

# FORESTS IN POLAND 2015

POLAND 



State Forests

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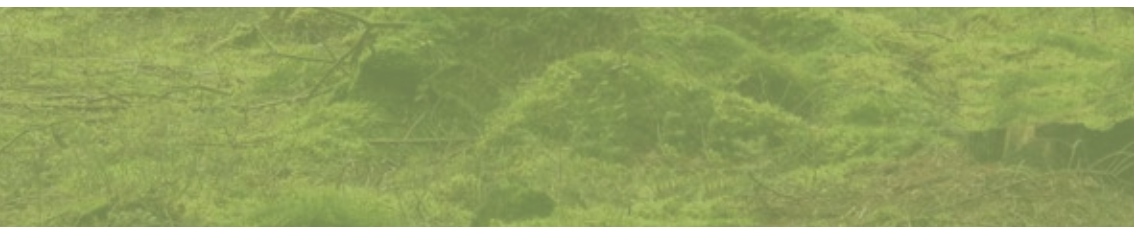
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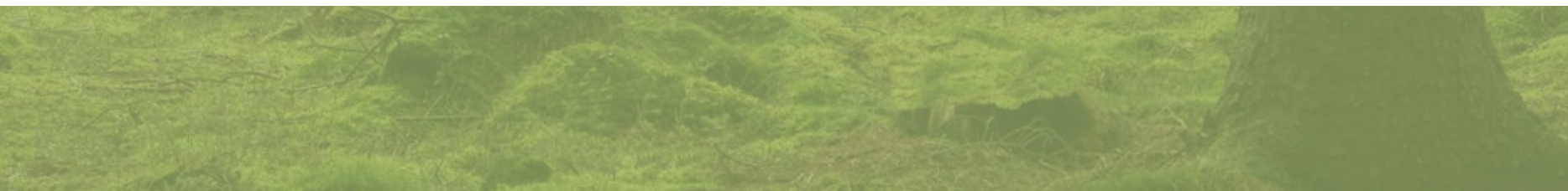


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# FORESTS IN POLAND 2015



State Forests





The Forest Act of 28 September 1991 states that the State Forests must publish an annual report on the condition of forests in Poland. This brochure is a shortened version of the report for the year 2014, which was commissioned by the Directorate-General of the State Forests and compiled by the Forest Research Institute. The report is based on materials provided by the Ministry of the Environment, the Directorate-General of the State Forests, the Forest Research Institute, the Central Statistical Office, the Bureau for Forest Management and Geodesy, and international statistics. The report describes the condition of Polish forests under all forms of ownership in 2014 in the context of the data from recent years and, where appropriate, from other countries. The scope of the report covers three areas: forest resources in Poland, functions of forests and threats to the forest environment.

## FOREST RESOURCES IN POLAND

## Forest area and forest cover

In our climatic and geographical zone forests are the least distorted natural formation. They are a necessary element of ecological balance and, at the same time, a form of land use which ensures biological production with a market value. Forests are the common good which enhances the quality of human life.

The total area of forests in Poland is 9197.9 thousand hectares (Central Statistical Office, figure for 31 December 2014), which puts forest cover at 29.4%. The Lubuskie province has the highest level of forest cover (49.2%) and the Łódzkie province has the lowest (21.3%).

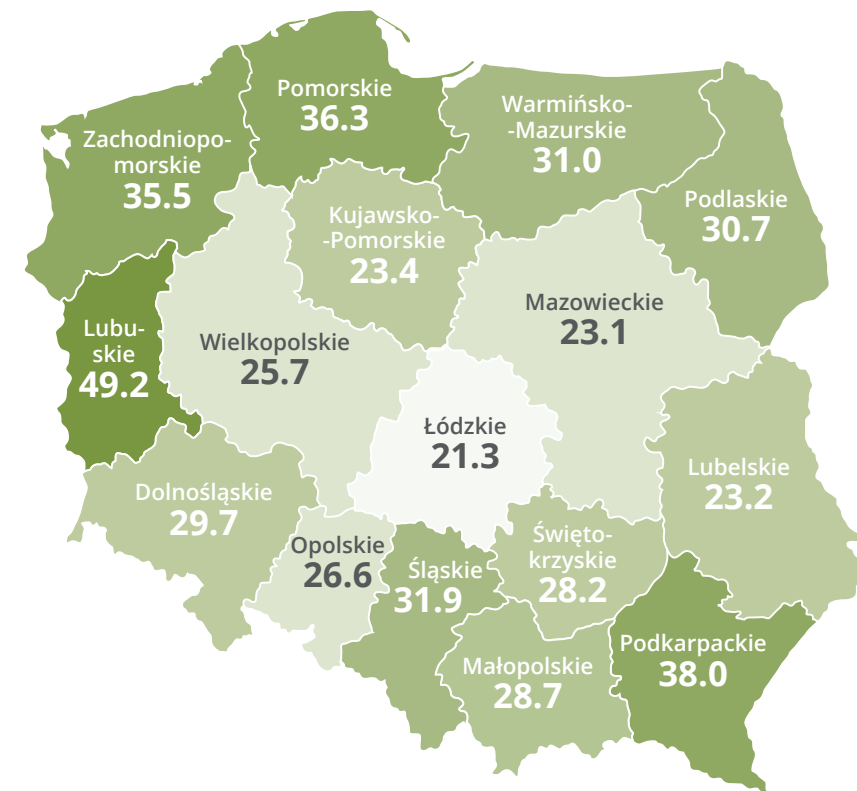
Measured by the international assessment standard, which takes into account the land associated with forestry, the forest area in Poland, as of 31 December 2014, was 9403 thousand hectares. Poland is among the countries with the largest forest area in the region, after France, Germany and Ukraine.

At the end of 2010, Poland's forest cover measured by the international assessment standard amounted to 30.4% and was lower than the European average (32.2%, exclusive of the Russian Federation). The same figure calculated at the end of 2014 was 30.7%.

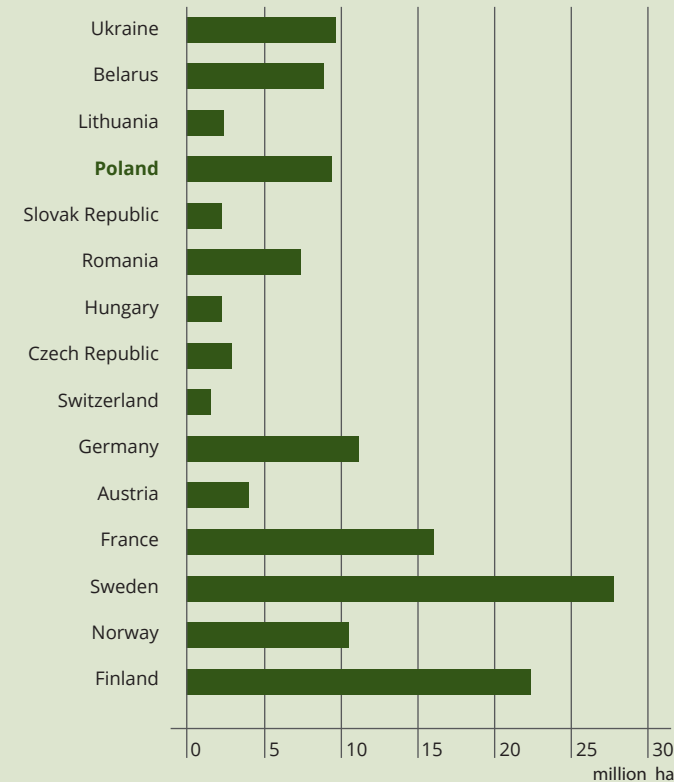
A comparison of forest area per capita in Europe with an overall land area clearly shows that these values are higher in countries with smaller populations. The forest area per capita in Poland (0.24 ha) is one of the lowest in the region.



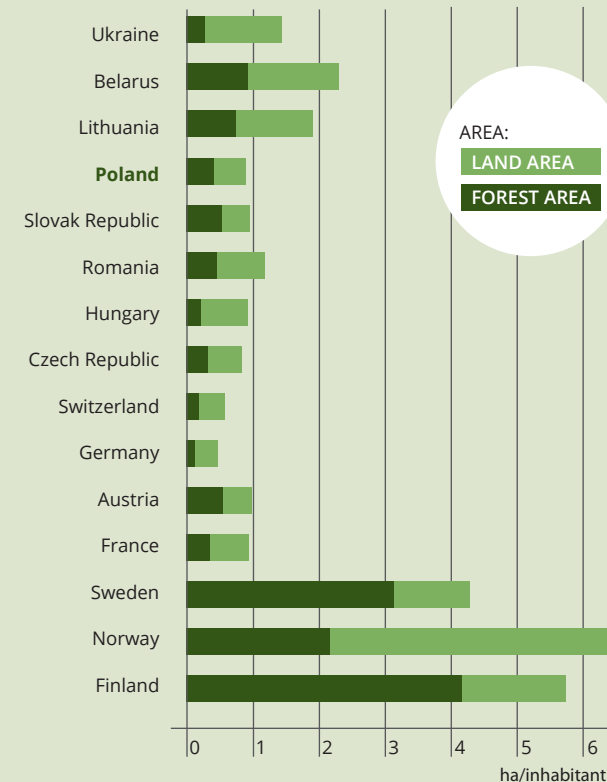
In the past, forests covered almost the whole area of Poland. As a result of socio-economic development the forest cover, which stood at 40% at the end of the 18<sup>th</sup> century, dropped to 20.8% by 1945. This process was reversed during the period 1945–1970 when almost a million hectares of land were afforested, which increased the forest cover up to 27.0%.



FOREST COVER IN POLAND (%) by province (Central Statistical Office)



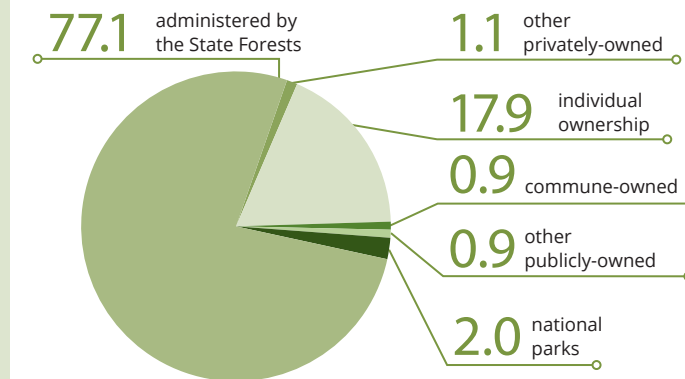
TOTAL FOREST AREA (SoEF 2011)



AREA OF FORESTS against the total land area, per inhabitant (SoEF 2011)

## Forest ownership in Poland

In the ownership structure of forests in Poland the majority, 81.0%, are publicly-owned, of which 77.1% are under the administration of the State Forests National Forest Holding (the State Forests). The ownership structure has changed very little since 1945. In the period 1990–2014 the proportion of privately-owned forests increased by 2% up to 19.0%. In the same period the proportion of the publicly-owned forests decreased from 83.0% to 81.0%. The share of publicly-owned forests in the total forest area varies in the group of countries selected for analysis.



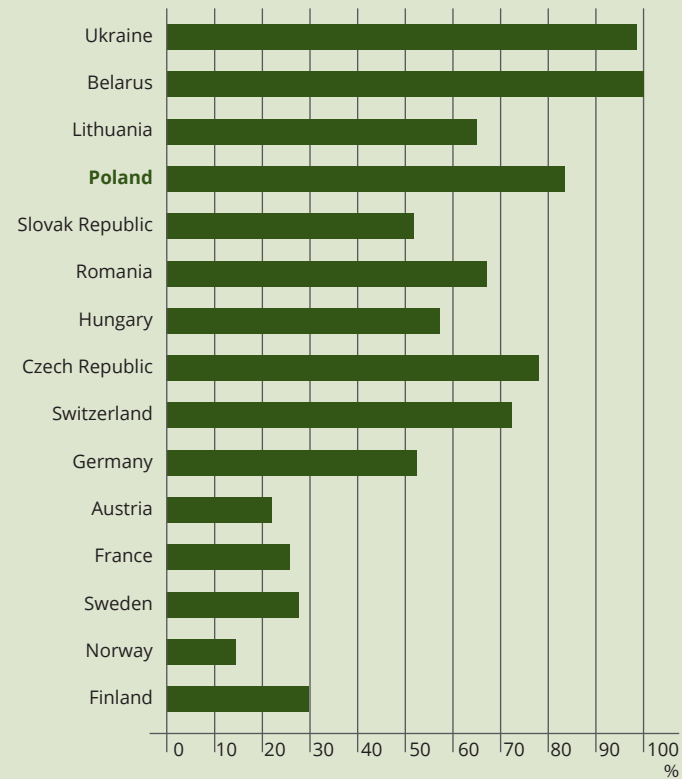
OWNERSHIP STRUCTURE (in %) of forests in Poland (Central Statistical Office)\*

\* The values do not add up to 100% due to rounding.



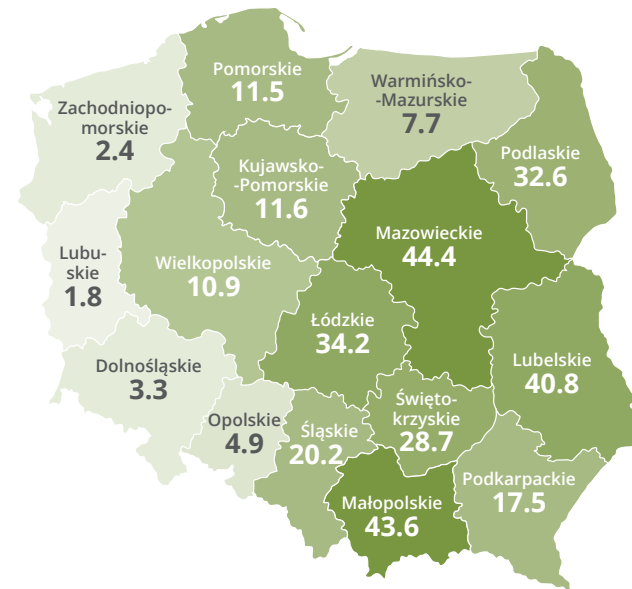
In Poland  
**81%**  
of forests  
are publicly-  
owned



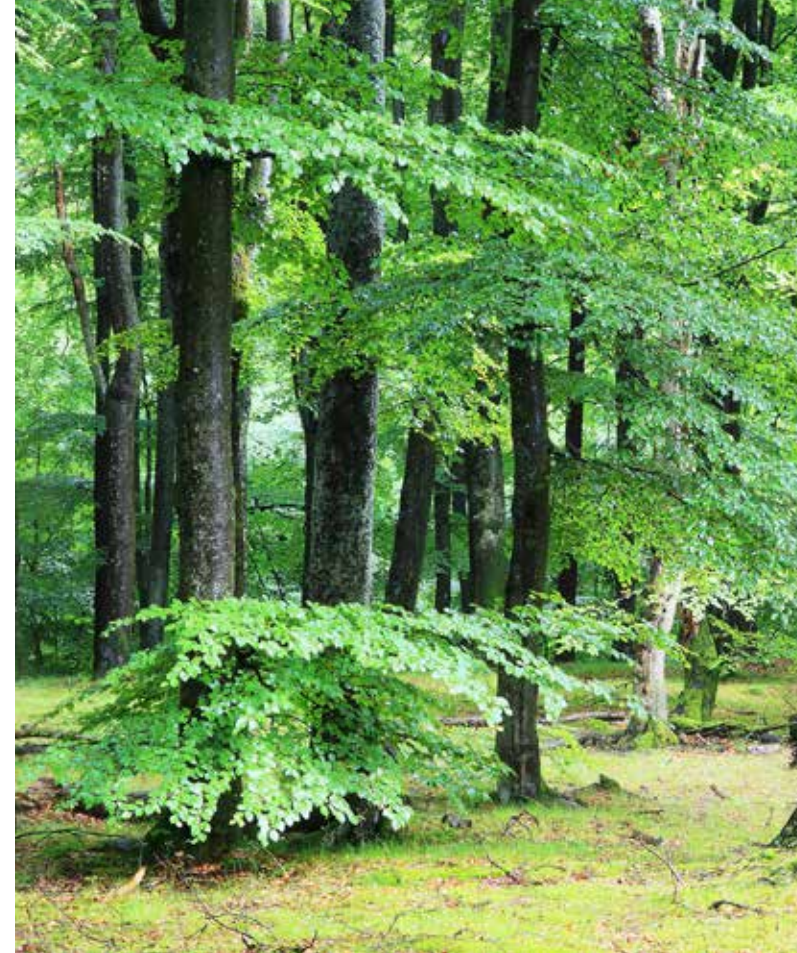


**SHARE OF PUBLICLY-OWNED FORESTS in the total forest area (SoEF 2011)**

The share of privately-owned forests in Poland varies between the regions – the greatest is in the Mazowieckie province at 365.1 thousand hectares, Lubelskie at 238.1 thousand hectares and Małopolskie at 189.7 thousand hectares. The lowest share is in the Lubuskie province at 12.1 thousand hectares, Zachodniopomorskie at 19.2 thousand hectares and Dolnośląskie at 19.7 thousand hectares.

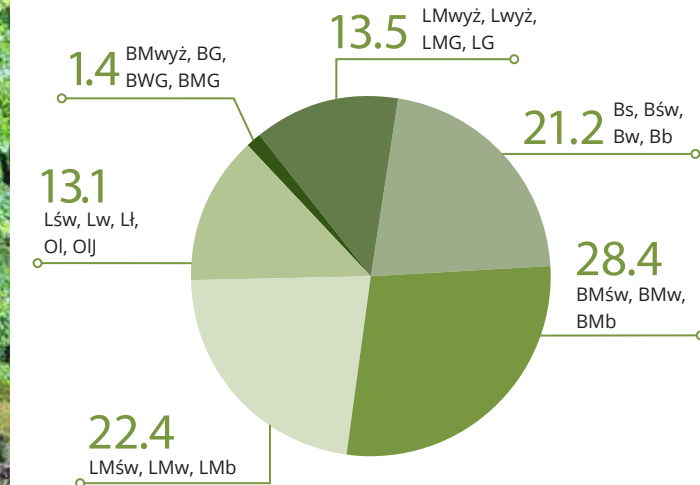


**SHARE (in %) OF PRIVATE FORESTS in the total forest area by province (Central Statistical Office)**



## Habitat structure

Forests in Poland mainly occur in areas with the poorest soils, which determines the structure of forest habitat types. Coniferous forest habitats predominate, accounting for 51% of the total forest area, while broadleaved habitats account for 49%.



**AREA SHARE (in %) of forest habitat types in Poland (Large-Scale Forest Inventory 2010-2014)**



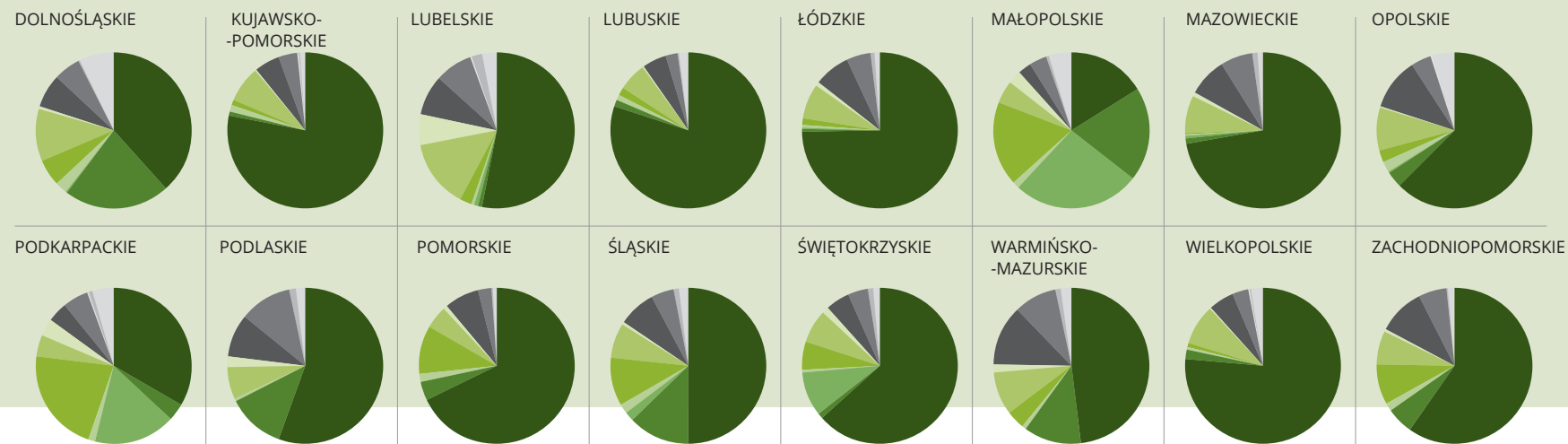
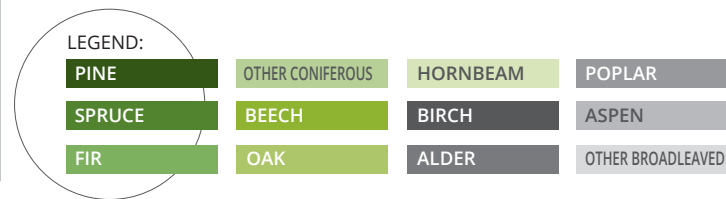
LEGEND:

- Bb – bog coniferous forest
- BG – montane coniferous forest
- BMb – bog mixed coniferous forest
- BMG – montane mixed coniferous forest
- BMśw – fresh mixed coniferous forest
- BMw – moist mixed coniferous forest
- BMwyz – upland mixed coniferous forest
- Bs – dry coniferous forest
- Bśw – fresh coniferous forest
- Bw – moist coniferous forest
- BWG – high-mountain coniferous forest
- LG – montane broadleaved forest
- Lł – riparian forest
- LMb – bog mixed broadleaved forest
- LMG – montane mixed broadleaved forest
- LMśw – fresh mixed broadleaved forest
- LMw – moist mixed broadleaved forest
- LMwyz – upland mixed broadleaved forest
- Lśw – fresh broadleaved forest
- Lw – moist broadleaved forest
- Lwyz – upland broadleaved forest
- Ol – alder forest
- Olj – alder-ash forest

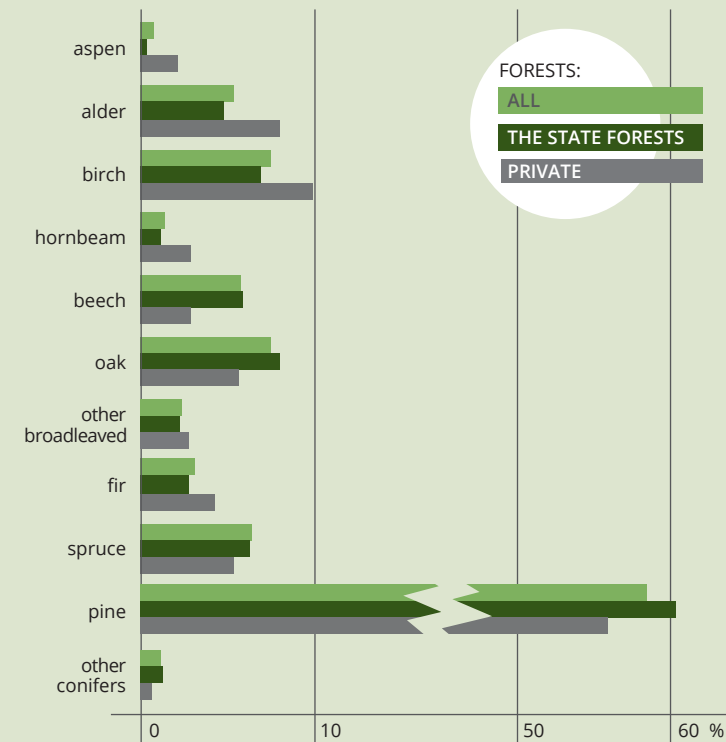


## Species composition

The 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 stand composition, in the rest of the country pine is the dominant species in the majority of stands.



AREA DISTRIBUTION OF STANDS in the structure of dominant species  
(Large-Scale Forest Inventory 2010–2014)



AREA SHARE OF DOMINANT SPECIES in forests in all ownership categories,  
in the State Forests and in private forests (Large-Scale Forest Inventory 2010–2014)

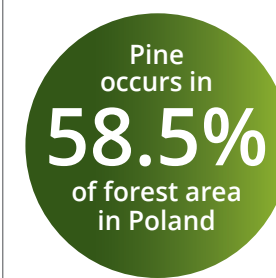
Coniferous species dominate in Polish forests, accounting for 69.1% of the total forest area. Pine, which in Poland has optimal climatic and site conditions within its Euro-Asiatic natural range, accounts for 58.5% of the area of forests in all ownership categories, 60.5% in the State Forests and 55.8% in privately-owned forests (Large-Scale Forest Inventory).

In the period 1945–2014 the species structure of Poland's forests changed substantially, which is evident in the increased share of stands with a prevalence of broadleaved species. In the State Forests, where these changes are monitored annually, the increase was from 13% to 23.4%.

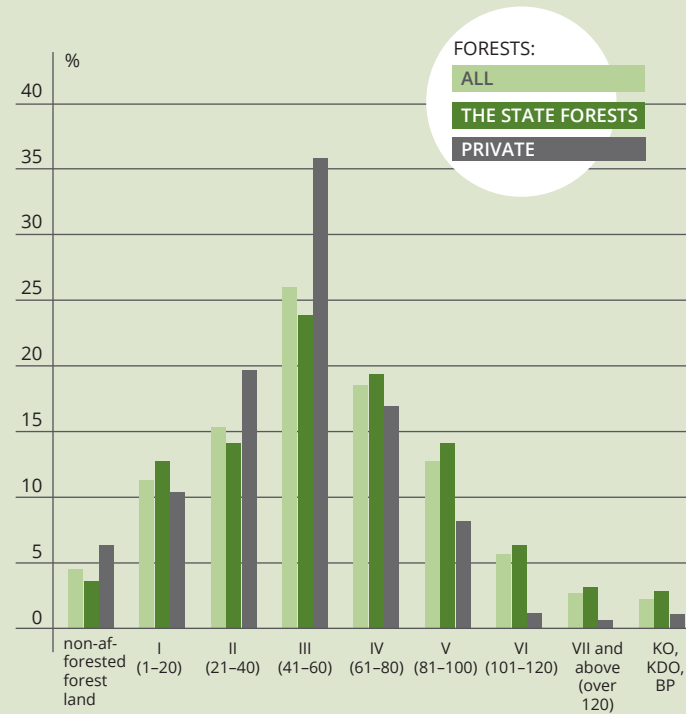
## Age structure

Stands aged 41–80 years, representing age classes III and IV, prevail in the forest age structure and cover 25.9% and 19.0% of the forest area respectively. Stands aged 41–60 years (class III) prevail in most ownership categories, while in private forests they occupy 35.5% of the area. Stands older than 100 years, including stands in classes KO, KDO and BP, account for 12.3% of the forest area managed by the State Forests, while in private forests they account for only 2.8%. Non-afforested land in privately-owned forests accounts for 6.8% of their total area and in the State Forests for 3.2%.

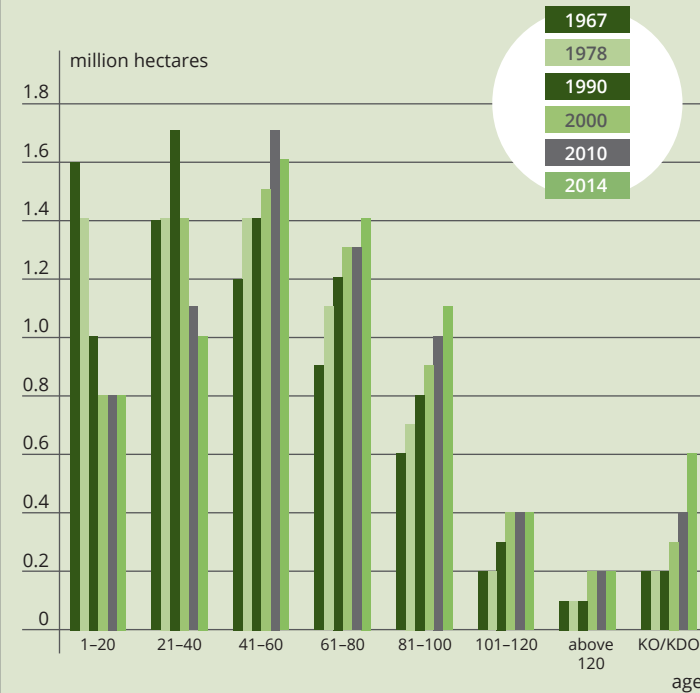
The direction of changes in the area structure of age classes is best illustrated by the forest resources administered by the State Forests.



Stands aged  
**41–80**  
years  
dominate in Polish  
forests



AREA SHARE OF STANDS BY AGE CLASS in all forms of ownership, in the State Forests and in private forests (Large-Scale Forest Inventory 2010–2014)

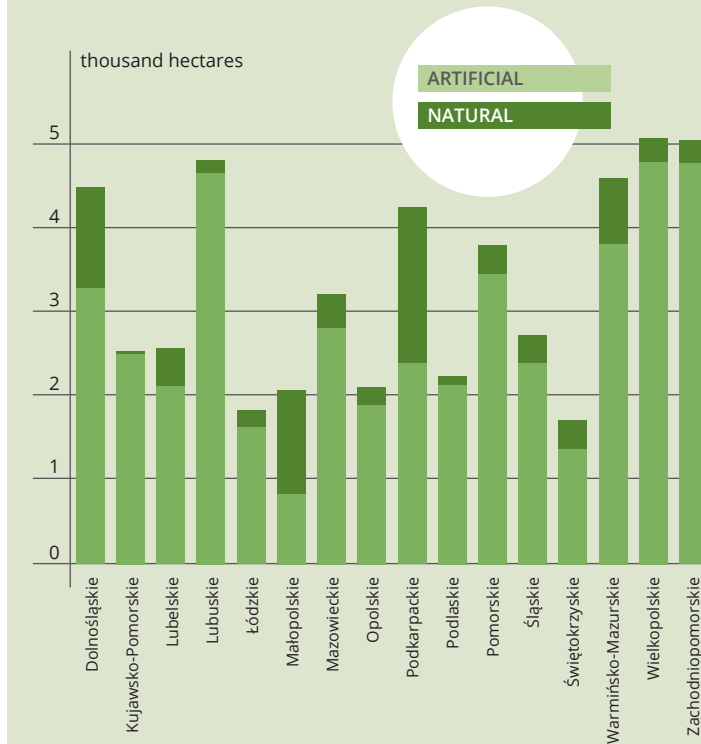


CHANGES IN THE AREA STRUCTURE OF AGE CLASSES in forests administered by the State Forests (Bureau for Forest Management and Geodesy)

The data provided by the Large-Scale Forest Inventory 2010–2014 shows that the area of stands aged above 80 years (excluding classes KO and KDO) increased from about 0.9 million hectares in 1945 to over 2 million hectares in 2014. In the same period the average age of stands in forests in all ownership categories increased to 56 years (58 years in the State Forests, 47 years in privately-owned forests).

Forest renewal (without filling gaps and introduction of second storey) in 2014 was carried out in an area of 52 941 hectares of land in all ownership categories, of which 8180 hectares (15.5%) was natural regeneration. The renewed area was larger by 1.5 thousand hectares in comparison with 2013. The work was carried out in 0.58% of the total forest area.

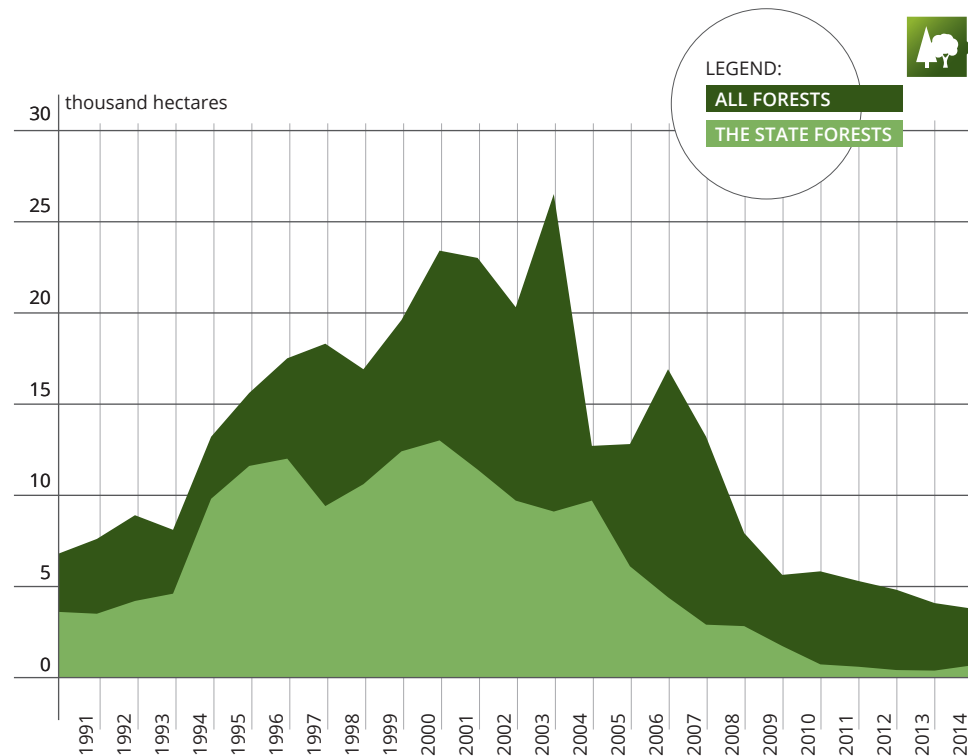
Since the mid-1970s the proportion of natural regeneration in the total area of forest renewal has been gradually increasing. In 1976–1980 the area of natural regeneration was 3.4% of the total renewal area, in 1981–2000 – 4.2%, in 2001–2010 – 10.4% and in 2014 – 15.5%.



SIZE OF FOREST RENEWAL AREA in 2014, by province (Central Statistical Office)

Almost  
**53** thousand  
hectares of forest  
were renewed  
in 2014



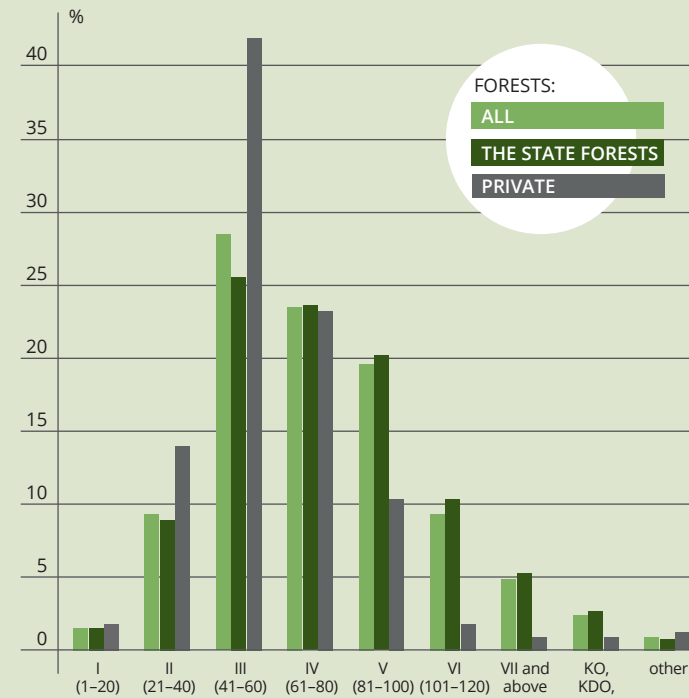


**AREA OF AFFORESTATION (artificial) in Poland in 1991–2014**  
(Central Statistical Office)

## Changes in forest area

Poland's forest area increased by 21 thousand hectares in 2014, compared with the previous year. According to the land records the forest area has increased by 504 thousand hectares since 1991. The basis for all afforestation in Poland is the "National Programme for the Augmentation of Forest Cover", which was prepared by the Forest Research Institute and recommended for implementation by the Council of Ministers in 1995 (the programme was modified in 2002). The main aims of the programme are to increase forest cover to 30% by 2020 and to 33% by 2050 and to ensure an optimal spatial and temporal distribution of afforestation.

Afforestation (artificial) carried out in 2014 covered 3776 hectares of land in all ownership categories. The drastic decline in afforestation (from 16 933 hectares in 2006, a decrease of 78%) is largely a result of changes to the criteria for designating privately-owned agricultural land for afforestation under the "Programme for the Development of Rural Areas". These changes included an increase of the minimal afforestation area, excluding from subsidy areas of grassland and land designated as Natura 2000 and the increase of subsidy for agricultural production, all of which made afforestation less attractive. A similar decrease in the size of afforested areas was observed in the State Forests where in 2014 only 674 hectares were artificially afforested, compared with 9.7 thousand hectares in 2004. This was a result of a sharp decline in the size of post-agricultural land and wasteland being designated for afforestation by the Agricultural Property Agency.



**VOLUME OF TIMBER RESOURCES in different age classes in forests in all ownership categories, in the State Forests and in privately-owned forests** (Large-Scale Forest Inventory 2010–2014)

## Structure of timber resources by volume

Over half (52.0%) of timber resources are in stands in age classes III and IV (41–80 years). This varies between 49.4% in the State Forests and 67.9% in privately-owned forests. In turn, the volume of timber resources in stands over 100 years old, including classes KO, KDO and BP, stands at 18.8% in the State Forests and 4.5% in private forests.

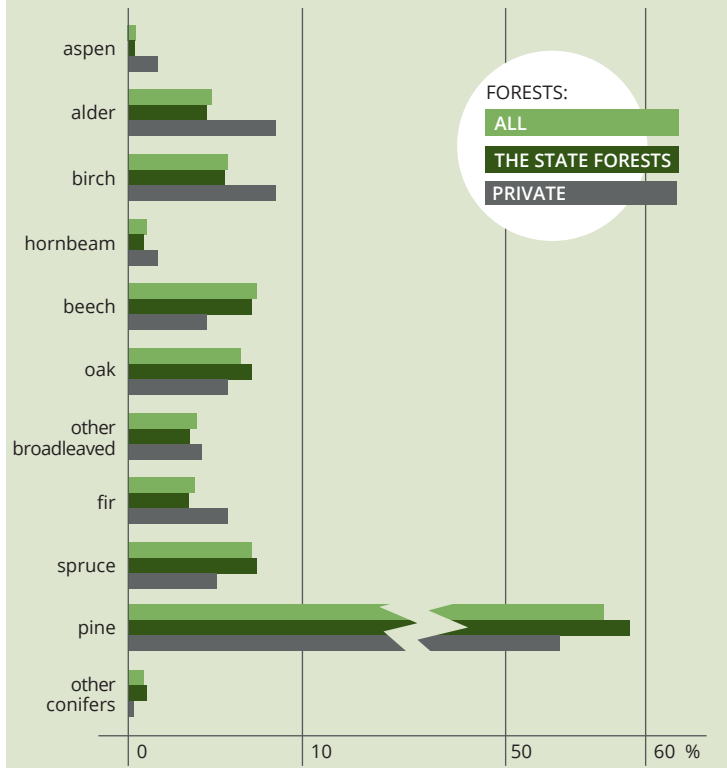
According to the Large-Scale Forest Inventory 2010–2014 calculations, the average standing volume of forests in Poland is 269 m<sup>3</sup>/ha; the same figure for the State Forests is 275 m<sup>3</sup>/ha and for privately-owned forests 232 m<sup>3</sup>/ha. These figures vary between the regions and are the highest in the Podkarpackie (308 m<sup>3</sup>/ha) and Małopolskie (307 m<sup>3</sup>/ha) provinces and the lowest in the Mazowieckie (243 m<sup>3</sup>/ha) province.

Pine accounts for 56.8% of the volume of timber resources in all categories of forest ownership, 58.6% in the State Forests and 54.6% in private forests. Timber resources in privately-owned forests have a higher proportion of broadleaved species than those in the State Forests, particularly species such as birch, alder and aspen but with a smaller share of oak and beech.

Polish forests rank highly in Europe with regard to standing volume. The SoEF figures for 2011 demonstrate that the average for Poland, amounting to 247 m<sup>3</sup>/ha, is more than double of the European

Timber resources in Poland  
**2469**  
million m<sup>3</sup>  
gross merchantable timber

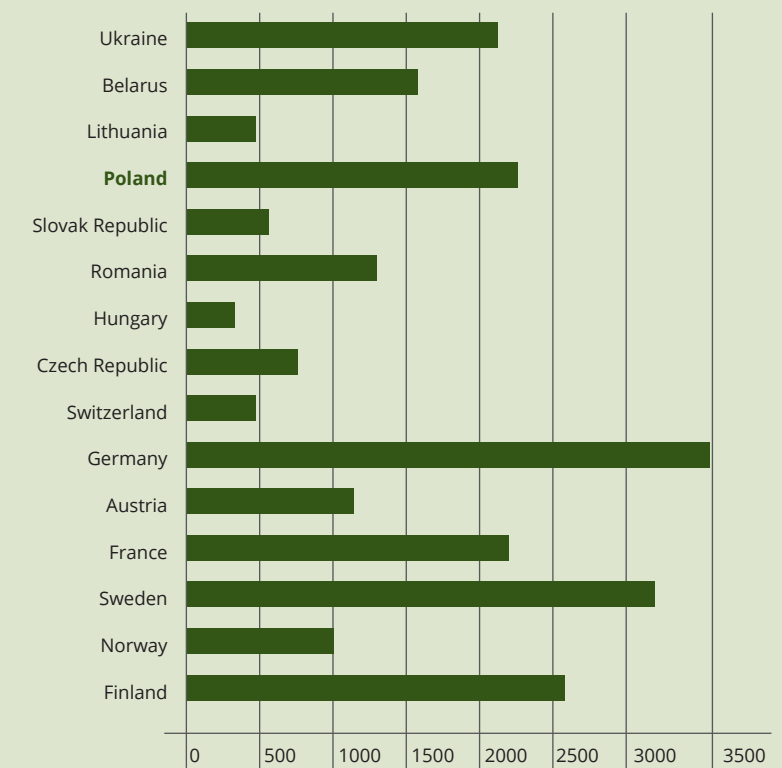
Average  
standing volume  
**269**  
m<sup>3</sup>/hectare



VOLUME OF TIMBER RESOURCES by tree species in forests in all ownership categories, in the State Forests and in privately-owned forests (Large-Scale Forest Inventory 2010–2014)

average (112 m<sup>3</sup>/ha, or 155 m<sup>3</sup>/ha excluding the Russian Federation). These figures include forest area and land associated with forestry.

Poland, with a relatively large absolute area of forests and with standing volume exceeding the European average, has significant timber resources which amount to more than 2.3 billion m<sup>3</sup>, according to SoEF 2011.



TIMBER RESOURCES in selected countries (SoEF 2011)



STANDING VOLUME in selected countries (SoEF 2011)

STANDING VOLUME (m <sup>3</sup> /ha):			
251–346	101–150	51–100	0–50
201–250	51–100	0–50	
151–200	0–50		

#### LEGEND:

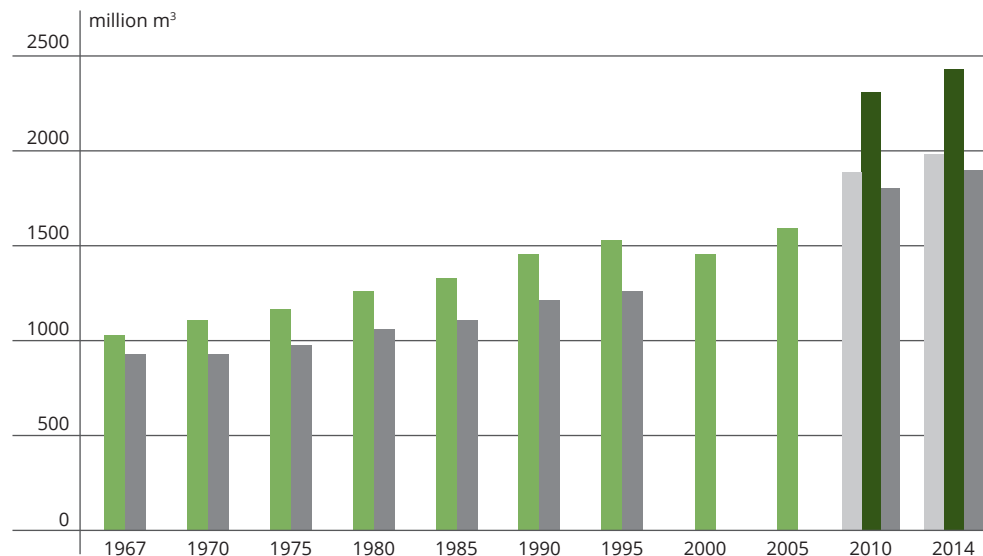
ALL FORESTS (Central Statistical Office)

THE STATE FORESTS (Large-Scale Forest Inventory\*)

ALL FORESTS (Large-Scale Forest Inventory\*)

THE STATE FORESTS (Bureau for Forest Management and Geodesy)

\* Large-Scale Forest Inventory data for periods 2006–2010 and 2010–2014



**TIMBER RESOURCES in Poland's forests in the period 1967–2014, in million m³ of gross merchantable timber**  
(Central Statistical Office, Bureau for Forest Management and Geodesy, Large-Scale Forest Inventory), figures for 1 January

## Changes in timber resources

There has been a steady growth of timber resources since the first inventory in the State Forests took place in 1967. A reliable source of data in the last few years has been the Large-Scale Forest Inventory which also includes information on resources in privately-owned forests. In relation to the State Forests the statistics produced by the Large-Scale Forest Inventory give a slightly higher figure (by 6%) for forest resources, than the annually updated data concerning forest area and timber resources from the Bureau for Forest Management and Geodesy. According to the Large-Scale Forest Inventory for the periods 2006–2010 and 2010–2014, the total timber resources in Poland were increasing annually by an average of 33 million m³.

In the last 20 years, from January 1994 to January 2014, the volume increment in forests administered by the State Forests amounted to 1199 million m³ of gross merchantable timber. During that period 665 million m³ of merchantable timber was harvested, which means that 534 million m³ of gross merchantable timber, representing 45% of the total increment, remained to augment standing timber resources. Another indicator of the general increase in timber resources is the standing volume (per hectare) within individual age classes; this has continually increased in all age classes except KO/KDO.

The increase in timber resources within the State Forests is a result of harvesting in accordance with the principle of forest sustainability and of the continuing augmentation of the forest area. However, to some extent it may also be due to more accurate inventory methods.



## FOREST FUNCTIONS

Forests fulfil diverse functions, either naturally or as a result of human activities:

### ENVIRONMENTAL (PROTECTIVE) FUNCTIONS

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

### SOCIAL FUNCTIONS

providing health-enhancing and recreational conditions for society, contributing to the labour market and helping to develop environmental awareness in society;

### PRODUCTIVE (ECONOMIC) FUNCTIONS

primarily production of renewable biomass, including timber and non-timber products and effective management of hunting.

The State Forests have a legal obligation to operate according to the principles of sustainable forest management which ensures permanence of forests, continuity of their utilisation and augmentation of forest resources.



Forests provide employment for nearly 50 thousand people directly involved in their utilisation and protection. Forests stimulate industries and support jobs in other sectors of the economy, such as timber, pulp-and-paper and energy industries.





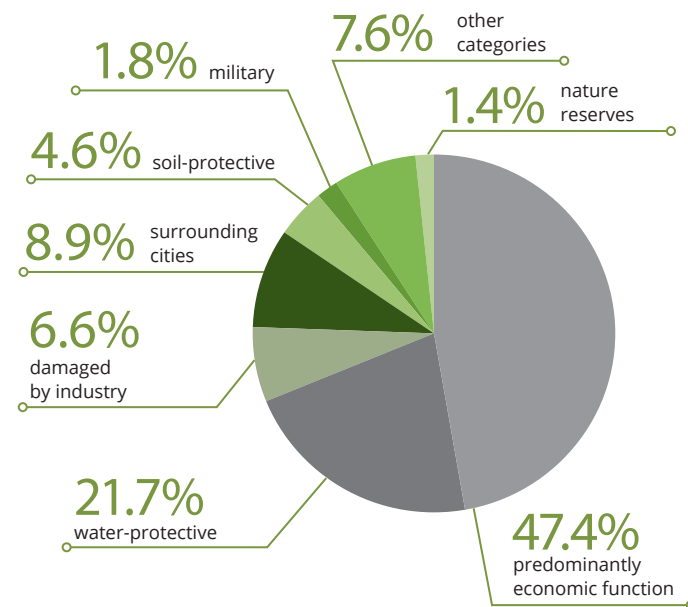
## Environmental functions of forests

Environmental and social functions of forests, often referred to as non-productive, have long been recognised in forest management which begun to distinguish a category of protective forests as early as in 1957. By the year 1975, a total of 1485 thousand hectares of forests were designated as protective, which amounted to 22.5% of the forest area administered at that time by the State Forests. At present, as of 1 January 2014, the total area of protective forests stands at 3625 thousand hectares, which represents 51.3% of the total forest area, or 52.7% including 102 thousand hectares of nature reserves. The majority of protective forests are located in the mountain regions (Kraków and Krosno RDSF) and in areas affected by industry (Katowice RDSF).

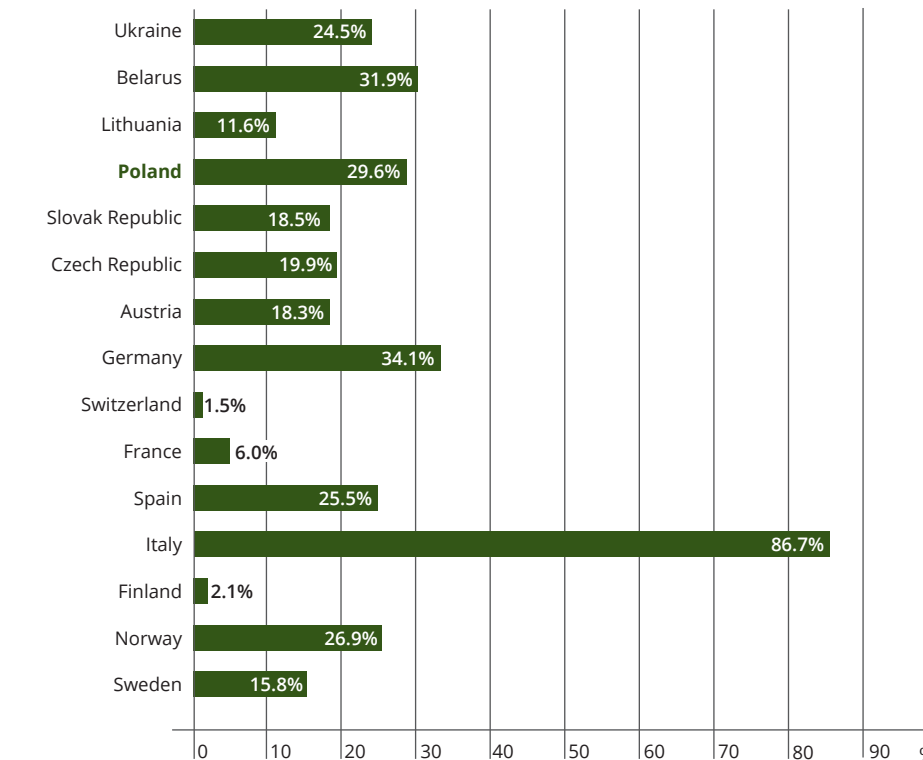
The area of private forests recognised as protective is estimated at 64.5 thousand hectares, or 3.7% of their total area. Protective forests owned by communes cover an area of 22.3 thousand hectares (26.0% of their total area). The share of protective forests in all ownership categories in the total forest area in Poland currently stands at 41.5%.

In comparison with other countries in the region, Poland has a relatively high proportion of protective forests (almost 30%, SoEF 2011). Slightly ahead of Poland are Germany (34%) and Belarus (32%) but the largest proportion of protective forests occurs in Italy (about 87%) due to large areas of soil- and water-protective forests.

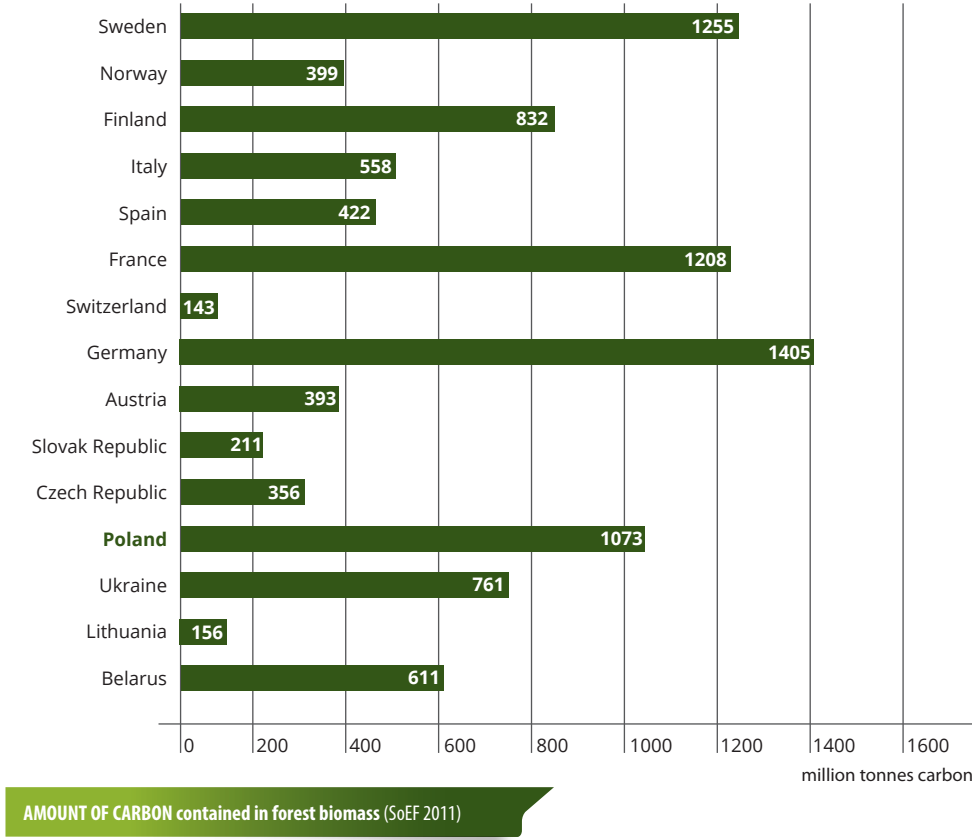
Protective forests are subject to different management practices, depending on their main function. They may include limits on clear-cutting, raising the age of trees for cutting, matching the species composition with the function or creating recreational facilities.



**SHARE OF PROTECTIVE FORESTS in the State Forests in 2014**  
(Directorate-General of the State Forests)



**SHARE OF PROTECTIVE FORESTS in the total area of forests (SoEF 2011)**



## Carbon sequestration

Assessment of the amount of carbon absorbed by ecosystems (including forests) was, until recently, of almost exclusively scientific interest. The growing threat of climate change caused by the increased concentration of atmospheric CO<sub>2</sub> and the social awareness of this threat, have brought about a more practical approach which was expressed in the Kyoto Protocol (in force since 16 February 2005).

According to the estimates based on the available data on timber resources in Poland, the forest biomass contains 1099 million tonnes of carbon, of which 26 million tonnes occur in deadwood (SoEF 2011). The diagram below compares the amount of carbon contained in forest biomass of several countries in the region. It also shows the size of timber resources in those countries. The amount of CO<sub>2</sub> absorbed every year by forests (including soil and taking into account utilisation) is estimated at 39.5 million tonnes, which roughly equals 10.8 million tonnes of carbon.

Appropriate forestry practices can contribute to the reduction of the greenhouse gases emissions, for example, increasing forest area by afforesting post-agricultural land, planting fast growing species when renewing forests and using silvicultural methods aiming at increasing standing volume. Prolonging the use of wood products and their recycling can also have an impact.

## Social functions of forests

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.

Health-enhancing properties of forest ecosystems encourage development of tourism and recreation, primarily in the areas designated as health resorts. Some types of woodland are particularly beneficial for stimulating respiratory and circulatory systems and all forests contribute to the process of cleaning the air of heavy metals and dust and help to reduce noise levels, therefore have a beneficial effect on the microclimate of urban areas.

Forests provide employment for nearly 50 thousand people directly involved in their protection and management. Additionally, they also stimulate industrial production and support many related jobs in other sectors of the economy, such as timber, pulp-and-paper or power industries.

Recreational attraction of forests provides a good opportunity to engage society in forest education. Various educational programmes organised by foresters attracted over 3 million participants in 2014. Among the events offered were outdoor lessons and guided tours, classes held in centres for forest education, meetings with foresters in and outside schools, exhibitions, competitions, sporting events and many others.

These diverse educational activities were possible because of the commitment of over 9 thousand foresters who devoted part of their time to popularising knowledge about forests and ecology. They were supported by an appropriate infrastructure which includes: forest education centres (58), classrooms (272), teaching shelters for use as "green classes" (548), educational trails (991), educational stops (1914), a "green school", other facilities (2771) and also overnight accommodation.

In providing forest education, the State Forests co-operate with centres for ecological education, national parks, cultural centres, museums, churches, media and various non-governmental organisations. Its own Information Centre also supports educational programmes.

Educational activity of the State Forests is financed mainly from the forest districts' own resources and from the national and regional funds for environmental protection. In 2014 approximately 32.6 million PLN was spent on forest education, of which 83.6% came from forest districts' own resources, 6.7% from the forest fund, 0.1% from national and 4.5% from regional funds for environmental protection, and 5.1% from other sources.

A leading role in forest education is unquestionably played by the promotional forest complexes (PFC) which attract about 30% of participants in the educational programmes organised by foresters. They employ qualified and experienced educators, known as leaders of the forest education, who have to their disposal a well-developed infrastructure: forest education centres (27), classrooms (54), teach-

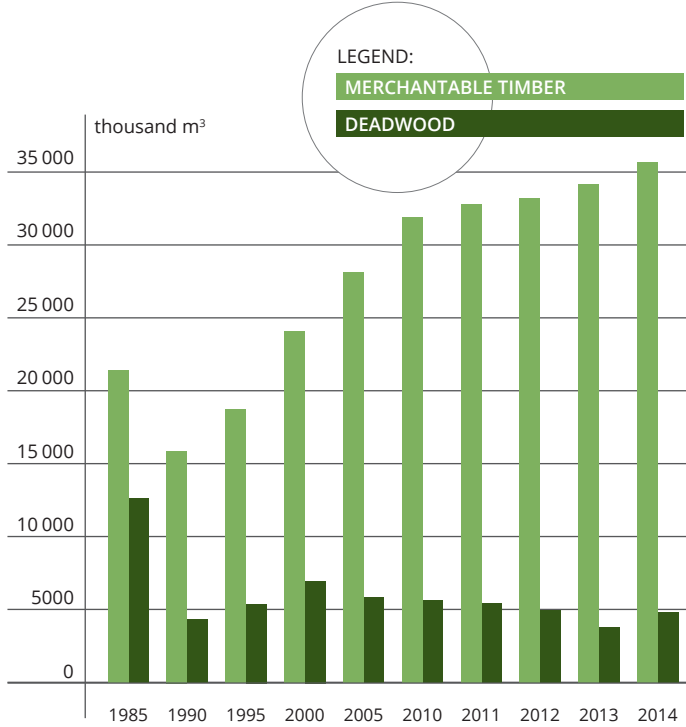


**3 million**  
participants  
in educational  
programmes





Timber  
harvest in Poland  
**53%**  
of volume  
increment



SHARE OF HARVESTED DEADWOOD in the total utilisation in the State Forests in 1985–2014, in thousand m³ of net merchantable timber (Directorate-General of the State Forests)

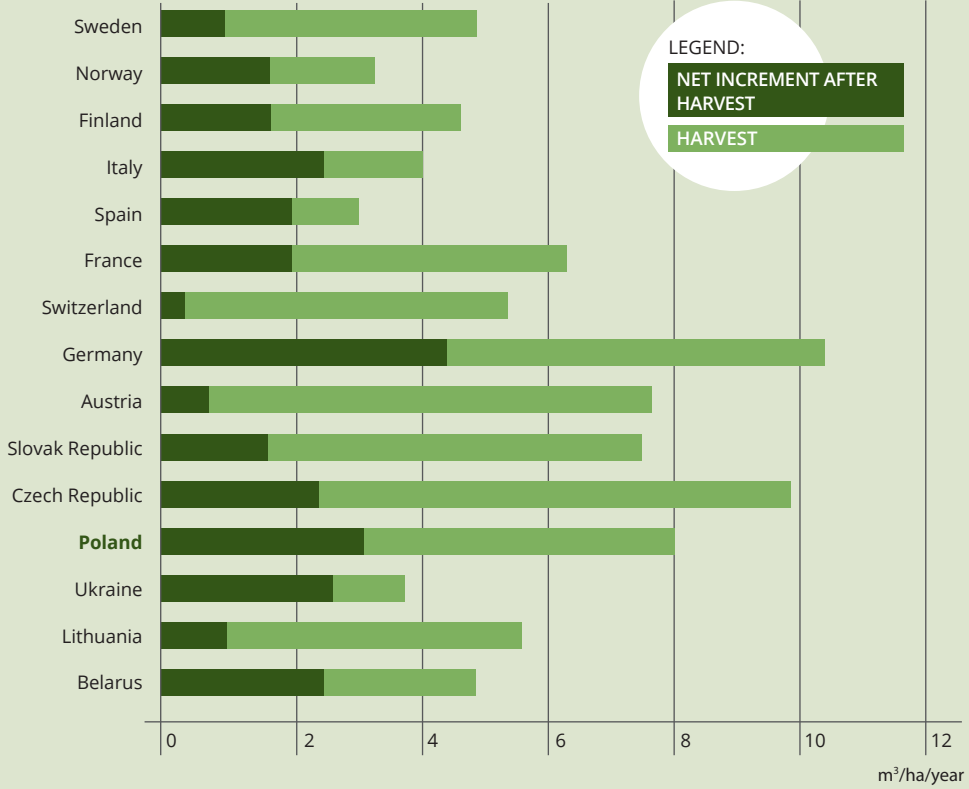
In 2014, under the clear-cut system, 6515 thousand m³ of merchantable timber was harvested in the State Forests, which accounts for 18.3% of the total harvest. The clear-cut area totalled 26.6 thousand hectares and was slightly larger than the average for the past decade at 25.1 thousand hectares. The gradual reduction in size of the clear-cut area is indicative of the progress in implementing sustainable forest management. However, clear-cutting is often necessary where a large-scale destruction occurs as a result of high winds and other abiotic factors or dieback caused by drought, fungal disease or insect infestation.

In the last 5 years the State Forests' harvest size expressed as net merchantable volume per hectare of forest area has stabilised at 5.03 m³/ha; in 2013 this indicator was 4.82 m³/ha. The harvest size has not exceeded the permitted level of utilisation and was at 53% of the current increment.

A comparison of the respective indicators for a group of countries with similar geographic conditions is indicative of the intensity of forest utilisation in Poland. The majority of countries in the region harvest over 50% of the annual increment (60% in Poland), with the exception of Ukraine (33%) and Belarus (47%).



CLEAR-CUT AREA in the State Forests in the years 1980–2014, in thousand hectares (Directorate-General of the State Forests)



PROPORTION OF HARVESTED TIMBER in the volume of annual increment, figures for 2010 (SoEF 2011)





## Forests in nature and landscape conservation

Forests in Poland are one of the most valuable elements of the environment and are protected by a variety of nature and landscape conservation measures. The highest level of protection is given to national parks, which currently number 23 and cover an area of 314.7 thousand hectares, of which 195.2 thousand hectares (62%) are forests.

The 1481 nature reserves cover an area of 165.7 thousand hectares. The vast majority of nature reserves (1272) are administered by the State Forests. The area of forest within nature reserves is 95.6 thousand hectares but this figure is incomplete due to on-going geodesy work in two regions.

Local authorities have so far created 122 landscape parks. They cover a total area of 2606 thousand hectares, including 1317.9 thousand hectares (50.6%) of forests. The areas of protected landscape include 385 nature sites with a total area of 7097.8 thousand hectares, of which 2293 thousand hectares (32.3%) are forests. Both forms of nature conservation account for 51% of the total area administered by the State Forests.

Within Natura 2000 network, at the end of 2014, there were 145 Special Protection Areas for birds (SPAs), with a total land and sea area of 5575 thousand hectares, and 849 Sites of Community Importance (SCIs) (awaiting to be designated by the European Commission as

special areas of conservation of habitats), with a total area of 3851 thousand hectares. Currently Natura 2000 sites cover 6853 thousand hectares, which is about 20% of the country's total area. Within the State Forests SPAs cover 2218 thousand hectares (29.2% of the total territory) and SCIs 1659 thousand hectares (21.8%).

The State Forests, in compliance with the Forest Act and the national policy on forests, has been maintaining an inventory of all forms of nature protection, which is updated annually with the data provided by forest districts.

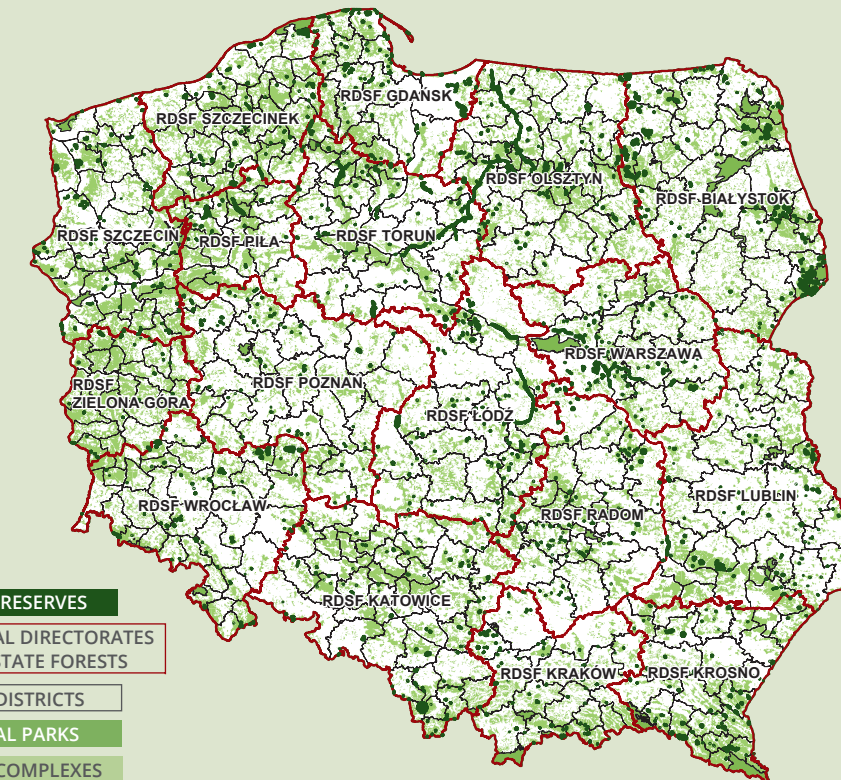
As of 31 December 2014, the State Forests inventory included:

- 1272 nature reserves with an area of 122.3 thousand hectares;
- Natura 2000 sites with a total area of 2892 thousand hectares (38% of the State Forests territory). They include: 135 Special Protection Areas for birds (SPAs) covering 2218 thousand hectares (29.2%) and 722 Sites of Community Importance (SCIs) with a total area of 1659 thousand hectares (21.8%);
- 9714 natural monuments, which include 7672 single trees, 1292 groups of trees, 107 monument tree avenues, 437 erratic boulders, 206 rocks and caves, 193 areas under monument protection (336 hectares);
- 8632 areas of ecological utility with a total area of 28 716 hectares;
- 137 documentation sites with a total area of 1075 hectares;
- 139 nature-and-landscape complexes with a total area of 47 842 hectares.

Additionally, 3267 protective zones for endangered species have been established within the State Forests, with a total area of 144 705 hectares, including all-year protection area of 32 226 hectares. These zones are created in order to protect refuges of rare birds (2974), mammals (1), reptiles (57), insects (10), plants and lichens (224) and other (1).

In the total area of forest stands under special protection over 200 658 hectares of stands are designated as the seed base, including 15 422 hectares of selected seed stands, 178 812 hectares of economic seed stands, 1884 hectares of seed and seedling orchards and 4540 hectares of gene conservation stands, which supply material for maintaining native ecotypes of forest-forming species in our forests.

The State Forests also initiate their own programmes aimed at maintaining biological diversity and protecting and restoring endangered species of flora and fauna. Among them are "Programme for the preservation of forest genetic resources", "Programme for the restitution of fir in Western Sudety", "Programme for the restitution of yew" and numerous projects focusing on reintroduction of wood grouse, black grouse, peregrine falcon, lynx, edible dormouse and bison. Other programmes focus on in situ and ex situ conservation of endangered species such as wild service tree, smooth snake, hermit beetle, great capricorn beetle, stag beetle, hare, grey partridge and many others. There are 8 animal rehabilitation centres run by forest districts, 5 botanical gardens and 5 arboreta.



LEGEND:

NATURE RESERVES

REGIONAL DIRECTORATES  
OF THE STATE FORESTS

FOREST DISTRICTS

NATIONAL PARKS

FOREST COMPLEXES

NATURE RESERVES in Poland within the territory administered by the State Forests (Directorate-General of the State Forests)

Elk  
population  
increased by  
**399%**  
in the last  
decade

The State Forests, in order to carry out projects aimed at protecting valuable elements of ecosystems, obtain additional government and EU funding. Examples include funding from Life+ programme:

- "Protection of lesser spotted eagle in selected areas of Natura 2000" (Białystok RDSF) – completed in December 2014;
- "Protection of biological diversity in forests, including areas of Natura 2000: promoting best practice" (Coordination Centre for Environmental Projects) – completed in December 2014;
- "Active protection of lowland populations of wood grouse (*Tetrao urogallus*) in the Dolnośląskie Forests and in Augustowska Primeval Forest" (Wrocław and Białystok RDSF).

Programmes funded by the European Regional Development Fund and the National Fund for Environmental Protection and Water Management:

- "Protection of yew and its restitution in the territory of Kraków RDSF" (several forest districts in the region);
- "Recultivation of degraded land and former military land administered by the State Forests" (57 forest districts and the total area of 24 thousand hectares).

In order to prevent degradation of forest habitats caused by disturbances in water relations, the State Forests carry out various actions aimed at increasing water retention. Examples of such projects include: "Increasing water retention capacity and counteracting flooding and drought in the lowland forest ecosystems" (178 forest districts across the country) and "Counteracting the effects of rainwater

outflow in the mountain regions. Increasing water retention capacity and maintaining streams and relating infrastructure in good condition" (55 forest districts in 4 RDSFs)

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 most species remain at high level and the pressure on the forest environment from these animals results in damage. In 2014 there was a small increase in the size of populations of most game animals, mainly elk, mouflon and hare, compared with 2013. In the last decade, however, this increase has been significant, most notably in the population of elk (399%), fallow deer (214%), wild boar (164%), mouflon (176%) and red deer (155%). The reverse trend was observed only in the population of grey partridge (decrease of 19%).



## THREATS TO THE FOREST ENVIRONMENT

### Abiotic threats

Several abiotic factors had devastating effects on forests in 2014, with most damage caused by disturbances in water relations (both flooding and drought), hurricane-force winds and heavy snow fall (ice and snow accretion). In most cases these events were local or regional. The amount of wood from fallen and broken trees, which was harvested in 2014, reached 3 228 568 m<sup>3</sup> and was 68% more than in 2013.

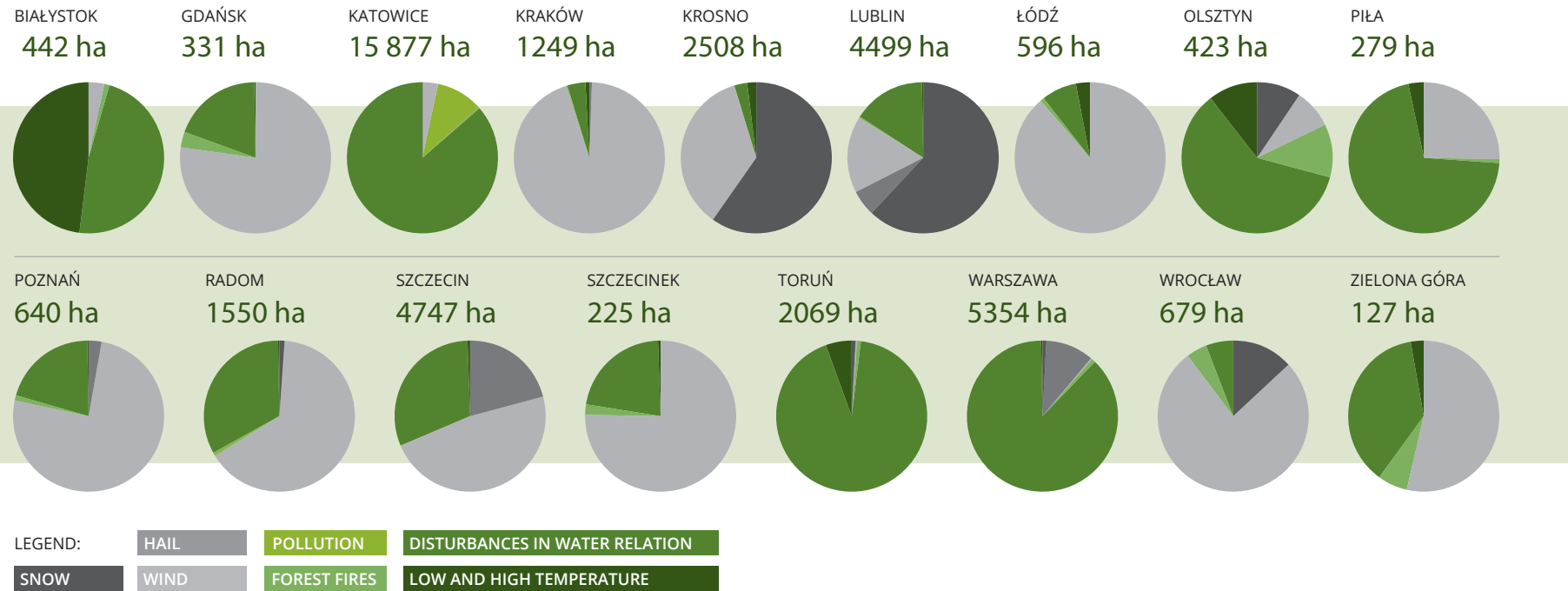
Damage caused by abiotic factors to forests in 2014 was reported in an area of 38 096 hectares in total. The largest area was damaged by disturbances in water relations (21 072 hectares across 162 forest districts), high winds affected 8781 hectares across 144 forest districts and snow and ice accretion 4485 hectares across 18 forest districts.

Most affected by abiotic factors in 2014 were stands in Katowice, Lublin and Szczecin RDSF. Area of damage to stands in the remaining RDSF was less than 2600 hectares. Disturbances in water relations were the main cause of damage to forests in Katowice, Warsaw, Toruń, Piła and Olsztyn RDSF. Snow accretion caused significant damage in Krosno and Lublin RDSF, while strong winds mainly affected stands in Szczecin, Krakow, Radom, Łódź, Poznań, Wrocław, Gdańsk, Szczecinek and Zielona Góra RDSF. Damage to forests caused by at least one abiotic factor was reported by 85% of all forest districts (39% reported one factor as a cause of damage, 28% two factors, 13% three factors and 5% four factors).



The level of threat to the forest environment in Poland is among the highest in Europe. This is due to a constant and simultaneous impact of a number of factors which have detrimental effects on the health of forests. The negative phenomena can be classified with respect to their origin as abiotic, biotic and anthropogenic.



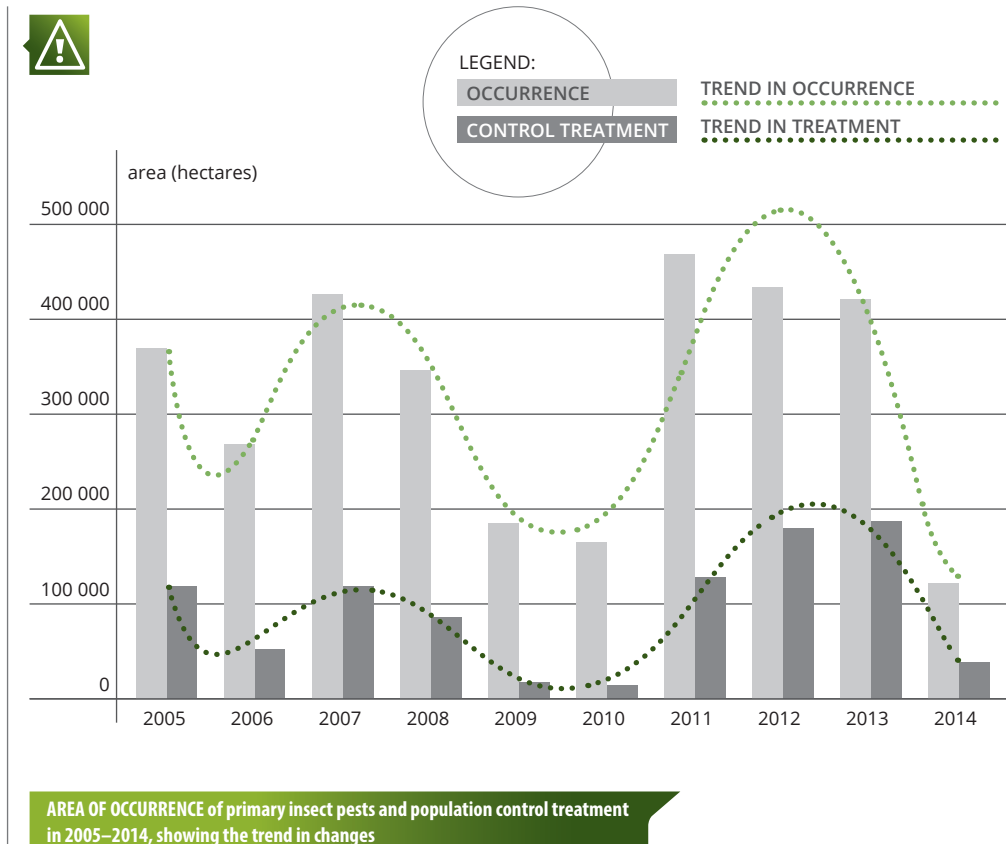


## Biotic threats

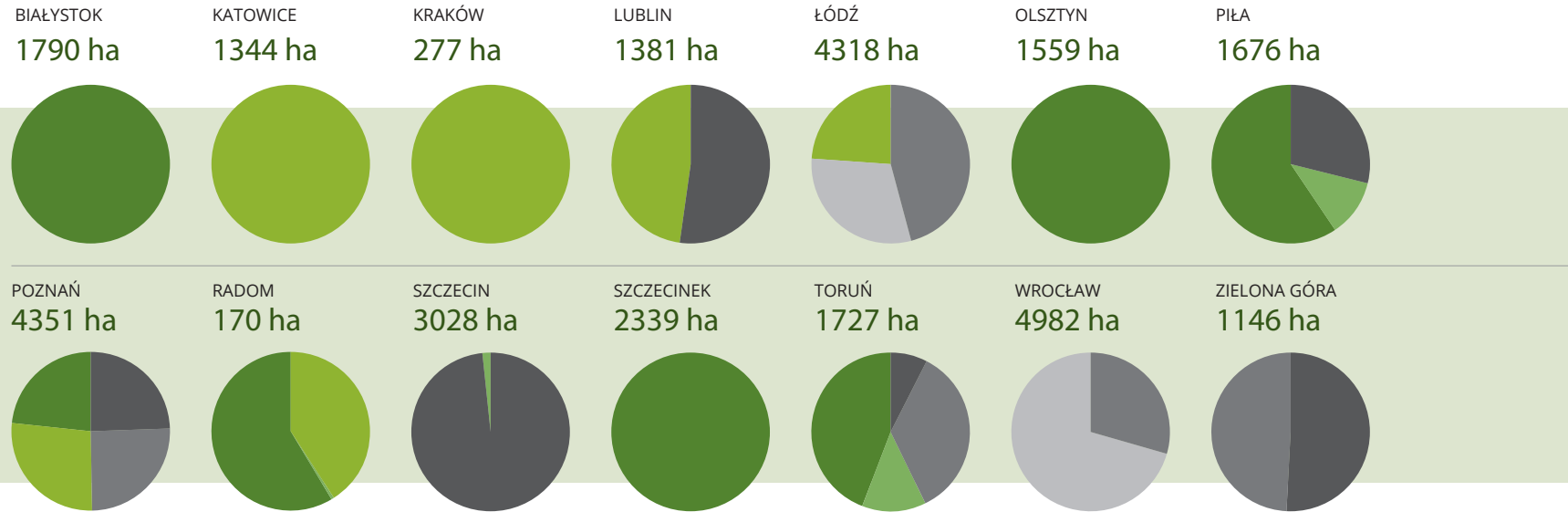
### Threats to forests from primary insects

Forests in Poland are under constant pressure from a variety of biotic factors of which insects and pathogenic fungi cause most damage, especially species that tend to occur in great numbers in a form of cyclic mass outbreaks and epiphytotics. In recent years damage caused by forest animals is also on the increase. All of these factors can cause various types of damage to stands, in extreme cases resulting in their complete destruction. The economic impact can be serious as both productive and non-productive functions of forests can be affected.

Threat to forests from primary insect pests decreased significantly in 2014, compared with the previous year. This was the lowest level of threat from this group of insects in the last decade, comparable to the years 2009–2010. In the State Forests the total area in which these pests occurred was 122 125 hectares, a decrease of 71% on the previous year. It was necessary to apply control treatment aimed to reduce populations of 40 primary insect species and groups. In the State Forests the control treatment in 2014 covered an area of 38 812 hectares, which was 80% smaller than in 2013. The largest areas subjected to control treatment were in Wrocław RDSF (5222 hectares), Poznań (4693 hectares) and Łódź (4475 hectares), while in the remaining RDSF they were below 3500 hectares.



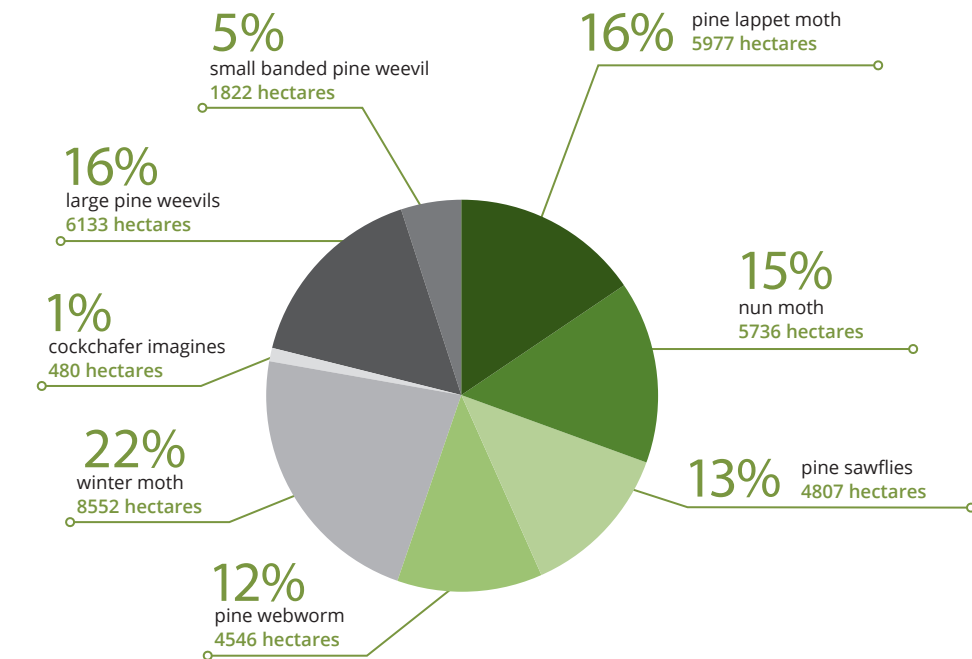




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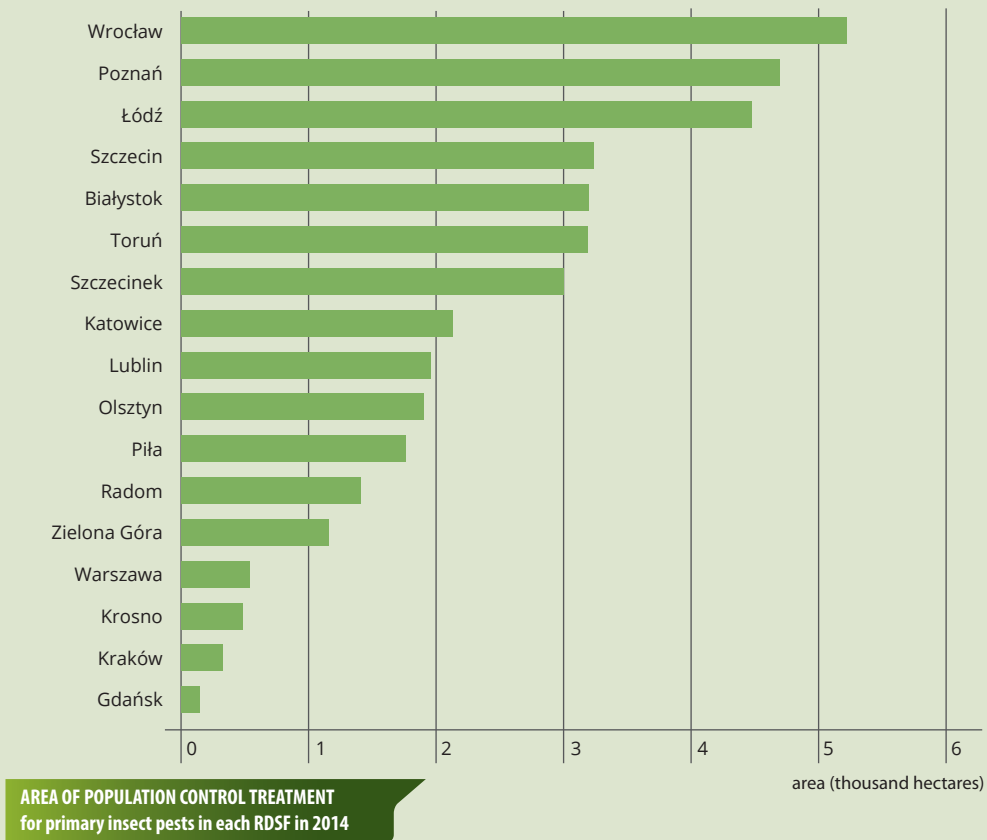


AREA OF POPULATION CONTROL TREATMENT for main species of primary insect pests in each RDSF in 2014



AREA SHARE OF POPULATION CONTROL TREATMENT for major primary insect pests in 2014

pests occurring in pine stands are marked in green; in broadleaved stands in light grey; in nurseries, plantations and young stands in dark grey



In the State Forests most damage was done by folivorous insects attacking pine and broadleaved (mainly oak) stands and by primary pests in nurseries, plantations and young pine stands. Folivorous insects attacking pine stands cause most damage and largest expenditure in their control in the State Forests. The area of pine stands affected by this group of insects in 2014 was 54 870 hectares. Large-scale control treatment using agricultural aviation equipment covered an area of 21 066 hectares. In 2014, a 12% decrease in a total area affected by folivorous insects attacking broadleaved stands was noted, from 53 315 hectares in 2013 to 46 803 hectares. The total area in which control treatment was applied also decreased by 59% in 2014. Insect pests attacking plantations and young stands occurred in a total area of 10 395 hectares in 2014, which was a decrease of 2173 hectares (17%), compared with the previous year. Control treatment was applied in an area of 8415 hectares, an increase of 14% on 2013. Other species and groups of harmful insects were also present in 2014, including pests attacking roots of forest trees and shrubs and pests affecting spruce, larch, fir and Douglas fir. Insects attacking roots of trees and shrubs occurred in the total area of 8823 hectares, a decrease of 73% on the previous year.

In 2014, the area affected by insects attacking spruce, larch, fir and Douglas fir was smaller than in the previous year and amounted to 1234 hectares, a 56% decrease (from 2831 hectares). It was the smallest area of stands in this category infested by insects since 1995. In 2014 there was also a significant decrease in population sizes of other insect species, such as green spruce gall aphids (*Sacchiphantes viridis*), larch thrips (*Thrips pini*), common sawfly (*Pristiphora laticis*) and European fir budworm (*Dichelia histrionana*).

## Threats to forests from secondary insects

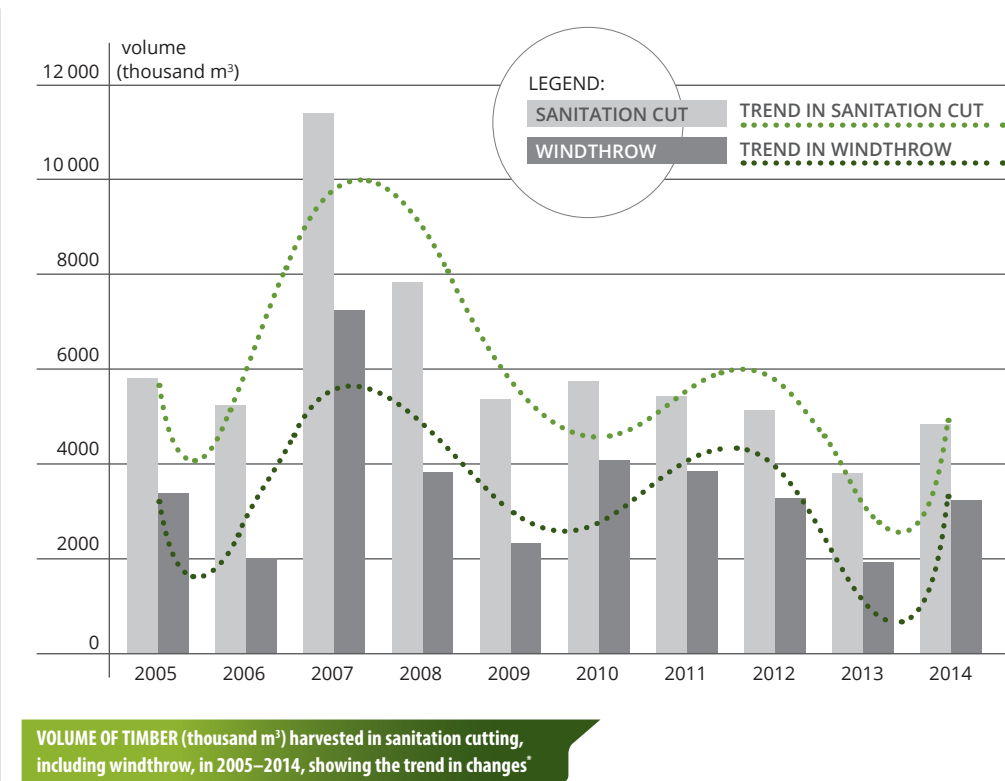
The level of threat to forests from secondary insect pests in 2014, measured by the volume of wood removed in sanitation cutting, was by 27% higher than in 2013. Sanitation cutting produced 4 816 729 m<sup>3</sup> of timber, of which 67% were windthrow and damaged trees.

Most affected were coniferous stands, from which 3 881 890 m<sup>3</sup> of timber was harvested, of which over 66% were windthrow and 29% of raw timber was infested by secondary pests.

Pine wood harvested in sanitation cutting in 2014 amounted to 1 983 977 m<sup>3</sup>, of which 71% came from windthrow.

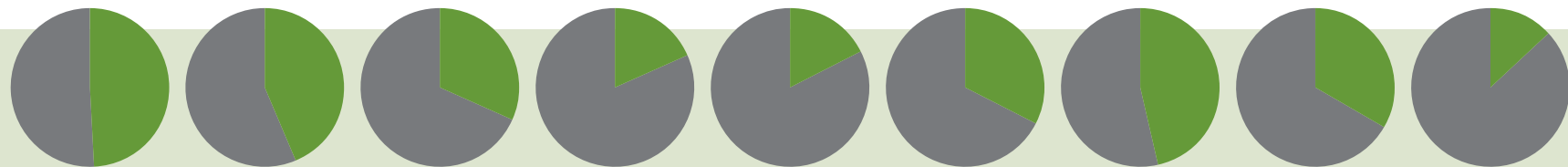
The amount of spruce timber harvested in sanitation cutting in 2014 was 1 714 683 m<sup>3</sup>, of which 58% were windthrow. The harvest of spruce deadwood in 2014 was 38% higher than in 2013, which points to a larger impact of secondary insect pests attacking spruce stands.

In addition, a significantly lower level of threat from secondary insect pests was observed in broadleaved stands in 2014. Sanitation cutting produced 934 839 m<sup>3</sup> of timber, which was an increase of about 30 thousand m<sup>3</sup>, compared with the previous year. The proportion of timber infested by secondary insects, as in 2013, was below 10%. Windthrow amounted to 72% of the total volume of harvest.

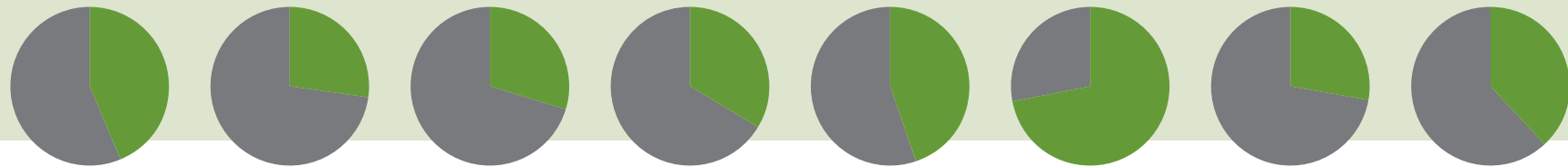


\* In 2012 the method of reporting data relating to the volume of timber harvested in sanitation cutting changed. Data for 2005–2011 cover the periods from October to September of the following year, while data for 2012–2014 cover periods from January to December of each year.

BIAŁYSTOK	GDAŃSK	KATOWICE	KRAKÓW	KROSNO	LUBLIN	ŁÓDŹ	OLSZTYN	PIŁA
383 672 m <sup>3</sup>	177 440 m <sup>3</sup>	818 240 m <sup>3</sup>	244 593 m <sup>3</sup>	287 417 m <sup>3</sup>	259 713 m <sup>3</sup>	71 480 m <sup>3</sup>	342 920 m <sup>3</sup>	159 057 m <sup>3</sup>



POZNAŃ	RADOM	SZCZECIN	SZCZECINEK	TORUŃ	WARSZAWA	WROCŁAW	ZIELONA GÓRA
173 572 m <sup>3</sup>	124 473 m <sup>3</sup>	442 872 m <sup>3</sup>	718 343 m <sup>3</sup>	133 715 m <sup>3</sup>	62 694 m <sup>3</sup>	373 561 m <sup>3</sup>	42 966 m <sup>3</sup>



LEGEND:

DEAD OR DYING TREES

WINDTHROW

VOLUME OF DEAD OR DYING TREES AND WINDTHROW harvested  
in 2014 in sanitation cutting in each RDSF

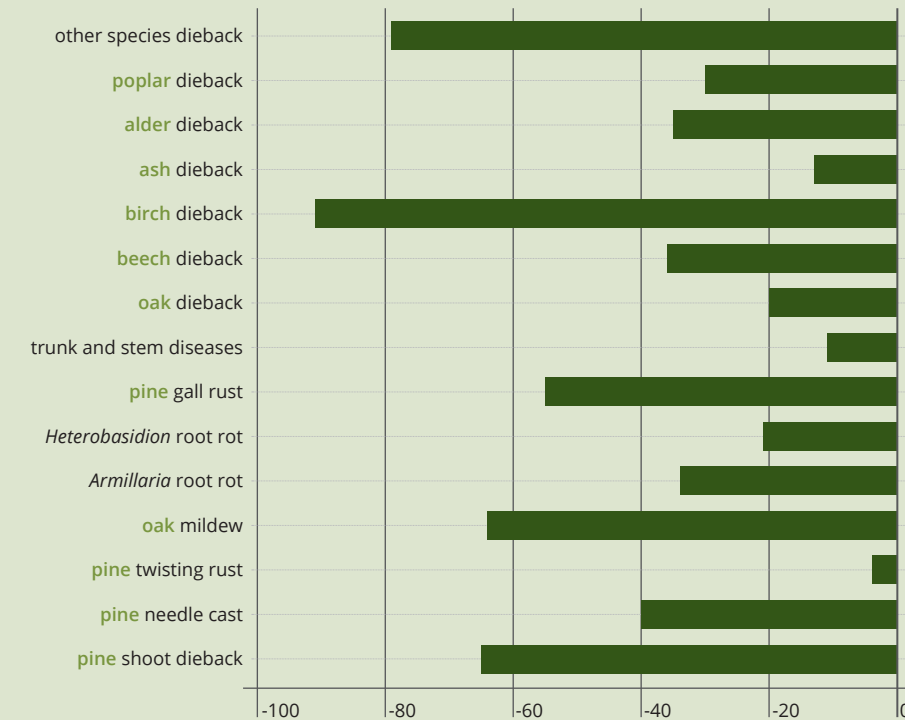
## Threats to forests from infectious fungal diseases

In 2014 infectious diseases were reported over a total area of 208.305 thousand hectares of stands, a decrease of 78.2 thousand hectares (27%), compared with 2013. The most significant changes in the level of threat (a drop of over 50%) concern diseases of assimilatory apparatus, namely pine shoot dieback, oak mildew and leaf and needle rust. The area affected by the occurrence of pine needle cast decreased by 40%, pine gall rust by over 50% and trunk and stem diseases were reported in the area of 25.8 thousand hectares which was smaller by 3.3 thousand hectares than in 2013.

The improvement in health condition of broadleaved stands continued in 2014. Areas affected by dieback of oak, beech, birch, ash, alder and poplar decreased by 20%, 36%, 91%, 13%, 35% and 30%, respectively, compared with 2013. Dieback of tree species other than the ones listed above also decreased and occurred in the area of 203 hectares (988 hectares in 2013).

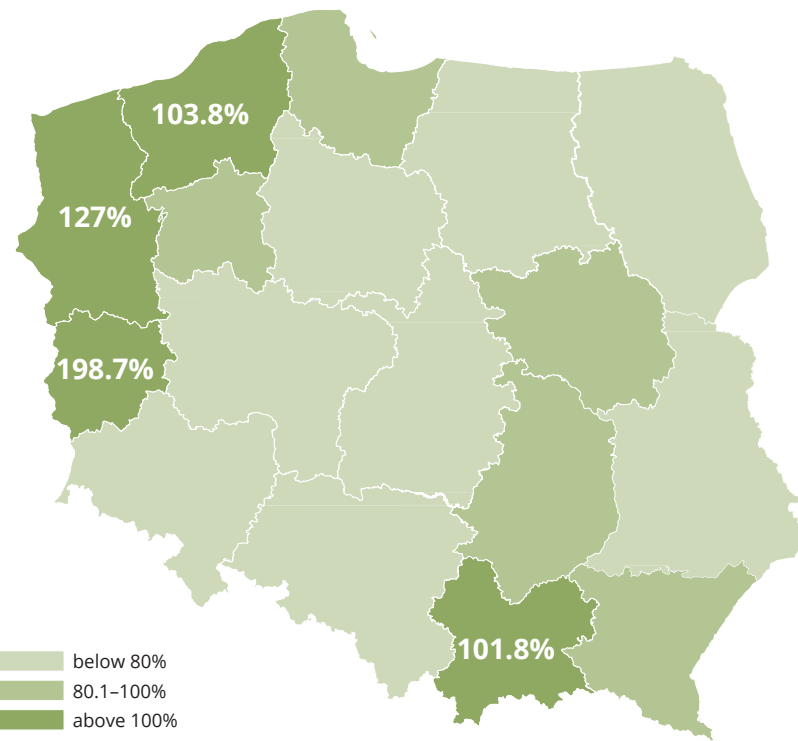
Areas affected by root diseases decreased by 56.9 thousand hectares and a decrease was noted in the spread of *Armillaria* root rot and *Heterobasidion* root rot by 34% and 21%, respectively.

The health condition of stands in each RDSF generally showed improvement or no change in comparison with 2013, which is supported by the statistics outlined above pointing to the nationwide decrease of the level of threat to stands. The exceptions are Szczecin



CHANGES IN AREAS AFFECTED BY INFECTIOUS DISEASES  
in 2014, in comparison with 2013 (%)





CHANGES IN AREAS AFFECTED BY INFECTIOUS DISEASES in 2014, expressed as percentage of the area affected in previous year

and Zielona Góra RDSF where the affected areas increased. In contrast, the area of diseased stands decreased by half or more in four RDSFs: Białystok and Łódź by 50% and Olsztyn and Poznań by 67%.

Generally, the health condition of forest stands with a share of broad-leaved tree species significantly improved in 2014. The multi-factor disturbances occurred in stands in an area of 10 223 hectares, a decrease of nearly 4000 hectares (30%) on the previous year.

Protective treatment aiming at controlling spread of infectious fungal diseases is used in forest nurseries (mainly chemical methods) and in stands, when it is necessary (biological and mechanical methods). In 2014 protective chemical treatment was used on the total area of 1291.2 hectares, biological treatment on 18 029.2 hectares and mechanical methods on 2690.2 hectares.



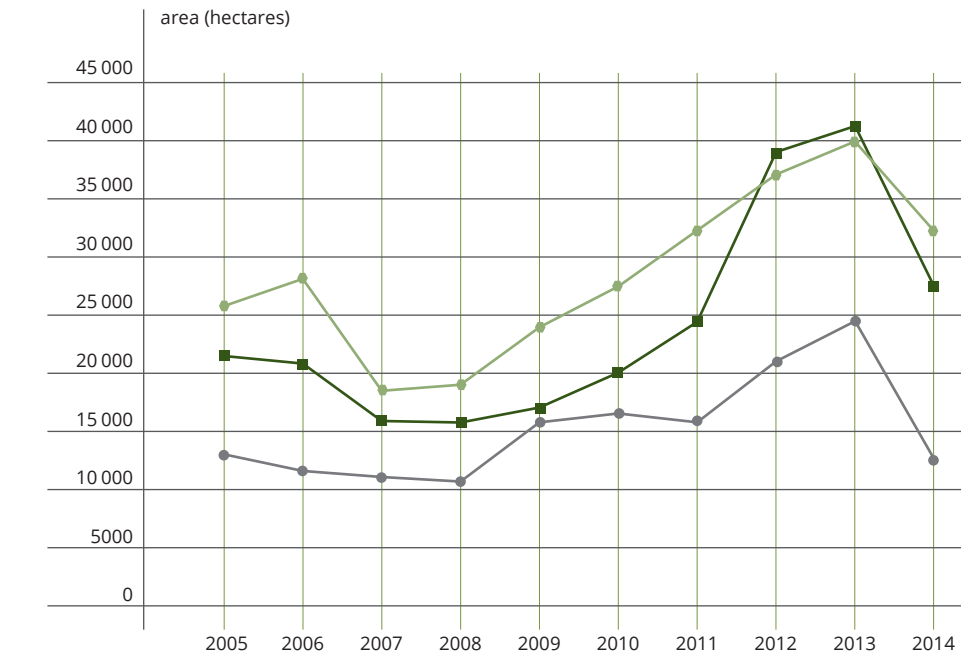
## Damage caused by animals

In 2014, damage to stands caused by game and protected animals was reported in the total area of 90 228 hectares. Damage in the range 21–40% occurred on 63 617.54 hectares and above 40% on 26 610 hectares.

Damage caused by red deer, fallow deer, roe deer, wild boar and hare was reported in the total area of 69 905 hectares, including 32 088 hectares of plantations, 27 562 hectares of young stands and 10 255 hectares of stands in older age classes.

However, since 2013 there has been a decrease in the level of damage in each category. Protective measures (fencing) were introduced in over 182 thousand hectares of forest plantations. In 2014 almost 50 thousand hectares were regenerated within the State Forests and further 500 hectares of former agricultural land were afforested. Active protection against animals in renewed areas included fencing off 18 407 hectares in total, mechanical protection on 10 826 hectares and chemical protection on 56 231 hectares.

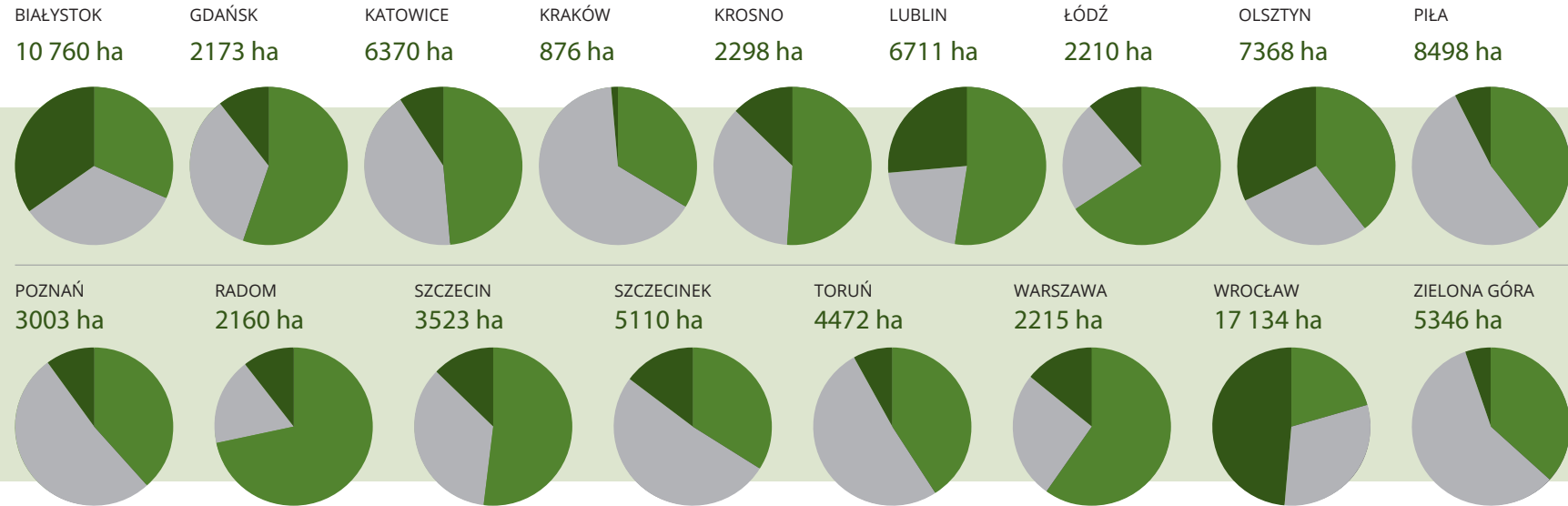
In addition to damage caused by game animals in 2014, harm to stands from species under various form of protection, eg. elk, beaver and bison, was also reported.



LEGEND:

● OLDER STANDS ■ YOUNG STANDS ● PLANTATIONS

AREA OF STANDS in which damage exceeding 20% was caused by game animals in 2005–2014



LEGENDA:

PLANTATIONS

YOUNG STANDS

OLDER STANDS

AREA OF STANDS in each RDSF in which damage exceeding 20% was caused by game and protected animals in 2014



## Anthropogenic threats

### Forest fires

There were 5245 forest fires in 2014 (compared to 4883 in 2013). The burnt area covered 2690 hectares of stands, which is 1401 hectares more than in the previous year. As in 2013, the largest number of fire events took place in the Mazowieckie province (1169 fires, 22% of the total number), the lowest – in the Małopolskie (120) and Opolskie (155) provinces.

In the State Forests there were 1825 forest fires in 2014 (34.8% of all forest fires in Poland), which covered an area of 561 hectares (20.8% of the total burnt area); these figures exclude the territories used by the military. Three large (over 10 hectares) forest fires destroyed 156.9 hectares of forest (two in Olsztyn RDSF and one in Wrocław RDSF), while in 2013 there was only one fire on a similar scale (16.7 hectares in Katowice RDSF).

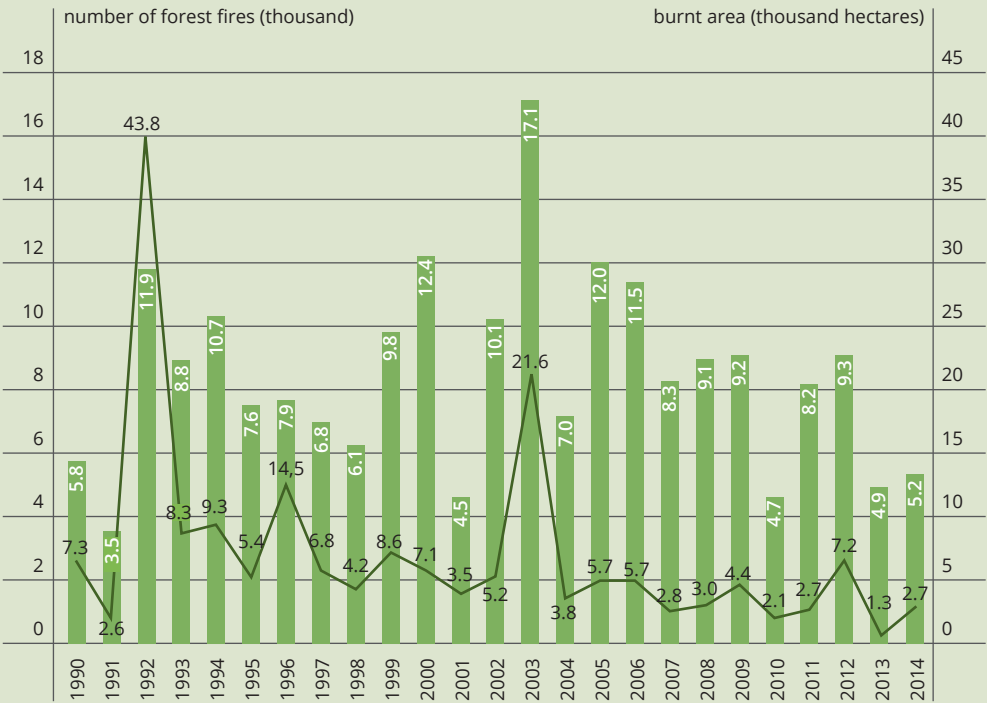
However, there were 102 forest fires covering an area of 607.2 hectares in territories used by the military in 2014, far more than in the previous year when the corresponding figures were 31 events covering 25.1 hectares.

Countrywide, 19 large fires were reported in 2014, in addition to two fires covering over 100 hectares each; there were 5 large fires in 2013 but none covered such an extensive area.



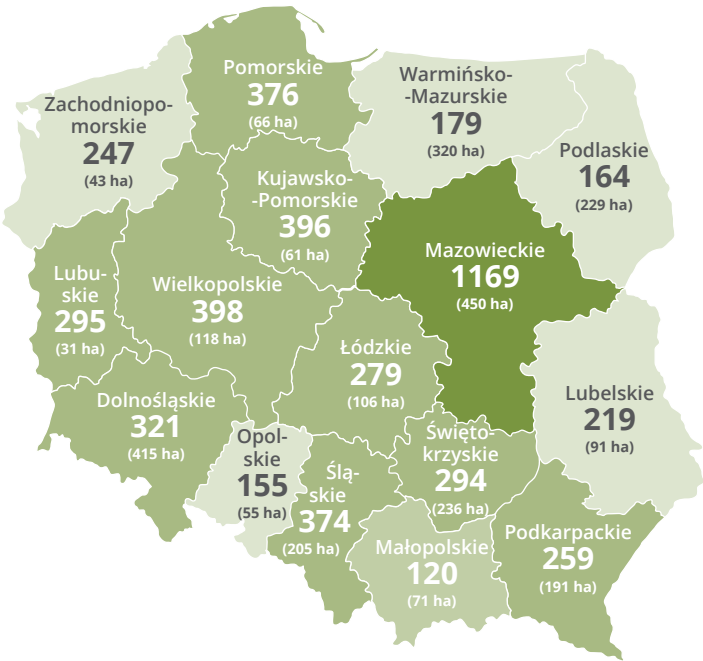
**5245**  
forest fires  
were recorded  
in 2014





LEGEND: NUMBER OF FOREST FIRES BURNT AREA

NUMBER OF FOREST FIRES and burnt area of stands in Poland in 1990–2014



NUMBER OF FOREST FIRES:

1–125	251–500	751–1000
126–250	501–750	> 1000

NUMBER OF FOREST FIRES in Poland in 2014

The most frequent causes of fires in the State Forests were arson (44%) and negligence (17%). In 33% of all fires their cause remained unknown. The corresponding figures for forests in all ownership categories were: 40% fires caused by arson, 29% caused by negligence and 22% of unknown causes.

The largest number of fires occurred in March (1088 fires, or 20.7% of all fires), then April (16.8%), July (15.9%) and June (11.2%). The smallest number (of the risk period) occurred in August and September.

## Air pollution

Estimated data from the National Centre for Emissions Management (“National Emissions Balance”, 2015) puts a total figure of emissions in Poland in 2013 at 847 thousand tonnes of sulphur dioxide and 798 thousand tonnes of nitrogen oxides, which is, respectively, 58% and 95% of the level of emissions in 2000.

Information on major pollutants in forests in different regions of Poland is supplied by the forest monitoring network. The network consists of 12 permanent observation plots located in pine (5), spruce (3), oak (2) and beech stands (2) across the country.

Average monthly concentration of sulphur dioxide in the air, measured on the observation plots, was within 0.4–12.6 µg/m³ and of nitrogen dioxide within 2.1–19.5 µg/m³. The lowest concentration of sulphur dioxide was observed in the north-east regions of the country and Gdańsk (annual mean below 2.5 µg/m³), while the highest

(annual mean above 3.2 µg/m³) occurred in Upper Silesia and around Płock. In the southern regions, particularly in the foothill and mountain areas, and in central Poland, these values were in the mid-range.

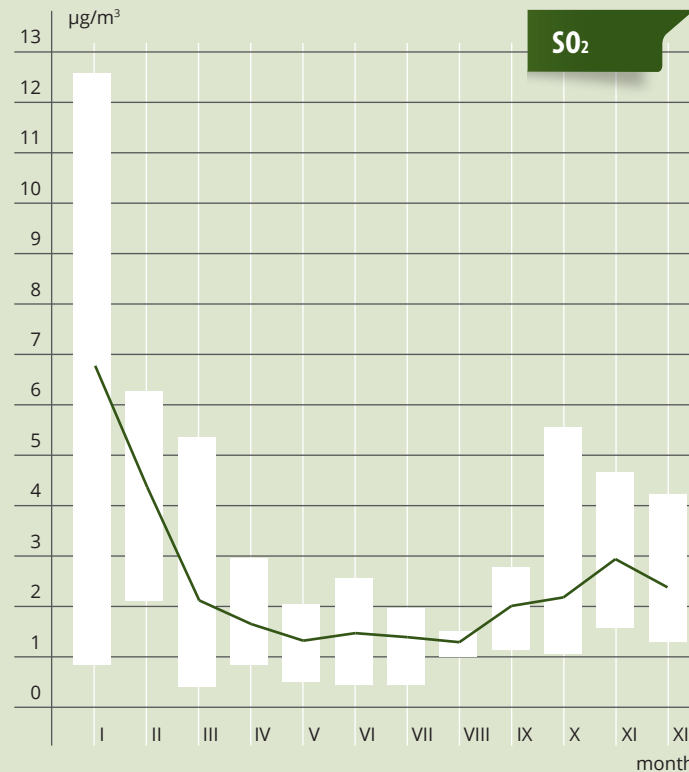
The level of concentration of nitrogen dioxide, as in previous years, was the highest in the central regions of Poland and in Upper Silesia. Forests in the north-eastern regions and in the southern foothill and mountain areas had a significantly lower concentration of NO<sub>2</sub>.

Intensity of air pollution changed with the seasons: the highest concentration of SO<sub>2</sub> and NO<sub>2</sub> was observed in winter months, especially in January, February, November and December, which coincided with the heating season and therefore increased emissions.

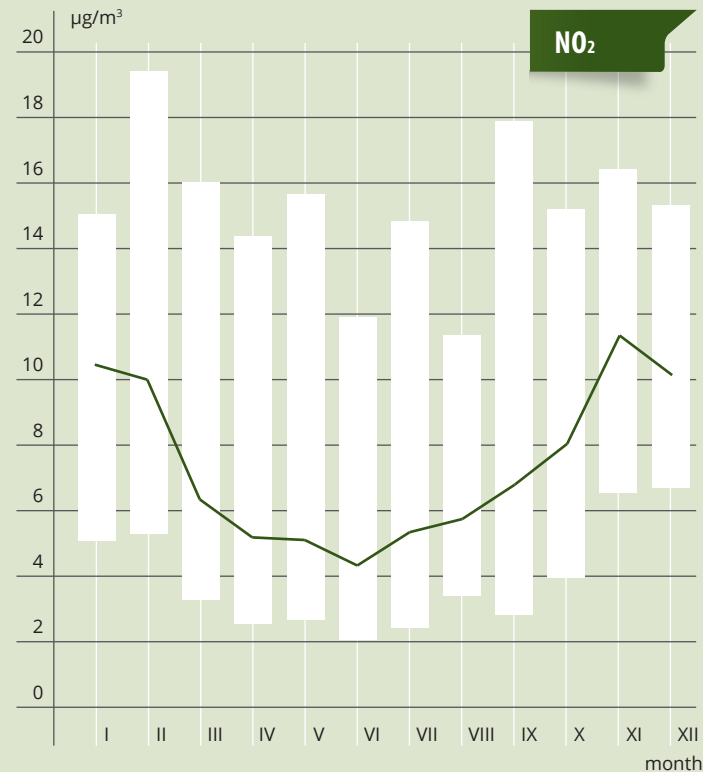
Pollution is cleared from the atmosphere by means of precipitation and deposition, such as rain, snow, drizzle, fog, etc., most of which contain acidifying substances. Acidic precipitation is defined as having pH value below 5.6. More than half of the monthly precipitation recorded on permanent observation plots in 2014 was acidic with the pH value below 5.5, a slight improvement compared with previous years.



The highest concentration of  $\text{SO}_2$  and  $\text{NO}_2$  is recorded during winter months



CHANGES IN CONCENTRATION (average, minimal and maximal values) of sulphur dioxide and nitrogen dioxide in the air, measured on intensive monitoring observation plots in 2014



## Threats to forest sustainability



Polish forests are increasingly more vulnerable to the effects of abiotic factors, which often cause major disasters. These, in addition to exposure to insect pests, fungi pathogens and wild animals, threaten sustainability of forests.

The recently recorded changes in climate which result in dynamic, if not catastrophic, weather events (droughts, floods, hurricanes, etc.) have had effect on the health condition of stands, as well as on populations of harmful pests. Constant exposure to a variety of stress factors, combined with limited resistance of forest ecosystems (eg. inappropriate species composition for the habitat or introduction of ecotypes of non-native trees), can lead, in extreme cases, to the total dieback of stands. This is exactly what happened in the Sudety in the 1980s and in the Beskidy in the first decade of this century.

Forester's efforts to increase 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 conditions.

The main responsibility for rebuilding forests and maintaining them in good health and appropriate structure falls on the State Forests. In 2014 rebuilding of forest stands was carried out in an area of 7.7 thousand hectares, cleaning on 135.7 thousand hectares and thinning on 311.0 thousand hectares. Additionally, the stability of stands was being reinforced by the introduction of understorey

In 2014  
**7.7**  
thousand  
hectares of stands  
were rebuilt



The Kostrzyca  
Forest Gene Bank  
has been operating  
for almost  
**20 years**

(0.6 thousand hectares), a second storey (4.1 thousand hectares), by filling gaps (1.1 thousand hectares) and by enhancing water drainage (63.3 thousand hectares).

The work which is being done in order to enhance the sustainability of forests often has limited effect in the face of increasingly frequent anomalous weather events. It was necessary, therefore, to find longer term solutions to preserving threatened forest ecosystems in Poland, including securing seed material from trees, shrubs and forest floor plants. As a result the Kostrzyca Forest Gene Bank was opened in December 1995. It is located in Miłków in the foothills of the Karkonosze mountains and was a collaborative project between the State Forests and the Institute of Dendrology of the Polish Academy of Sciences.



The Kostrzyca Forest Gene Bank has a stock of 5809 genetic resources relating to 90 species of forest flora, both whole populations and individual plants. Of these, 28 species are of trees and forest-forming shrubs and the remaining 62 species are of rare and protected plants which are listed in the "Polish Red Data Book of Plants". Resources of the Gene Bank constitute seed batches kept in liquid nitrogen for a long-term storage, which have been harvested from the selected seed stands, conservation stands and from maternal trees, tree monuments and other trees and plants designated for conservation. The work of the Kostrzyca Gene Bank focuses on preservation of genetic diversity of forest plant communities. Communities with greater genetic variety adapt better to constantly changing environment because they are less vulnerable to the negative impact of biotic and abiotic factors.

## Level of damage to forests



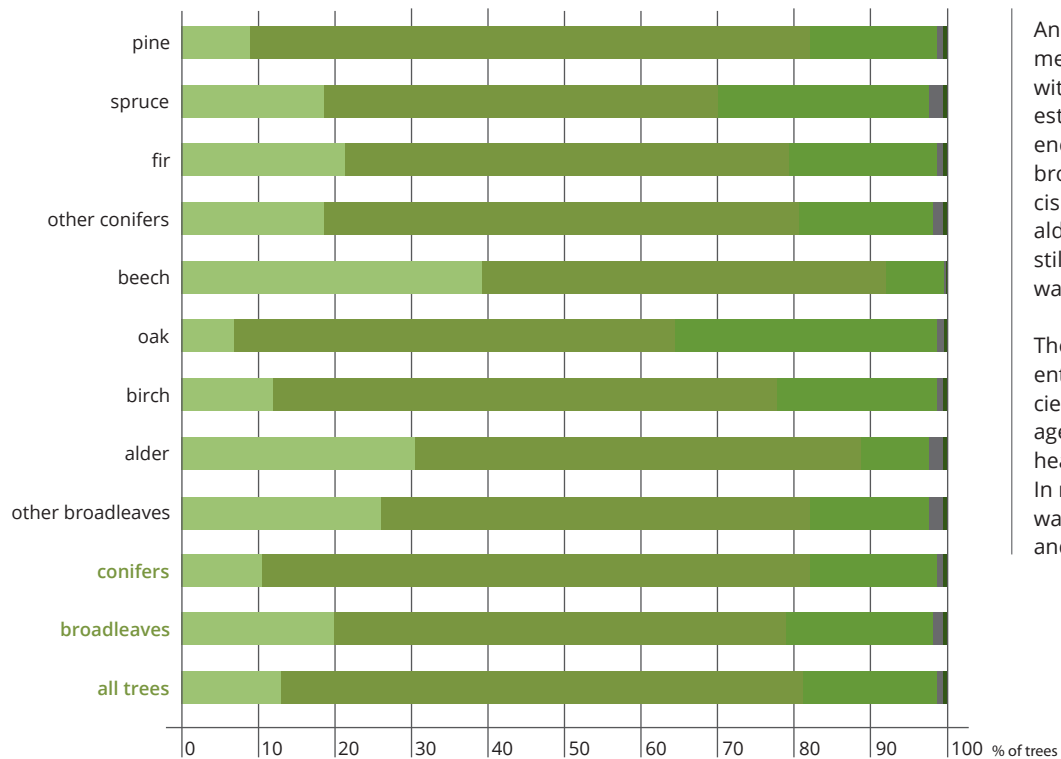
The level of damage to forests in Poland has been assessed every year since 1989 as part of the forest monitoring programme which is one of the elements of the National Environment Monitoring system. Monitored are forests in all ownership categories and under different forms of protection. Sample observation areas are located in stands aged over 20 years and trees of all species are selected for further scrutiny.

Assessment of the condition of tree crowns in 2014 covered 40 258 trees over the age of 20 years, located on 2013 Level I permanent observation plots. In that sample, 11.6% of trees showed no defoliation (defoliation class 0 – healthy trees), including 9.5% of conifers and 15.4% of broadleaves. The largest share of coniferous trees without any defoliation was reported for fir (18.6%), and the smallest for pine (8.3%). As for the broadleaves, the largest share of healthy trees was reported for beech (33.4%) whereas the smallest for oak (4.7%).

The share of damaged trees with defoliation over 25% (defoliation classes 2–4) for all species was 18.9%; the share among conifers was 17.2% and among broadleaves 21.9%. The lowest share among the conifers had fir (16.2%) and the highest spruce (25.1%). Among the broadleaves beech had the lowest share (7.6%) and oak the highest (35.0%).







Analysis of the proportions of healthy trees, damaged trees and the mean value of defoliation allows differentiation between species with respect to tree damage. In 2014 beech was by far the healthiest of species, followed by alder. There was no significant difference among fir and species in categories “other conifers” and “other broadleaves”, however the level of their crown defoliation was decisively higher than that of beech and slightly higher than that of alder. Much higher level of damage was observed in pine trees and still higher in spruce. But the species that showed most defoliation was oak, closely followed by birch.

There was very little variation in the condition of forests in different categories of ownership. In the State Forests 12.0% of all species of trees were healthy (defoliation class 0) and 17.7% were damaged (classes 2–4). In privately-owned forests the proportion of healthy trees was smaller (10.1%) and damaged trees larger (21.7%). In national parks the percentage of both healthy and damaged trees was higher (12.3% and 24.1% respectively) than in the State Forests and in privately-owned forests.

CLASS:

0	1
2	3
4	

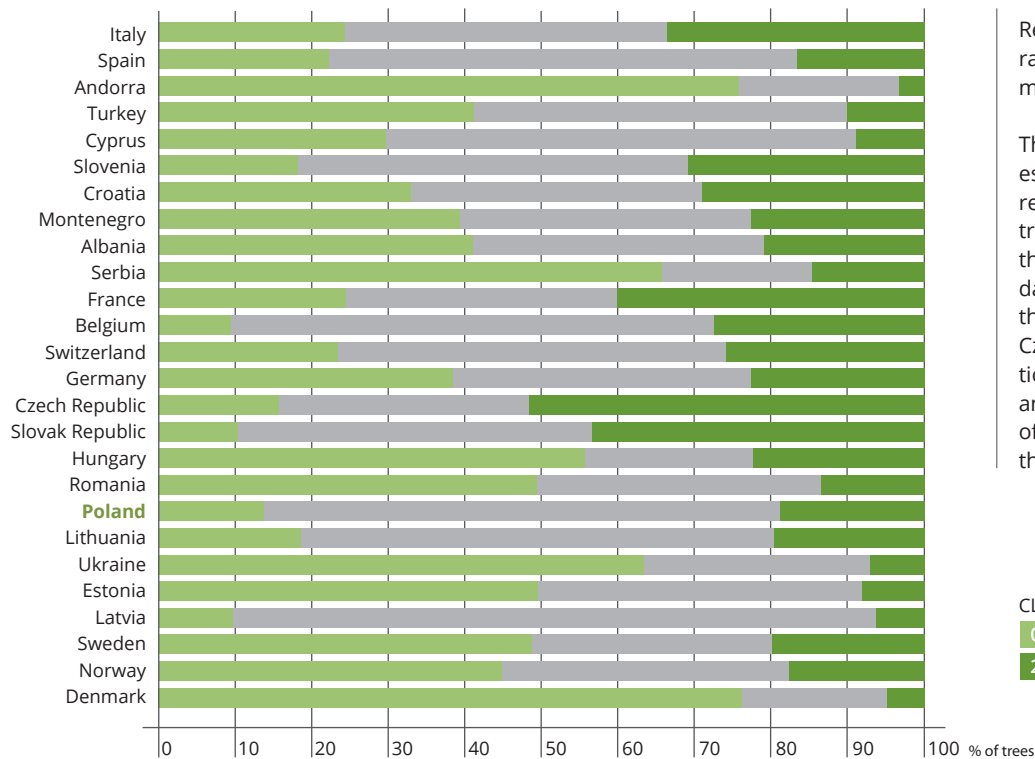
Class 0: 0–10% defoliation  
 Class 1: 11–25% defoliation  
 Class 2: 26–60% defoliation  
 Class 3: above 60% defoliation  
 Class 4: dead trees

SHARE OF MONITORED TREE SPECIES on Level I permanent observation plots (Forest Monitoring), in defoliation classes in 2014



**Beech**  
 is the healthiest  
 tree in Polish  
 forests





Results of monitoring defoliation on sample observation plots can rank regions with respect to the health condition of forests (see the map below).

The latest report on the condition of European forests in 2013 ("Forest Condition in Europe", 2014) places Poland quite low in the ranking relating to the condition of tree crowns. The proportion of healthy trees (defoliation class 0) in Polish forests was much smaller than in the forests of other European countries. However, the proportion of damaged trees (defoliation classes 2–4) in Poland was also smaller than in the majority of other countries. Some countries (Italy, France, Czech Republic and Slovak Republic) had significantly higher proportion of damaged trees. Forests in Denmark, Ukraine, Estonia, Serbia and Romania were in best condition in 2013 and at the other end of the scale were the most damaged forests in the Czech Republic, the Slovak Republic, France, Belgium and Slovenia.

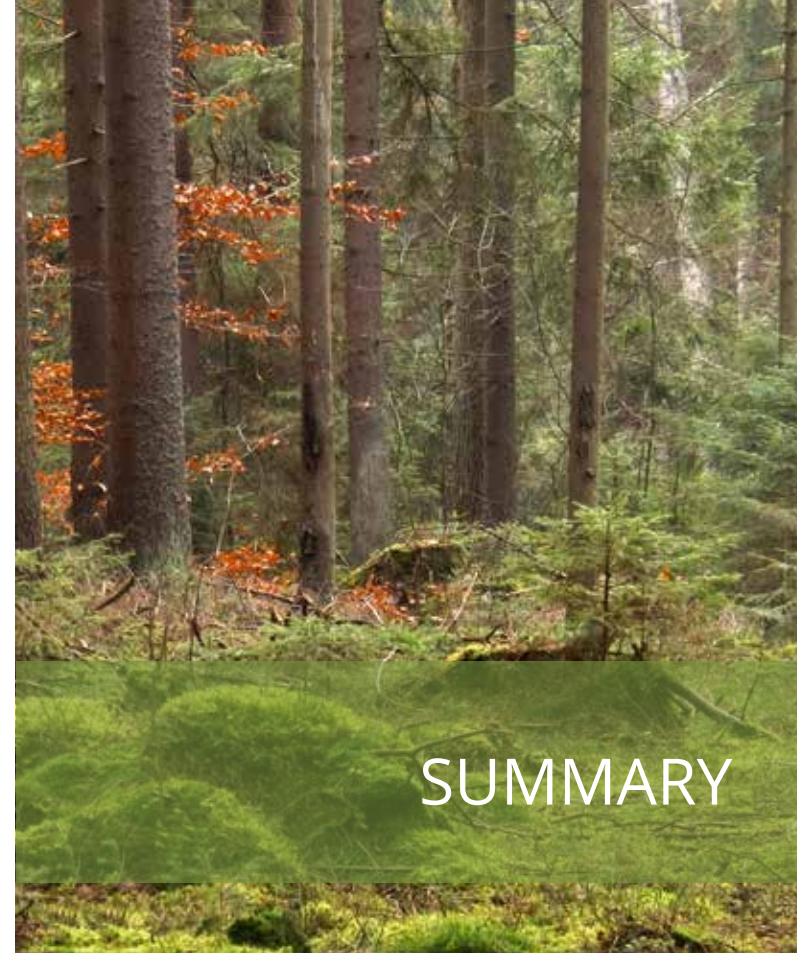
CLASS:

0 1

2-4

Class 0: 0–10% defoliation  
Class 1: 11–25% defoliation  
Classes 2–4: above 25% defoliation including dead trees

STANDS DEFOLIATION in the European countries in 2013; countries are grouped geographically (Forest Research Institute, adapted from UNECE, 2014)



## SUMMARY

- In our climatic and geographical zone, forests are the most natural formation. They are a crucial element of ecological balance, life continuity, landscape, and of the process of neutralisation of contaminants, thus counteracting environmental degradation. Forests, as a form of land use, allow biological production with a market value and help to shape the quality of human life.
- The areas of Natura 2000 network cover about 20% of the country's land area. Within the State Forests, Special Protection Areas for birds (SPAs) cover 2218 thousand hectares (29.2% of the State Forests territory) and Sites of Community Importance (SCIs) – 1659 thousand hectares (21.8%).
- Poland's timber resources have been steadily increasing. Their volume stands at 2.5 billion m<sup>3</sup> of gross merchantable timber. Timber resources in the State Forests (1.9 billion m<sup>3</sup>) are the largest in the country, the standing volume is 275 m<sup>3</sup>/ha and their average age is 58 years. In privately-owned forests these indicators are 232 m<sup>3</sup>/ha and 47 years, respectively.
- In 2014 the area of post-agricultural land and wasteland afforested under the "National Programme for the Augmentation of Forest Cover", which assumes the increase in forest cover to 30% by 2020 and to 33% by 2050, decreased again in comparison with the previous years. The total area of (artificial) afforestation was 3.8 thousand hectares (4.1 thousand hectares in 2013 and 4.9 thousand hectares in 2012).
- 37 662 thousand m<sup>3</sup> of net merchantable timber was harvested in Poland in 2014, of which 35 686 thousand m<sup>3</sup> came from the State Forests (102.8% of the volume of approximate annual prescribed cut). Area size of clear-cuts was limited to 26.6 thousand hectares and timber harvested from clear-cutting to 6515 thousand m<sup>3</sup> of



Forest ecosystems are the largest and most valuable elements of all forms of nature conservation in Poland. They account for 38.0% of the land area under legal protection. The proportion of protective forests in the total forest area is 40.4%; they are primarily water-protective forests and those surrounding cities and areas damaged by industry.



Clear-cutting  
was limited to  
**26.6**  
thousand  
hectares  
in 2014

merchantable timber (18.3% of total harvest). Utilisation of timber resources in the State Forests in 2014 stood at 53% of the volume of increment.

- The health condition of Polish forests, assessed on the basis of the level of defoliation of tree crowns, remained at the level recorded in 2013. The share of damaged trees (defoliation in excess of 25%, defoliation classes 2–4) stood at 18.9% (18.8% in 2013); the share of healthy trees decreased slightly from 13.7% in 2013 to 11.6% in 2014.
- Activity of the most destructive primary insect pests considerably diminished in 2014 (by 71%). This group of pests occurred in 122.1 thousand hectares of the State Forests territory and the control treatment covered an area of 38.8 thousand hectares. Threat to forests from secondary insect pests increased by 27% in comparison with the previous year.
- The area affected by infectious fungal diseases decreased by nearly 27% in 2014 and stood at 208.3 thousand hectares.
- Damage to forests was also caused by herbivore mammals, mainly red deer, roe deer and elk, and locally by rodents (beavers and mice).

## GLOSSARY

**Afforestation** – the establishment of new forests on the land previously used for agriculture or on wasteland.

**Age class** – an agreed period, usually 20 years, which allows the grouping of stands by age; for example, stands aged up to 20 years form class I, stands ranging from 21 to 40 years form class II, and so on.

**Amount of cut, yield** – the amount (volume) of timber for harvesting derived from management objectives and financial plans.

**Annual prescribed cut by volume in the State Forests** – an annual measure of utilisation of forests as set out in forest management plans. It is calculated as a sum of final and pre-final (intermediate) cuts for each forest district (approximately equalling 1/10 of the cut prescribed for a 10-year period). The annual quotas may vary depending on forest condition, but the overall harvest in each district must balance over a 10-year period during which the current forest management plan is in force.

**annual prescribed cut in final cuts in the State Forests** – an annually averaged sum of final cuts agreed for every forest district; the volume of harvest is set out in the forest management plan (usually established for a 10-year period) and should not be exceeded.

**annual prescribed cut in pre-final cuts in the State Forests** – an annually averaged sum of approximate pre-final cuts agreed for every forest district.

**Bark stripping (peeling)** – a method of feeding by ungulate animals using their teeth to strip off the bark from standing or cut trees.

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

**species diversity** – a variety of species,



A

B



**ecological diversity** – a variety of community types (biocoenoses, ecosystems),

**diversity of genetic resources** – a variety of genes forming a gene pool of a population.

**Class for restocking (KDO)** – a type of vertical structure of stands in which there is simultaneous utilisation and regeneration under the canopy of the parent stand, and in which the level of regeneration does not yet meet the standard requirements.

**Cleaning** – a series of tending treatments aimed at adjusting the composition of species, the structure and density of stands and the quality of young trees;

**early cleaning** – cleaning in plantations prior to crown closure;

**late cleaning** – cleaning during the period between crown closure and the beginning of self-thinning of trees.

**Clear-cuts** – an area from which all trees have been removed in one operation (final cut) and which is designated for reforestation within five years.

**Deadwood** – trees which are dead or dying as a result of excessive crowding in the stand, attacks by primary or secondary insect pests, the impact of industrial emissions, changes in water relations, etc.

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

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

**Economic seed stands** – stands whose origin and quality indicate that seeds harvested from them will produce valuable progeny thus ensuring long-lasting production of timber of satisfactory quality and quantity.

**Ecotype** – race, ecological form – the entire population of one plant species found in a specific location; it develops as a result of long-term conditioning by specific (local) properties of the environment; ecotypes vary with regard to their physiological and, less frequently, morphological characteristics.

**Epiphytotic** – epidemic (mass) occurrence of plant diseases in a given area, caused by a single pathogenic agent (eg. fungus) whose development is facilitated by a particular set of favourable conditions.

**Final cutting (felling)** – harvesting of wood associated with renewal of stands or deforestation as a result of a change in land use; the wood obtained from final cutting is known as the final cut timber.

**Folivores (folivorous species)** – leaf-eating animals.

**Forest cover (or index thereof)** – percentage of the area covered by forests in the country's total land area.

**Forest ecosystem** – a basic ecological entity which is represented by a relatively homogenous plot of forest and in which habitat, flora and fauna are interdependent and function as a whole.

**Forest habitat (site) type** – a generalised concept of the group of stands on sites of similar suitability for forest production; the basic unit of the typological classification applied in Poland.

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

**Managed forests** – forests which are managed according to a plan and whose function is to produce wood and other forest products, while applying the principles of spatial and temporal order.

**Merchantable timber (large timber)** – (1) the volume of a tree above stump with a diameter at the thinner end of at least 7 cm with

bark (refers to standing timber), (2) round wood with a diameter at the thinner end of at least 5 cm without bark (refers to harvested timber).

**gross merchantable** – timber with bark,

**net merchantable** – timber without bark and losses during harvest.

**Outbreak (gradation, infestation)** – a mass occurrence of insect pests as a consequence of favourable environmental factors for a given species.

**Pathogens** – factors causing diseases; primary pathogens attack healthy organisms while secondary pathogens attack already damaged organisms (eg. trees).

**pH** – indicator of acidity level, eg. of soil.

**Pollutant emission** – gaseous substances and particles in the air, which impact upon their surroundings, i.e. by reaching organisms and ecosystems and exerting influence on them.

**Pre-final (intermediate) cutting (felling)** – harvest of wood associated with stand tending procedure.

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

**Protective forests** – forests under special protection because of their functions or vulnerability to threats.

**Regeneration (renewal, restocking, reforestation)** – new forest stands established after the removal of previous stands by felling or as a result of damage by natural causes;

**natural regeneration** – stands established as a result of self-seeding or suckering;

**artificial regeneration** – stands established by man by planting or seeding.

**Repellents** – substances used to protect young trees from damage caused by animals.

**Restocking class (KO)** – a type of vertical structure of stands in which there is simultaneous utilisation and regeneration under the canopy of the parent stand, and in which the level of regeneration permits the subsequent stages of tending.

**Selected seed stand** – a stand of high quality trees whose main purpose is seed production; they are excluded from felling for a defined period of time (excluded from final cutting).

**Selection structure (BP)** – a type of vertical structure of stands, representing groups and clumps of trees of uneven age and size.

**Small-sized timber** – round wood with a diameter at the thicker end (under bark) of up to 5 cm.

**Standing volume** – the volume of all live trees in a given area (stand, province, country, etc.), with a diameter (with bark) over 7 cm at breast height. Standing volume is often calculated per hectare.

**Timber resources** – a total volume of trees in forest, usually equated with the estimated volume of merchantable timber in stands.

**Thinning** – cuts made in immature stands after they have passed through the cleaning period, during which economically undesirable trees are removed. Thinning has a positive effect on the quality of stands as it allows the trees to increase their volume, height and crown size.

**early thinning** – cuts covering a period of intensive natural self-thinning process;

**late thinning** – cuts following early thinning.

**Tree volume** – the amount of wood expressed in cubic metres (m<sup>3</sup>).

V

W

**Volume increment** – an increase in the volume of 1) a tree, 2) a stand (including harvested timber) over a period of time;

**current increment** – an increase in volume over a specified period of time; depending on the length of that period it can be:

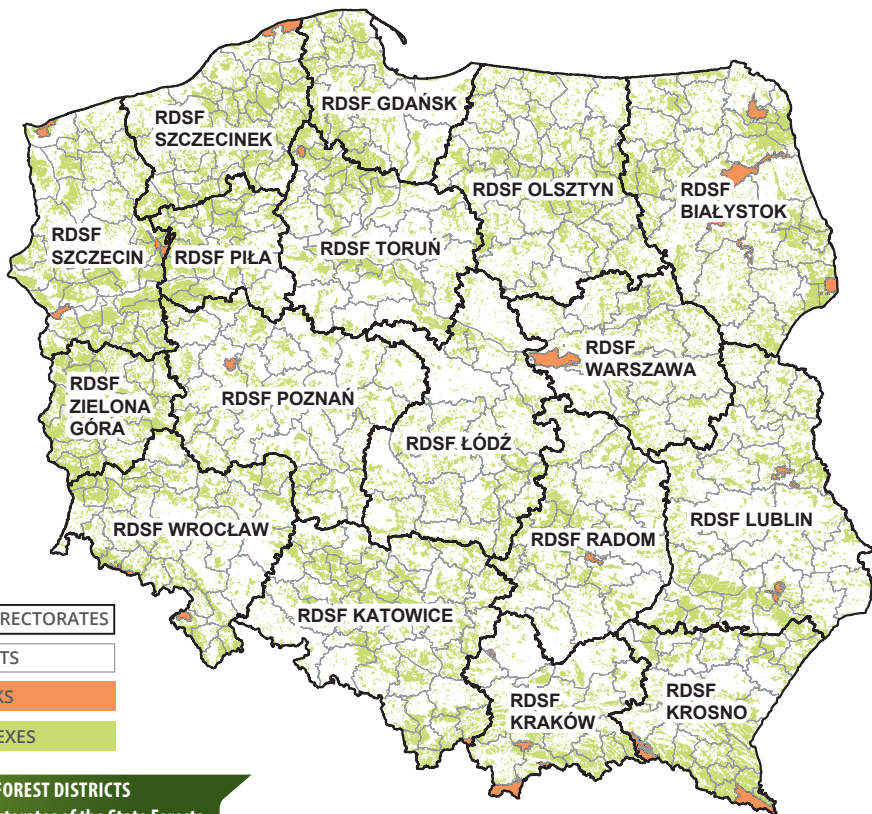
- current annual increment,
- periodic current increment (more than one year),
- current increment over the whole period (from origin to a specified age);

**mean annual increment** – quotient of the current increment and the length of the period of time:

- mean annual increment over a specified period,
- mean annual increment over the whole period (from origin to a specified age).

**Windthrow** – trees broken or brought down by wind.





LEGEND:

SF REGIONAL DIRECTORATES

FOREST DISTRICTS

NATIONAL PARKS

FOREST COMPLEXES

**TERRITORIES OF FOREST DISTRICTS  
and regional directorates of the State Forests**





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