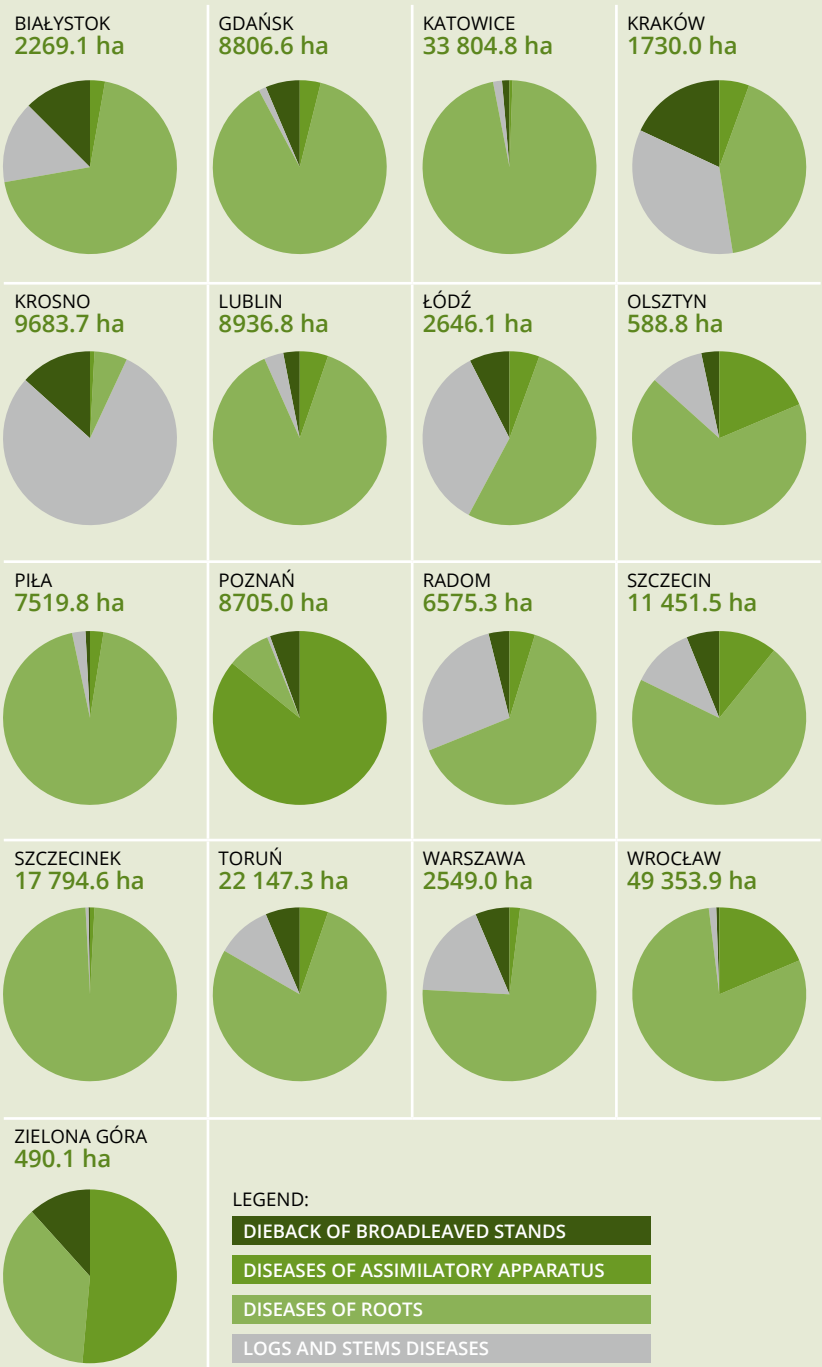
In nurseries the area of disease incidence was 428 ha and was smaller in comparison to 2015 by 58 ha. The diseases of stands aged up to 20 years were recorded in the area of 16 thousand ha, which is by 90 ha smaller than in the previous year. In mature stands (over 20 years), the occurrence of fungal diseases was observed in the area of 179.5 thousand ha, i.e. by 23 thousand ha larger than in 2015.

Root diseases cover **76.2%** of the total area affected by infectious diseases

In general structure of threat to forests from infectious diseases, root diseases continue to dominate (149 thousand ha in total, representing 76.2% of the total disease area); pine gall rust and the diseases of logs and stems were observed in the area of 17.5 thousand ha, whereas the dieback of broadleaves took an area of 6.6 thousand ha. In 2016, the diseases of assimilatory apparatus were recorded in a combined area of 21.8 thousand ha.

Protective treatment applied in forestry in order to control the spread of infectious fungal diseases is carried out in forest nurseries and in stands, as and when it is necessary. In 2016, the combined

area in which various control treatment was applied amounted 23.4 thousand ha, however chemical methods were applied on 950 ha, and biological on 15.4 thousand ha.



SIZE OF DAMAGE TO STANDS caused by groups of infectious fungal diseases in each RDSF, in 2016

Threats to forests from animals

In 2016, damage to stands caused by game and protected animals was reported in the combined area of 88.7 thousand ha. Damage within the range 21–40% was prevailing and occurred on 61.5 thousand ha. Strong damage, exceeding 40% was observed in the area of 27.2 thousand ha.

Damage caused by animals was reported on **88.7 thous. ha** of forests

Damage caused solely by game, including red deer, fallow deer, roe deer, wild boar and hare was reported in 66.7 thousand ha, of which 32.7 thousand ha are plantations, 25.7 thousand ha are sapling stands, and 8.3 thousand ha are stands in older age classes.

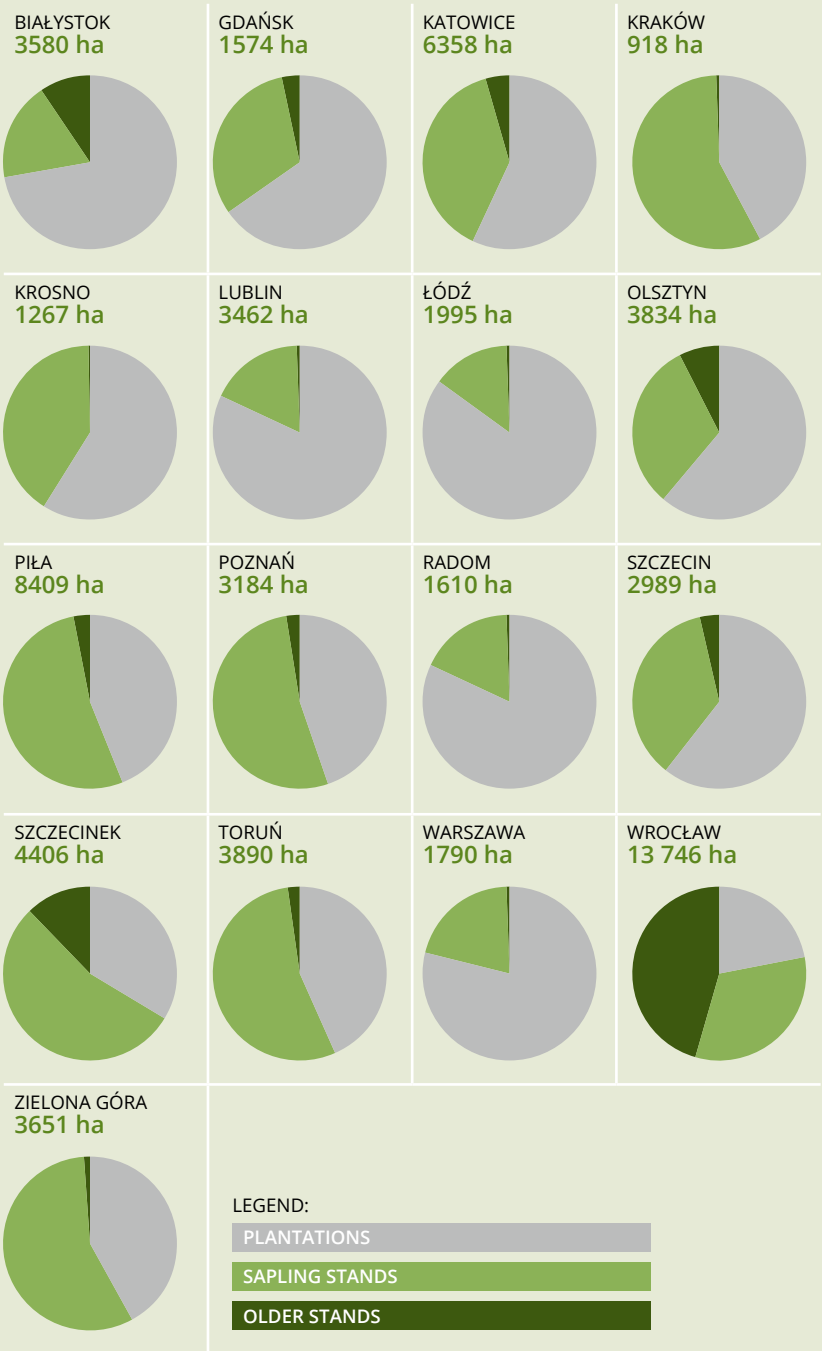
Besides damage from game, animal species under various forms of protection were also reported as being harmful to forests, above all beavers, elks and European bison.

Damage to stands caused by beavers is observed in a total area of 12.8 thousand ha. The greatest damage from beavers was observed in north-eastern and eastern Poland in the area of Białystok (3.4 thousand ha), Olsztyn (2.9 thousand ha) and Lublin (1.4 thousand ha).

The largest area damaged by elks in 2016 was noted in Białystok RDSF (3.7 thousand ha), Lublin RDSF (1.4 thousand ha) and Olsztyn RDSF (1.1 thousand ha).

The European bison, as a population of free-living animals, live in the areas of Białystok, Krosno, Piła and Szczecinek RDSFs, where the pressure on stands from these animals is observed. Injuries to stands caused by

herbivorous mammals were reported in a total area of 539 ha; in Krosno RDSF on 314 ha, in Białystok RDSF on 220 ha. The damage also appeared in the area of Szczecinek and Piła RDSFs on 1 and 4 ha, respectively.



AREA OF PLANTATIONS, SAPLING AND OLDER STANDS in each RDSF where damage exceeding 20% was caused by game and protected animal species, in 2016

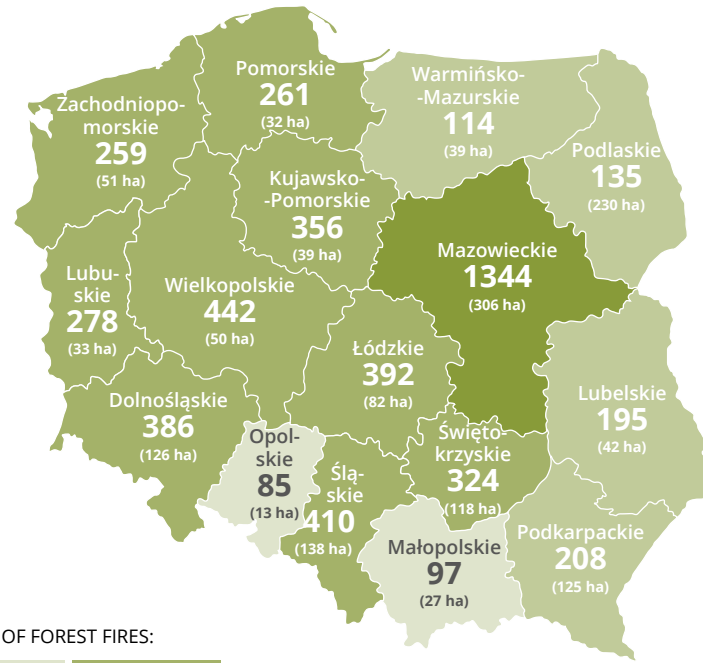
Threats to forests from anthropogenic factors

Forest fires

In 2016, in Poland as a whole, 5286 forest fires were recorded, which is by 6971 more than in the previous year; 1451 ha of stands were burnt, which is by 4059 ha less than in 2015. The largest number of fires, as in 2015, was in the Mazowieckie province (1344, which is 25.4% of the total number), the lowest, however, in the Opolskie (85), the Małopolskie (97), and the Warmińsko-Mazurskie (114).

In 2016 there were **1725** forest fires in SF

In the State Forests in 2016, there were 1725 (32.63% of all forest fires in Poland) forest fires in the area of 299 ha (20.61% of the total), excluding the territories used by the military. The largest number of fires in SF in 2016, took place in Katowice RDSF (237), followed by Wrocław (194), Szczecin (193), and Zielona Góra (164) RDSFs. Forest fires took the largest area in Katowice RDSF (54 ha), then in Wrocław (39 ha) and Szczecinek (30 ha). In 2016, in the State Forests there were two large fires (> 10 ha), resulting in 22.14 ha of burnt forest (Szczecinek RDSF in Czaplinek Forest District, and Wrocław RDSF in Pieńsk Forest District). However, in



NUMBER OF FOREST FIRES:

up to 100	251–500
101–250	above 500

NUMBER OF FOREST FIRES IN POLAND AND BURNT AREA in each province, in 2016

2015 there was only one large fire which covered an area of 17.96 ha (Olsztyn RDSF in Myszyniec Forest District).

In 2016, in the territory used by the military there were 121 fires, which comprised 144.92 ha (in 2015 there were 165, and covered 776.17 ha).

The average area of fire in the forests in all ownership categories, in 2016 amounted to 0.27 ha (by 0.18 ha less than in 2015). As compared to 2015, the average area of fire in the State Forests decreased by 0.07 ha, reaching 0.17 ha. In forests of other ownership it was 0.32 ha.

The most frequent causes of fires in the State Forests were arson (40%) and negligence (14%), however the share of fires from an unknown cause amounted 39% of all fires.

In 2016, the largest number of fires occurred in May (24.7% of fires), then June (21%), April (14.8%) and September (14.6%). During the fire season (April–September) a total of 90.6% of fires happened; the smallest number took place in August (7.4%) and July (8%).

Air pollution

Forest monitoring provides information on major pollutants in the forest areas. The network of intensive monitoring consists of 12 permanent observation plots, located in the following parts of Poland:

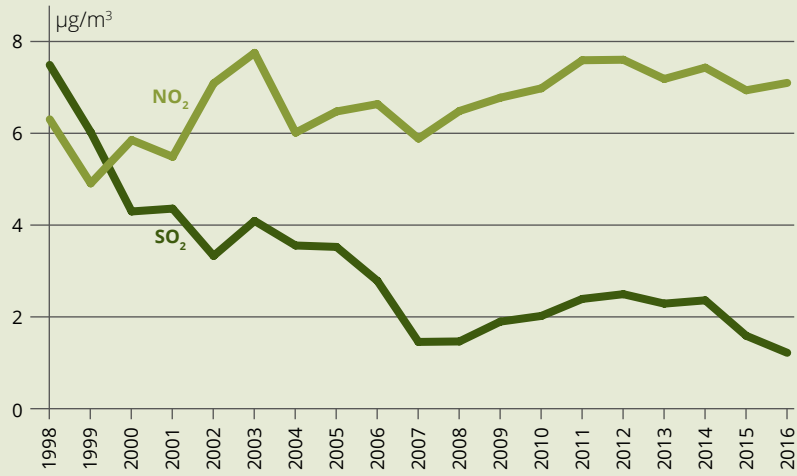
- northern and north-eastern, in: Gdańsk (Gdańsk RDSF), Strzałowo (Olsztyn RDSF), Suwałki (Białystok RDSF) and Białowieża (Białystok RDSF) forest districts;
- central and western, in: Chojnów (Warszawa RDSF), Łąck (Łódź RDSF), Krucz (Piła RDSF) and Krotoszyn (Poznań RDSF) forest districts;
- southern: Upper Silesia in Zawadzkie Forest District (Katowice RDSF) and in the mountain and foothill areas, in: Szklarska Poręba (Wrocław RDSF), Bircza (Krosno RDSF), Bielsko (Katowice RDSF) forest districts until 2013, and Piwniczna Forest District (Kraków RDSF) from 2013.

Five plots were located in pine stands, two in oak stands and two in beech stands (Gdańsk and Bircza forest districts). Other three observation plots are located in spruce stands, like the fourth, currently not functional plot in Bielsk.

According to Central Statistical Office, emissions of sulfur dioxide and nitrogen dioxide have decreased considerably in recent decades in Poland. Decreasing emissions were accompanied by a decrease in concentrations of gaseous pollutants recorded in forest areas subject to monitoring of air quality. This concerned primarily sulfur dioxide. Concentrations of SO_2 were decreasing expressly until 2007, followed by a period of relative stabilization.

NO_2 concentration over the years 1998–2016 was relatively stable, however a slight increase in concentrations in recent years has been recorded.

In 2016, monthly air concentrations in the studied forest areas ranged between 0.2–4.8 µg SO_2/m^3 (average 0.9–2.1 µg SO_2/m^3 per year) and 2.3–20.2 µg NO_2/m^3 (average 4.0–15.0 µg NO_2/m^3 per year). The concentration of SO_2 higher than in other regions of the country were recorded in Upper Silesia (Zawadzkie), at the foothills in southern Poland (Bircza) and in central Poland (Łąck and Krotoszyn). The concentration of NO_2 was the highest in central Poland (Chojnów, Łąck, Krotoszyn) and in Upper Silesia (Zawadzkie).



CONCENTRATION OF SULPHUR DIOXIDE AND NITROGEN DIOXIDE on intensive monitoring plots

THREATS TO FOREST SUSTAINABILITY

Apart from insect pests, pathogenic fungi and animals, Polish forests are more and more frequently disturbed by various sorts of abiotic factors which seldom may become large-scale natural disasters threating forests sustainability. Foresters' efforts to reinforce the sustainability of forests, mainly by rebuilding stands to match them with the habitat conditions do not always prevent damage, especially when faced with unpredictable weather anomalies.

The main responsibility for rebuilding forests and maintaining them in good health condition and proper structure falls on the State Forests. In 2016, rebuilding of forest stands was carried out in an area of 1.5 thousand ha, cleanings on 131.0 thousand ha, and thinning on 423.3 thousand ha. Moreover, the stability of stands was being reinforced by planting understoreys (0.3 thousand ha) and a second storey (2.9 thousand ha), by local afforestation of gaps (0.9 thousand ha), and by agronomic techniques and water drainage treatment (64.2 thousand ha).

In 2016 rebuilding was carried out on **1.5 thous. ha** of stands

The work which is being done in order to enhance the sustainability of forests often has limited effect in

The programmes carried out by FGB Kostrzyca are of countrywide strategic importance

the face of increasingly frequent anomalous weather events occurring in the region. It was necessary, therefore, to find longer-term solutions to preserve threatened forest ecosystems in Poland, including securing seed material from trees, shrubs and forest floor vegetation. As a result, the Forest Gene Bank Kostrzyca located in Miłków at the foothills of the Karkonosze mountains, was opened in the middle of the 1990s. The objectives for the Forests Gene Bank were prepared by the State Forests and the Institute of Dendrology of the Polish Academy of Sciences.

The Forest Gene Bank Kostrzyca has a stock of 8000 genetic resources relating to 114 forest plant species, both whole populations and individual plants. Of these, 28 species are forest-forming trees and shrubs as Scots pine, Norway spruce, European larch, Douglas fir, black pine, black alder, common (European) beech, and ash. The remaining species are of rare and protected plants which are enlisted in the *Polish Red Data Book of Plants*. Resources of the Forest Gene Bank constitute seed batches which have been harvested from the selected seed stands, conservation stands, other stands, as well as parent trees, legacy trees or conservation trees and other individual trees or parts of plants designated for long-term storage in refrigerator (10 and –20°C) and cryogenic (–150 and –196°C) conditions.

The activities of the Forest Gene Bank are of countrywide strategic importance as they concern the conservation of forests genetic resources and selective silviculture of forest trees, testing the progeny of: selected seed stands, parent trees, seed orchards, seed crop plantations; also protection and restitution of common yew and wild service tree, the restitution of fir in the Sudetes, and also *ex situ* protection of endangered and protected vegetation which grows wildly in the western part of Poland.

Kostrzyca cooperates with other centres in Poland and abroad, also inspires and contributes to scientific research concerning mainly genetic variability of trees. Development plans of the Forest Gene Bank Kostrzyca also include the storage of genetic resources of wild animals under species protection.

LEVEL OF DAMAGE TO FORESTS

The level of damage to forests in Poland has been assessed every year since 1989 as part of the Forest Monitoring programme, which is one of the elements of the National Environment Monitoring system. Since 2007, there has been a network of Level I Permanent Observation Plots of 16 × 16 km density, established in accordance with the design principles for the ICP Forests Monitoring Networks. In 2009, the network of observation plots was densified to 8 × 8 km plots, and since this year it has become better integrated both with Forest Monitoring programme and the National Forest Inventory.

Monitored are forests in all ownership categories and being under different forms of protection. Measurements are taken in observation plots located in stands aged more than 20 years; sample trees of all tree species are selected for scrutiny from major layer of stand.

One of the basic parameters for the assessment of tree damage is the level of defoliation, i.e. the loss of leaves or needles, estimated at 5% deviation.

In 2016, the assessment of the condition of crowns was made on 40 020 trees located on 2001 Level I Permanent Observation Plots. The average defoliation of all species amounted to 22.7%, all coniferous – 22.4%, broadleaved – 23.2%. The share of healthy trees (up to 10% defoliation) of all species was 8.3%, and of damaged tress (over 25% defoliation) it was 19.5%. Broadleaved species had larger share of healthy trees (11.2%) and larger proportion of damaged trees (24.0%) than coniferous species (6.7% and 17.1% respectively).

In Polish forests **8.3%** of trees are healthy

Among coniferous species the healthiest was fir which was characterised by the highest proportion of healthy trees (16.3%), low share of damaged trees (17.5%) and the lowest average defoliation (21.1%). The most damaged was spruce with lowest share of healthy trees (9.2%), the highest proportion of damaged trees (25.7%) and the highest average defoliation (24.2%) as well.

Among broadleaved species the healthiest was beech with the highest proportion of healthy trees (24.3%),

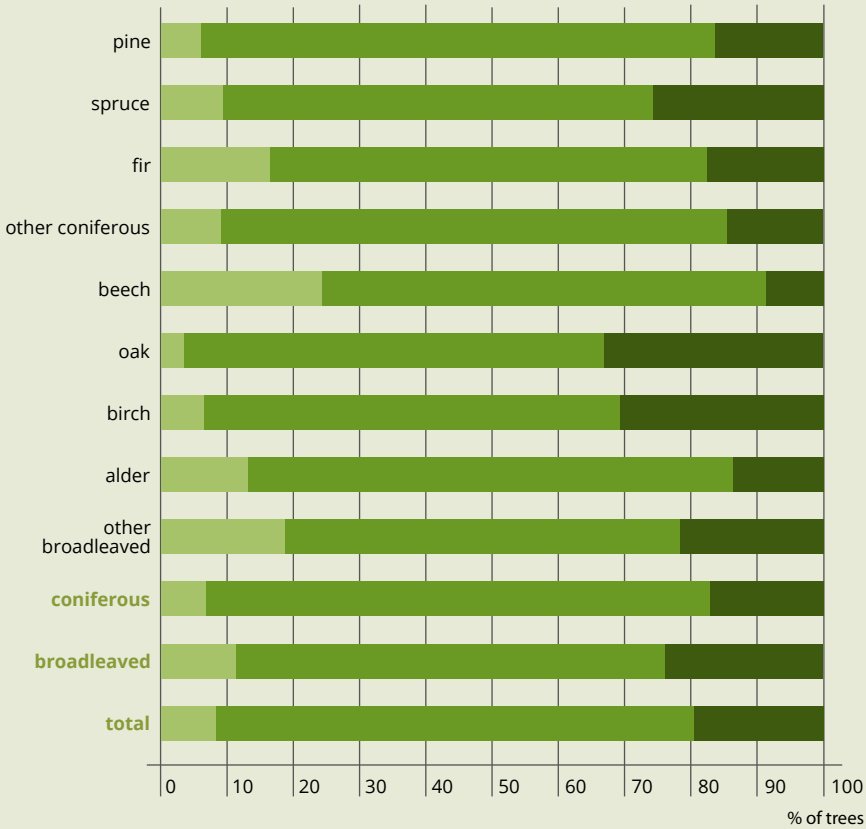
the lowest share of damaged trees (8.8%) and the lowest average defoliation (17.8%) in this group of species. The most damaged was oak with the lowest share of healthy trees (3.4%), the highest proportion of damaged trees (33.2%) and the highest average defoliation (25.7%).

Beech is the healthiest tree in Polish forests

The highest proportion of damaged trees was recorded in national parks (28.5%), lower in forests of other ownership (25.3%) and in private forests (22.5%); the lowest share was in the State Forests (18.0%).

The results of observing defoliation of trees on monitoring plots allow for separating areas which are diversified as far as forests' health condition is concerned. Forests in the north-western, northern, south-western, north-eastern (east of Białystok) and the southernmost regions of Poland are the healthiest.

Forest stands that are part of large dense forest complexes were healthier in comparison with stands in scattered forest areas.



SHARE OF MONITORED TREE SPECIES by defoliation classes on Level I Permanent Observation Plots (Forest Monitoring) **in 2016**

PROMOTING SUSTAINABLE FORESTRY

In 2016, the State Forests continued with the campaign "The State Forests. Welcome", directed at informing the target groups that all forests under the State Forests administration are in good hands and effectively fulfil the social, ecological and economical needs of society.

Most of the promotional activities were coordinated, on behalf of the State Forests, by the State Forests Information Centre. In 2016, in cooperation with various units of the SF and other organizations and institutions, the SF Information Centre organized several conferences, workshops, competitions, educational and sports events at national and regional levels, which included among others:

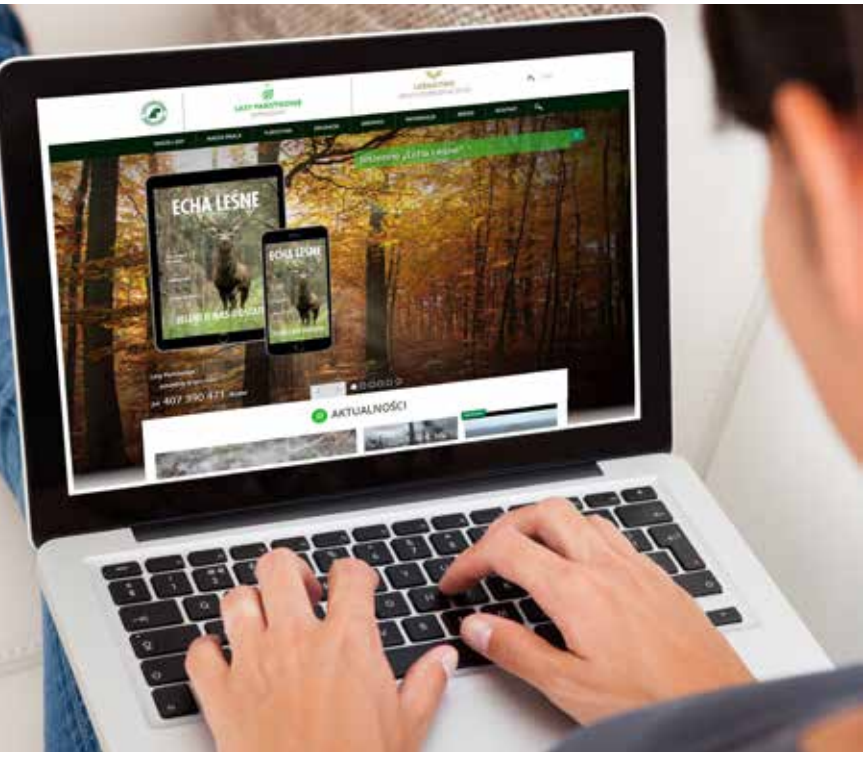
- National Forest Festival under the patronage of the President of Poland, which took place in Celestynów Forest District (RDSF Warszawa);
- "Earth Day" – a programme of activities of promotional and educational nature carried out in cooperation with the Foundation for Environmental Education Centre and RDSF in Warsaw;
- Celebration of the 35th anniversary of signing the "Sękocin Agreements";
- 15th edition of the "Day of the Polish Forget-me-not" – a national educational festival organised at the Forest Educational Centre in Jedlnia-Letnisko;
- The Lumberjacks World Championship, organized in Wisła in cooperation with RDSF in Katowice and the Association of Forest Entrepreneurs;
- "The Great Mushroom Picking" – educational and promotional event in Długosiodło, which was preceded by the information campaign broadcast by the Polish Radio One.
- "Get to know the mushrooms – avoid poisoning" – exhibition of mushrooms and an accompanying photo competition "Forest Inspirations", organized jointly with the Reginal Sanitary and Epidemiological Station in Warsaw;
- the first inaugural plenary meeting of the Forestry and Self-government Forum, during which the fields of cooperation between the State Forests and self-government units were discussed;
- first meeting of the Ecological Forum in Warsaw, attended by representatives of non-governmental environmental organizations and the State Forests;
- "I run because I like FORESTS" – "Forests in four scenes of the nature" – a series of jogging events organized in cooperation with the Club "I run because I like", and Chojnów Forest District. The idea of this action was to show the forest as an ideal place for active recreation, regardless of the season. The center has organized four open cross-country events, each in a different quarter of the year.

In 2016
the SF website was
visited by over
5 million
people

The primary source of information about the State Forests and Polish forests in general is the website of the State Forests, which contains information on the structure of the organization, its history, forest management, protection of Polish forests, as well as its market and social activities. The site has two sections: "State Forests. Welcome" (addressed to tourists and nature lovers) and "Forestry. Professional service" (addressed to foresters, academics, forestry students). In addition, on the State Forests website a separate subpage was created, which is dedicated to the Białowieża Forest and the problem of decaying spruce stands and the activities of foresters ("All about the Białowieża Forest"). In 2016, the home page of the State Forests recorded over 5 million visits and over 8.8 million page views.

The social portal Facebook is now the most popular tool for communication. For people from the outside of the State Forests' structure, Facebook fan pages are the most convenient channels to communicate with a forest district. The number of fan pages led by SF units in 2016 has increased from 130 to 160. Currently, the profiles of the State Forests have a total of nearly 400 thousand fans.

By the end of June 2016, the State Forests Information Centre launched the official profile of the State Forests on the Instagram – the largest social photographic networking site. In less than half a year there were submitted 388 photographs. By the end of 2016, the profile was observed by 3165 people.



In 2016, the official channel of the State Forests on YouTube began to appear under the name of the State Forests Television. Its purpose is to report events related to the State Forests, presenting the official positions of the management of the organization, promotion of forestry or nature and forestry education. The channel is addressed primarily to people who are professionally associated with the State Forests: their staff, wood industry representatives, students of forestry faculties and forestry technical high-schools, NGO workers, scientists, etc. In 2016, 170 films have been submitted to the State Forests channel, which is almost a threefold increase as compared to the previous year. In total, the films were viewed 1.908 million times (a year earlier the number was 920 thousand times). During this time, there were 1666 subscribers, and at the end of the year there were over 4800. In October 2016, the Centre created the Echa Leśne TV, which became the second channel of the State Forests on YouTube. It is less formal than the State Forests Television channel, and is aimed primarily at nature lovers, tourists, mushroom pickers, people taking up sporting activities in the forests, and anyone interested in forests as a hobby. The channel received 898 subscribers by the end of the year.

In 2016 SFTV offered **170** films to watch

In turn, the educational vortal "Las rysia eRysia" recorded 545 thousand visits (an average 20 thousand a month). The most popular thematic blogs are: "Forester's blog" and "Forest Educator's Blog".

An online guide **czaswlas.pl** is a database of tourist facilities provided by the State Forests. In 2016, the website recorded nearly 574 thousand visits and nearly 767 thousand page views.

The State Forests publish and distribute periodicals on forest and forestry:

- "Głos Lasu" – an internal monthly magazine of the State Forests;
- "Echa Leśne" – a quarterly magazine aimed at people who are interested in Polish forests, mainly tourists and forest enthusiasts, teachers, pupils, students and also commercial partners; it is available also for Android and iOS operational systems;
- "The State Forests Information Bulletin" – the official body of the Director-General of the State Forests. The bulletin publishes legal acts (ordinances, decisions, etc.) pertaining to forest management in Poland.

In 2016, the State Forest Information Centre implemented a publishing plan, which was in line with the promotional and educational needs of the State Forests. In total, 28 titles were published and 7 publications were prepared for printing in 2017. These were specialist and promotional publications with circulation ranging from several hundred copies to as much as 10 thousand. Promotional publications were developed as part of the ongoing campaign "The State Forests. Welcome".

In 2016 the State Forests Information Centre published **28** titles

GLOSSARY

A

Afforestation – new forest established in non-forest areas previously used for agriculture or constituting uncultivated grounds.

Age class – agreed, usually 20-year period which allows grouping of stands according to their age; stands aged up to 20 years form class I, stands aged from 21 to 40 years form class II, and so on.

Amount of cut, yield – the amount (volume) of timber scheduled for removals in management and financial plans.

Annual prescribed cut by volume in the State Forests – an annual measure of forest use, determined in forest management plans for each forest district as a sum of final and pre-final (intermediate) felling (approximately equalling 1/10 of the cut prescribed for a 10-year period). The quota is variable and depends on the condition of forests; the total sum of annual prescribed cuts in each district must be balancing over a 10-year period, i.e. at the end of the current forest management plan.

- **annual prescribed cut by volume in final cuts in the State Forests** – an annually averaged sum of prescribed final cuts agreed for every forest district; the volume of final cuts in particular forest districts is determined in the forest management plans as absolute maximum in the whole (usually 10-year) planning period and therefore must not be exceeded.
- **annual prescribed cut by volume in pre-final cuts in the State Forests** – an annually averaged sum of approximate prescribed pre-final cuts agreed for every forest district.

B

Biological diversity (biodiversity) – the variety of life forms on Earth or in a given area, usually related to three levels of nature organization:

- **species diversity** – variety of species;
- **ecological diversity** – a variety of community types (biocoenoses, ecosystems);
- **genetic diversity** – a variety of genes forming a gene pool of a population.

Broken and fallen trees – trees damaged by being broken or thrown down by wind or snowfall.

C

Class for restocking (KDO) – a type of vertical structure of stands in which there is simultaneous felling and restocking under the shelter of parent stand, and in which the level of renewal has not met the standard requirement yet.

Cleaning – a series of tending treatments aimed at adjusting species composition, species mixture and structure of restocking; regulating the density of stands and improving the quality of saplings;

early cleanings – cleanings in plantations prior to crown closure;

late cleanings – cleanings in plantations during the period between crown closure and the beginning of stands' natural self-thinning.

Clear-cuts – an area from which whole stand has been removed in final felling, designated for renewal within five incoming years.

D

Dead wood – trees which are dead or dying as a result of excessive density in the stand, attacks of primary or secondary insect pests, the impact of industrial emissions, changes in water conditions, etc.

Defoliation – loss of leaves or needles which intensifies with a worsening health condition of a tree.

Diameter at breast height (DBH) – thickness (diameter) of a standing tree measured at the standard height of 1.3 m above the ground.

E

Ecotype – *race, ecological form* – the entire population of one tree species or other plant covering a particular area; it develops as a result of long-lasting ecological conditions decisive for its establishment. Ecotypes differ with regard to their physiological properties and, less frequently, morphological characteristics.

Eutrophication – a process of accumulating nutrient substances in the environment as a result of natural or anthropogenic processes; the amount of plant nutrient override the environmental capacities to use it or decompose by other organisms.

F

Final felling (cutting) – wood harvesting associated with stand's renewal or deforestation of land due to change in the land use; the timber obtained in final felling is final felling harvest.

Folivores – leaf-eating animals.

Forest cover (or index thereof) – percentage of the area covered by forests in the total geographical territory of a country.

Forest habitat (site) type – a basic unit of the typological classification of forest sites applied in Poland comprising a forest area with similar site condition.

G

Gene conservation stands (*in situ* conservation stands) – stands selected for preservation of endangered populations of the indigenous forest tree species.

Gradation – mass occurrence of insects as a result of favourable environmetnal factors for a given species.

Growing stock (standing volume) – the thickness (volume) of all live trees in a given area (stand, province, country, etc.) with a diameter at breast height over 7 cm (measured with bark). Growing stock may be calculated per hectare.

I

Imagines – adult insects, the final stage in the process of development of these insects which undergo metamorphosis.

M

Merchantable timber (large-size wood) – (1) volume of wood with the diameter 7 cm measured with bark at the thinner end (refers to growing stock); (2) round wood with the diameter at least 5 cm measured without bark at the thinner end (refers to felled wood);

gross merchantable timber – with bark;

net merchantable timber – without bark and loss during harvest operations.

P

Pathogens – factors causing disease; primary pathogens attack healthy organisms, secondary attack already damaged organisms (e.g. trees).

pH – potential hydrogen; indicator of acidity level, e.g. of soil.

Pre-final cutting (felling) – harvest of wood related to forest tending.

Production forests – forests managed according to the principles of a planned sustainable forest management in order to fulfil productive and non-productive functions of forest, while complying to the rules of spatial and temporal order.

Productive seed stands – stands whose origin and good quality indicate that their seed crop is very likely to produce valuable offspring ensuring in given ecological conditions long-lasting production of timber of satisfactory quality and quantity.

Promotional forest complex (PFC) – a functional forest area of special ecological, educational and social value, established for the purpose of promoting sustainable forest management and protection of nature resources in forests.

Protective forests – forests that mitigate or prevent the impact of natural risks and hazard; forests under special protection because of their function.

R

Regeneration (renewal, restocking, reforestation) – new forest established in place of the previous stand which was either removed by felling or destroyed by natural disaster;

- **natural renewal** – established by self-seeding or offshooting;
- **artificial renewal** – planted by man.

Restocking class (KO) – a type of vertical structure of stands in which felling and restocking is practiced concurrently under the shelter of the parent stand whose level of regeneration allows to move on to the next stages of tending.

S

Selected seed stands – the most valuable seed stands aimed mainly at seed supply therefore they are excluded from logging for a defined period of time (excluded from final felling).

Selection structure (BP) – a type of vertical structure of stands in which there is mutual penetration of groups and clamps of trees and shrubs being of different age and height.

Small-sized timber – round wood with a diameter at the thicker end up to 5 cm (measured without bark).

T

Thinning – tending cuts made in stands after they have undergone the period of cleanings, during which economically undesirable trees are removed. Thinning has positive effect on stands as the increment of thickness, height and crown size of trees is more intense therefore the quality of stand improves.

- **early thinning** – covers the period of intensive natural selection of trees;
- **late thinning** – covers later period.

Timber resources – combined volume of trees in forest, usually equated with the measured (estimated) volume of merchantable timber in stands.

V

Volume (thickness) of wood – the amount of wood, measured in cubic metres (m^3).

ABBREVIATIONS

BF	– the Białowieża Forest
BP	– selection structure (type of vertical structure of stand)
DGSF	– Directorate-General of the State Forests
FCF	– Forest Carbon Farms
FGB	– Forest Gene Bank
KDO	– type of stand (class for restocking)
KO	– type of stand (restocking class)
NFI	– National Forest Inventory
NFP	– National Forest Programme
PFC	– Promotional Forest Complex
RDSF	– Regional Directorate of the State Forests
***SoEF* 2015**	– *State of Europe's Forests* 2015
SF NFH	– State Forests National Forest Holding

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