

POLAND  The State Forests

THE STATE FORESTS IN FIGURES 2011



Centrum Informacyjne
Lasów Państwowych

Forest functions

Forests serve, either naturally or as a result of human activity, various functions:

- **Ecological (protective) functions:** beneficial impact on the shaping of the climate both locally and globally, the regulation of the water cycle in nature, the prevention of floods, avalanches and landslides, the protection of soil against erosion and the landscape against steppization;
- **Productive (economic) functions:** primarily the production of renewable biomass, including timber and non-timber products;
- **Social functions:** providing health-improving and recreational conditions for society and contributing to the labour market.

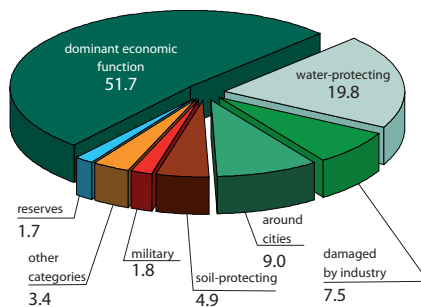
The statutory obligation of the State Forests is to pursue sustainable, multifunctional forest management to ensure maintenance, continuity and sustainable use of all forest functions and increase forest resources.

Protective forests

The recognition in forest management of the ecological and social functions of forests, frequently referred to as non-productive functions, has resulted in the establishment of protective forests since 1957. The total area of protective forests managed by the State Forests as of 31 December 2010 amounted to 3 292 thousand hectares, which represents 46.6% of the total forest area, and together with the nature reserves – 48.3%.

Within the recognised categories, the water-protecting forests occupy the largest area of 1 414 thousand hectares, forests around cities

– 637 thousand hectares, stands damaged by industrial activity – 531 thousand hectares, and soil-protecting forests – 344 thousand hectares. The majority of the protective forests are located in the mountain regions and in areas affected by industry.



Share by protective forest categories in the State Forests in 2010

Depending on their predominant function, protective forests are subject to modified management procedures, including strict limits on clear-cutting, increase of rotation age and adjustment of species composition according to the functions served.

Carbon sequestration

Until recently the assessment of the amounts of carbon absorbed by ecosystems (including forests) has been of an almost exclusively scientific nature. The growing threat of climate warming caused by the increased concentrations of atmospheric CO₂ and the rising social awareness of this threat, have brought about a more practical approach which was expressed in the *Kyoto Protocol* (16 February

2005). The Protocol listed and evaluated various forestry-related actions aimed at increased carbon sequestration and included them in the total balance of greenhouse gas emission and absorption. The general rules governing the amounts of carbon absorbed by forest ecosystems and their inclusion in the total CO₂ emission balance are based on the decisions taken at the Conferences of the Parties to Climate Convention and the goals set out in the Kyoto Protocol. At the latest conference in December 2010 in Cancún, Mexico, the parties agreed to create the strategies and plans for low carbon development, including both the public and private sectors.

According to the estimates based on the available data on timber resources in Poland, the forest biomass contains more than 968 million tonnes of carbon of which about 80% is accumulated in the aboveground biomass.

Reduction of the concentrations of greenhouse gases can be achieved by appropriate forest management, for example: increasing afforested areas by utilizing land no longer used for agriculture, forest regeneration including the planting of fast-growing species, silvicultural treatments which increase standing volume, life extension and recycling of wood products, reduction of emissions from fossil fuel and use of wood as a source of energy and an increase of carbon retention in soil. The State Forests' aims resulting from the *Forest Act* are in line with the goals set out in the *Kyoto Protocol*. This is demonstrated by the increase in the last decade in the area of forests under the management of the State Forests by 119 thousand hectares and their resources by 399 million m³. The average standing volume in this period increased from 211 to 264 m³/ha.

The aims and objectives of the State Forests

In accordance with the provisions of the *Forest Act* of 28 September 1991, with its later amendments and the regulations and ordinances resulting from it, the guiding principles of the State Forests' management of forests are the universal protection of forests, maintaining their permanence, continuous and sustainable use of all forest functions and augmentation of forest resources.

These goals are pursued through sustainable, multifunctional forest management in accordance with forest management plans drawn up for each Forest District for a ten-year period. Each plan sets out the objectives of silvicultural management and protection of specified parts (stands) of forests and states the methods for achieving them.

The State Forests administers the state-owned forests (other than national parks, the land administered by the Agricultural Property Agency or leased under a perpetual lease agreement). This involves managing forests and other land and property, monitoring of the forest condition and keeping data on the area size and timber resources up to date, monitoring and forecasting of the level of fire hazard and the occurrence of insect pest and fungal diseases of trees.

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

- the *Forestry Principles* and *Agenda 21* adopted at the 1992 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);
- the *Kyoto Protocol* (1997) concerning the role of forests in carbon sequestration.

Since Poland's accession to the European Union on 1 May 2004, the State Forests has also been obliged, within its remit, to implement the European Natura 2000 Programme resulting from:

- *Directive 79/409/EEC* of 2 April 1979 concerning the conservation of wild birds
- *Directive 92/43/EEC* of 21 May 1992 concerning the conservation of natural habitats and wild fauna and flora.

Other important objectives of the State Forests are: to make forests accessible to society and to increase society's awareness of ecological issues by providing forest and nature education.

Organisation of the State Forests

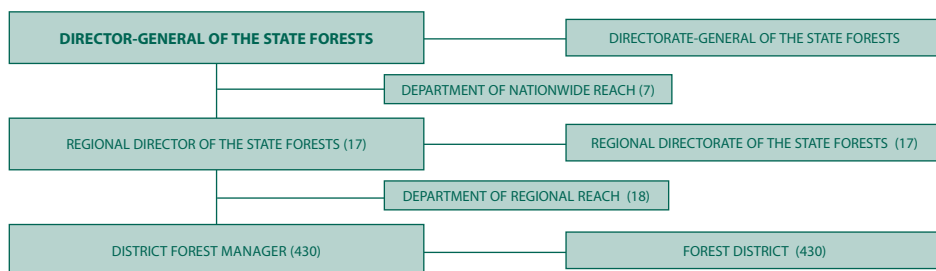
The State Forests is a state organisational unit without legal personality, which administers

property on behalf of the Treasury. It operates on a self-financing basis.

The State Forests is headed by the Director-General, assisted by the Directorate-General and Directors of the Regional Directorates of the State Forests.

As of 31 December 2010, the State Forests comprised the following organisational units, none of which have legal personality:

- Directorate-General of the State Forests (GDSF);
- 17 Regional Directorates of the State Forests (RDSFs);
- 430 Forest Districts;
- 18 organisational units (departments) with regional authority reporting to the Regional Directors of State Forests (transport and logistics – 2, forest transport – 2, forest services – 2, service and production – 3, storage complexes – 5, fisheries – 2, training and recreation centres – 2);
- 7 organisational units (departments) with national authority some of which report to the Director-General of the State Forest (the State Forest Information Centre, the Centre for Research and Implementation in Bedoń, the Forest Technology Centre in Jarocin, the State Forests Information Department in Bedoń and the Environmental Project Co-



The three-tier organisation of the State Forests (status as of 31 December 2010)

ordination Centre in Warsaw). Two organisational units (the Kostrzyca Forest Gene Bank in Miłków and the Forest Culture Centre in Gołuchów) report to the Regional Directors of the Wrocław and Poznań RDSFs, respectively.

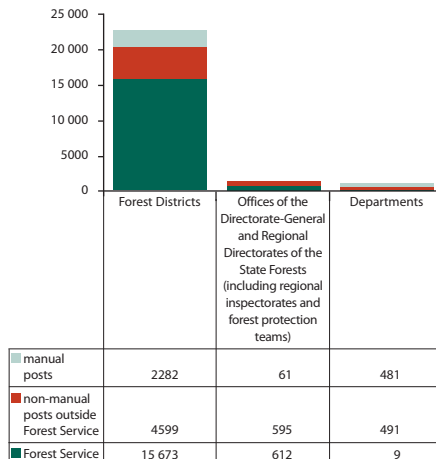
The remaining integral parts of the Directorate-General of the State Forests comprise nine forest protection teams and eleven regional inspectorates.

The fundamental organisational units of the State Forests are forest districts. Each is led by a District Forest Manager who has autonomy in managing the forests in his area according to the forest management plan and who is responsible for their condition. In 2010 there were 430 Forest Districts with an average area of 17.5 thousand hectares each. In the same year there were seven organizational changes in the structure and boundaries which resulted in the merger of two forest districts Wetlina and Cisna.

The average monthly employment in the State Forests in 2010 was 24 733 staff and was less than in the previous year by 459.

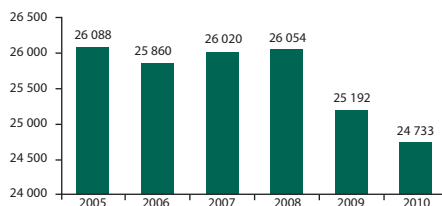
The employment structure in the State Forests can be broken down as follows:

1. In Forest Districts 22 554 persons including:
 - Forest Service 15 673 persons
 - non-manual posts outside Forest Service 4 599 persons
 - manual posts 2 282 persons
2. In the Departments 972 persons Including non-manual posts 491 persons
3. In the Directorate-General and Regional Directorates of the State Forests (including regional inspectorates and forest protection teams 1 207 persons including Forest Service 612 persons



Employment structure in the State Forests in 2010

The analysis of the average level of employment in the State Forests in the years 2005–2010 shows a steady decrease which corresponds with the change in the employment structure.



Average monthly employment in the State Forests in 2005–2010

As of 31 December 2010, 24 861 people were employed with the State Forests, an increase of 32 as compared with the last day of 2009.

The resources of the State Forests

Land-use structure

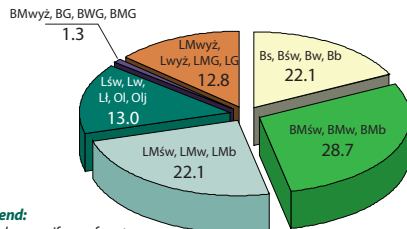
As of 31 December 2010, the total area of land administered by the State Forests accounted for 7 596.6 thousand hectares of which 7 273.1 thousand hectares were forests. The structure of areas administered by the State Forests is as follows:

Land administered by the State Forests	7 596 600 ha (100%)
– forests, total	7 273 100 ha (95.7%)
including:	
– afforested land	6 968 900 ha (91.7%)
– non-afforested land	103 500 ha (1.4%)
– farmland	149 100 ha (2.0%)
– wasteland	101 500 ha (1.3%)
– waters	9 000 ha (0.1%)
– landscape afforestation	13 100 ha (0.2%)

Areal structure by dominant tree species and habitats

Poland has mainly retained forests on the poorest soils, which is reflected in the structure of forest habitat types. Coniferous habitats prevail, accounting for 52.1% of the total forest area, while broadleaved habitats cover 47.9%. In both groups, a further distinction is made between upland habitats which occupy 5.5% of the forest area and mountain habitats which occupy 8.7%. Similar proportions occur in the State Forests.

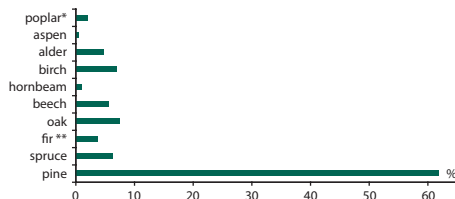
Coniferous species dominate in Polish forests, accounting for 70.8% of the total forest area. Poland offers optimal climatic and site conditions for pine (62.2% of the state forests area) within its euro-asiatic natural range, which resulted in development of a number of important ecotypes (e.g. the taborska pine or the augustowska pine).



Legend:

Bb – bog coniferous forest	Lmb – bog mixed broadleaved forest
BG – montane coniferous forest	LMG – montane mixed broadleaved forest
BMb – bog mixed coniferous forest	LMsw – fresh mixed broadleaved forest
BMG – montane mixed coniferous forest	LMw – moist mixed broadleaved forest
BMsw – fresh mixed coniferous forest	LMwyz – upland mixed broadleaved forest
BMw – moist coniferous forest	Lsw – fresh broadleaved forest
BMwyz – upland mixed coniferous forest	Lw – moist broadleaved forest
Bs – dry coniferous forest	Lwyz – upland broadleaved forest
Bsw – fresh coniferous forest	Oi – alder forest
Bw – moist coniferous forest	Oj – alder-ash forest
BWG – high-mountain coniferous forest	LG – montane broadleaved forest
LG – montane broadleaved forest	Li – riparian forest
Li – riparian forest	

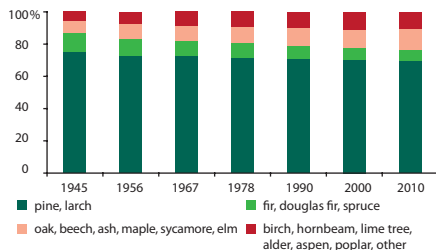
Areal share by forest habitat type within the State Forests (in %) (Large-Scale Forest Inventory)



Areal share of dominant species in the state forests (large-scale forest inventory)

* including other broadleaves ** including other conifers

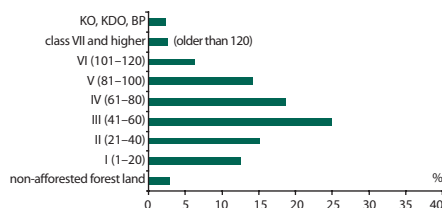
In the period 1945–2010, the species structure of Poland's forests underwent substantial changes resulting, among other things, in an increase in the share of stands with the prevalence of broadleaved species. In the state forests the area of broadleaved stands increased from 13.0% to 23.2%.



Areal share of dominant tree species in the forests administered by the State Forests in 1945–2010

Age structure

Stands aged 41–80 years, representing age classes III and IV prevail in the age structure of forests and cover 27.1% and 18.3% of the forest area respectively. Stands older than 100 years, including stands in the restocking class (KO), stands in the class for restocking (KDO) and stands with selection structure (BP), account for 11.4% of the forest area managed by the State Forest. The share of non-afforested land accounts for 2.9%.



Areal share of stands by age class in the State Forests (Large-Scale Forest Inventory)

A steady increase in the share of stands older than 80 years from about 0.9 million hectares in 1945 to 1.89 million hectares (excluding the KO and KDO classes) between

2006 and 2010 is an indicator of the changes in the age structure of forests. In the same period the average age of stands within the State Forests was 57 years, according to the Large-Scale Forest Inventory.

Afforestation

The basis for all afforestation activities undertaken in Poland is *The National Programme for the Augmentation of Forest Cover*, which was commissioned by the Ministry of the Environment and prepared by the Forest Research Institute. The Programme was adopted for implementation by the Council of Ministers on 23 June 1995. The experience gained during the implementation of the Programme necessitated some modification which was completed in 2002. Consequently, the area foreseen for afforestation in 2001–2020 was increased by 100 thousand hectares to 680 thousand hectares and afforestation preferences for each commune in Poland were revised.

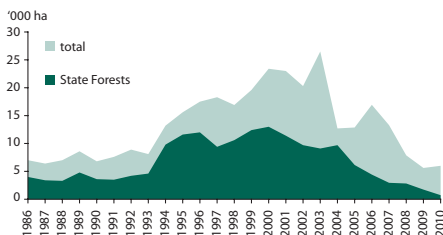
The Programme's main task is to increase the forest cover to 30% by 2020 and 33% by 2050, as well as to ensure an optimal spatial and temporal distribution of forested areas and to set ecological and economic priorities and tools for its implementation.

The afforestation of land under all ownership categories carried out in 2010 covered about 5 864.9 hectares. The largest afforested areas were reported in the Warmińsko-Mazurskie Province at 1 136.1 hectares and in the Mazowieckie Province at 716.1 hectares, while the lowest – in the Śląskie Province at 49.5 hectares and Małopolskie Province at 70.7 hectares. The area afforested in 2010 was by 253 hectares (4.5%) larger in comparison with the previous year.

The current level of implementation of the National Program for the Augmentation of Forest Cover in Poland is shown in the table below:

Ownership category	Stage I (1995–2000)		Stage II (2001–2005)		Stage III (2006–2010)		Total (1995–2010)	
	plan	implemen-	plan	implemen-	plan	implemen-	plan	implemen-
	(’000 ha)	tation (%)	(’000 ha)	tation (%)	(’000 ha)	tation (%)	(’000 ha)	tation (%)
State Treasury	50	140	50	96	40	36	140	95
Private and commune-owned	50	82	70	70	120	31	240	53
Total	100	111	120	81	160	32	380	68

Thanks to subsidies from the state budget and a loan from the European Investment Bank, the afforestation process within the State Forests has accelerated since 1994, in comparison with the period 1988–1993, when the average area of afforested post-agricultural land and wasteland was 3.9 thousand hectares per year. The area afforested between 1994 and 2004 approximated to 10.8 thousand hectares. Since 2005, a steady decline in the afforestation rate within the State Forests has been noted, with 6.1 thousand hectares in 2005 and only 0.7 thousand hectares in 2010.



The level of artificial afforestation in Poland in the years 1986–2010

The total area afforested between 1995 and 2010 amounted to 132.4 thousand hectares of the state-owned land, of which 127.7 thousand hectares was land administered by the State Forests. Areas afforested by way of natural succession approximated 3.2 thousand hectares.

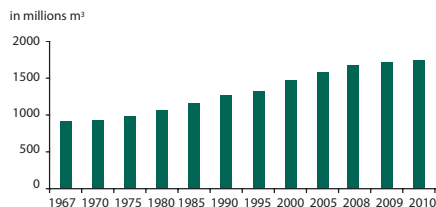
The main problem in implementing the National Programme for the Augmentation of Forest Cover on state-owned land is a significant reduction in the area of post-agricultural and waste land designated for afforestation by the Agricultural Property Agency.

In addition to afforestation of post-agricultural and waste land, forest plantations are being established in areas cleared of mature stands. The area restocked in 2010 covered 46 080 hectares of land under all ownership categories, of which 4 631.2 hectares (10.1%) were naturally regenerated. The area restocked in 2010 was larger by 1.9 thousand hectares, as compared with 2009.

Characteristic of timber resources

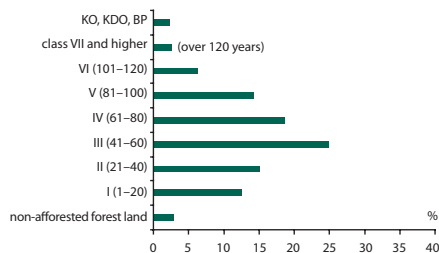
According to the Large-Scale Forest Inventory, the timber resources in the forests under all forms of ownership in the years 2006–2010 totalled at 2 336 million gross merchantable timber, of which 1 865 million m³ were in the State Forests and 355 million m³ in private forests. The most recent inventory of 1 January 2010 estimates timber resources in the forests managed by the State Forests at 1 748 million m³ of gross merchantable timber.

There has been a steady growth of timber resources since the first inventory in the State Forests took place in 1967.



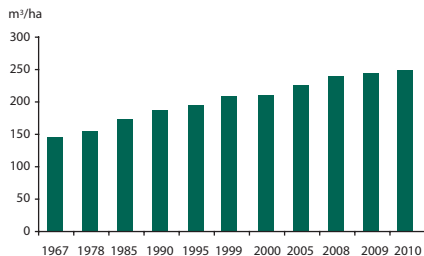
Timber resources in Poland's forests in 1967–2010, in millions of m³ of gross merchantable timber

Stands in the age class 41–80 years account for 50.6% of timber resources within the State Forests. The volume of stands older than 100 years, together with those in classes KO, KDO and BP, accounts for 17.7 per cent of all State Forests' resources.



Volume structure of timber resources by age class within the State Forests (Large-Scale Forest Inventory)

Pine has the largest share in the volume of timber resources within State Forests and accounts for 64.4%. The share of broadleaved timber resources within the State Forests is lower in comparison with private forests. According to the forest area and timber resource update (as of 1 January 2010), the average standing volume of afforested land in the forests managed by the State Forests was 250 m³/ha. The Large-Scale Forest



Average standing volume in the State Forests, 1967–2010 in m³/ha of gross merchantable timber (Central Statistical Office, Forest Management and Geodesy Bureau, Large-Scale Forest Inventory)

Inventory shows that the average standing volume of the forests managed by the State Forests in relation to the total forest area was 264 m³/ha.

From January 1990 to January 2010, the increment in the forests managed by the State Forests amounted to 1 072 million m³ of gross merchantable timber. During that period 586 million m³ of merchantable timber was harvested, which means that 486 million m³ of gross merchantable timber, representing 45% of total increment, remained to augment the standing volume.

The current annual increment in gross merchantable timber calculated for the last 20 years (1990–2010), from the difference in volume at the end (January 2010) and at the beginning (January 1990) of that period, including harvest and calculated per hectare of forest land administered by the State Forests, is 7.7 m³/ha. The same figure for the last five years is 9.2 m³/ha.

The observed growth in timber resources (volume per hectare) in the analysed age classes suggest that an increase in standing volume is not only the result of expanding the forest area. A steady increase of this indicator is observed for all age classes of stands (excluding KO and KDO).

The growth of timber resources within the State Forests is the result of timber harvesting in accordance with the forest sustainability principle and of persistent enlargement of the forest area. To some extent the recorded growth may be due to the application of more precise inventory methods.

Silviculture

Silvicultural aims and principles

The aim of silviculture is to ensure the sustainability and continuity of development of forest ecosystems. This is achieved by using methods of stand regeneration and of profiling their species

and age structures, which are based on natural processes. These renewal, tending and protective methods are used at all stages of stand development.

In the State Forests much attention is being given to the ecological bases for the development of trees and forest stands. This is reflected in a precise analysis of soil/site conditions, which is essential in preserving or restoring the suitability of habitats for species composition and in protecting near-natural ecosystems (for example in riparian and alder forests, mid-forest water bodies and watercourses, mires, peatbogs, heather moors, habitats of rare plant species and animals refuges).

Of no lesser importance is the conservation of biological diversity, enrichment of forest biocoenoses, setting restrictions on clear-cutting, prioritizing natural regeneration of forest and diversification of the forest edge zones. Emphasis is also put on the afforestation of land and stand conversion, especially in the upper parts of mountain catchments, in watershed areas and in places threatened by erosion.

The more important forest management activities undertaken within the State Forests in 2010 were as follows (data in hectares):

1. Nursery production (total production area in forest nurseries)	2 575
2. Restocking and afforestation (including filling gaps and introduction of the second storey)	51 435
including:	
– restocking and afforestation	47 569
– natural regeneration	3 866
including natural succession	172
3. Introduction of the second storey in restocking	5 858
4. Fill planting and supplementary planting	4 814
5. Forest tending, total	262 962

including:

– underbrush	904
– soil preparation and weed control	12 147
– early cleaning	59 231
– late cleaning	75 681
6. Thinning, total	447 027
including:	
– early thinning	114 715
– late thinning	332 312
7. Agrotechnical and hydrological drainage, supplementary	55 642
including:	
– agrotechnical drainage	52 840
– water drainage	2 802
8. Stand conversion, total	10 641

Forest protection

Poland's forests are among the most threatened in Europe due to a permanent, concurrent impact of a number of factors which cause changes in their health conditions. The negative phenomena, often called stress factors, can be classified with respect to:

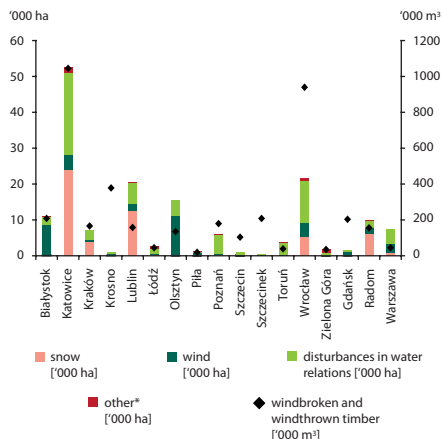
- their origin into: abiotic, biotic and anthropogenic;
- character of the impact into: physiological, mechanical and chemical;
- durability of impact into: chronic and periodical;
- the role they play in the morbid processes into: predisposing, initiating and contributing.

The impact of stress factors on the forest environment is complex and frequently synergic. Moreover, the response to a stress factor from the moment of its occurrence can be delayed. This creates a difficulty in interpreting the observed phenomena, particularly the direct cause-and-effect relationships.

Threats to forests posed by abiotic factors

In 2010 (October 2009 – September 2010), damage caused by abiotic factors to the forests managed by the State Forests was reported on 164.4 thousand hectares of stands older than 20 years. More than 38 thousand hectares of stands were damaged by wind, more than 68 thousand hectares by groundwater level fluctuations, 54 thousand hectares by snowfall, 2.3 thousand hectares by toxic emissions and 644 hectares by low and high temperatures.

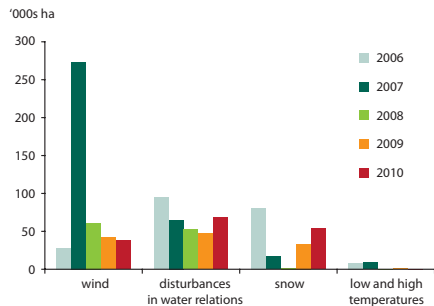
In 2010, the largest area (52.7 thousand hectares) of damage to forests caused by abiotic factors was noted in the Katowice Regional Directorate of the State Forests. With regard to the volume of windbroken and windthrown timber, the greatest damage to stands occurred in the territories of regional directorates of Katowice (1 045 thousand m³), Wrocław (939 thousand m³) and Krosno (378 thousand m³).



Area of occurrence of damage caused by selected abiotic factors to stands over 20 years and the volume of windbroken and windthrown timber, by RDSF in 2010

* hail, emissions, low and high temperatures, fires

The data from the period 2006–2010 demonstrates that forests are exposed to an ongoing pressure from the extremely unfavourable thermal conditions and from groundwater level fluctuations (despite a marked decline in the area of damaged stands caused by this factor in 2007–2009), as well as to a random occurrence of the remaining factors.



Area of occurrence of damage caused by abiotic factors to the forests administered by the State Forests between 2006–2010

Threats to forests posed by biotic factors

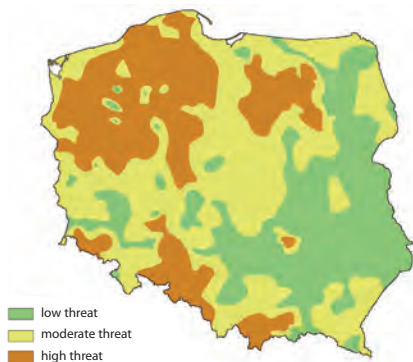
Threats to forests posed by insects

Poland is in the group of countries in which unfavourable phenomena in forests, such as mass outbreaks of insect pests or infectious fungal diseases, occur with high diversity and intensity.

Over the last few decades, the negative impact of stress factors in the forest environment resulted in: activation of new and poorly documented insect and fungal species which so far have not done any serious damage; shortening of intervals between the outbreaks of most dangerous known insects: appearance of new and enlargement of old outbreak centres, i.e. an increase in the area of mass incidence; deterioration of the health condition of

broadleaved tree species so far considered resistant to industrial pollution.

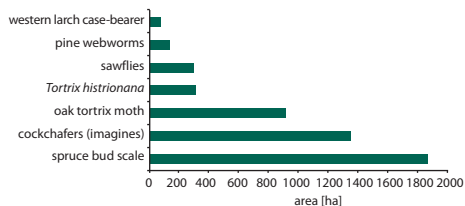
The geographical distribution of damage to forest stands by insect pests shows that most threatened are the stands in northern Poland (western part of the Mazury Lakeland), in the north-west (the Pomorze and Wielkopolska Lakelands) and in three southern regions (the Sudety Mountains, Śląsk Opolski and the Beskid Wysoki Mountains). The threat to forests in southern Poland is almost entirely attributed to secondary pests and in other regions of the country – to primary pests (chiefly nun moth).



Areas threatened by forest insect pests (both primary and secondary) (Forest Research Institute)

The activity of pest insects in 2010 decreased by nearly 10% in comparison with the previous year. The control treatments aimed to reduce the populations of about 45 insect species covered an overall area of almost 12.8 thousand hectares which was smaller by 4.3 thousand hectares than in 2009. The reduction in the area of stands affected by insect pests was due to a decline in the populations of conifer sawflies (*Diprionidae* spp.),

pine beauty moth (*Panolis flammea* Den. et Schiff.) and imagines of *Melolontha* spp.



Area of stands covered by protective treatments against major folivorous insect pests in 2010

The greatest damage to stands in Poland is caused by folivorous species which attack older pine stands, among them: the nun moth (*Lymantria monacha* L.), sawflies (*Diprionidae*), pine lappet moth (*Dendrolimus pini* L.), pine looper moth (*Bupalus piniarius* L.), pine beauty moth (*Panolis flammea* Den. et Schiff.) and pine webworm (*Acantholyda nemoralis* L.). The outbreaks occur cyclically.

The last three years have seen a decrease in the threat to broadleaved stands from cockchafer beetles. The affected area in 2010 covered 13.1 thousand hectares, a reduction of about 5.4 thousand hectares in comparison with the previous year. Salvation measures taken against these pests were applied on an area of 1 345 hectares.

In 2010, damage to stands caused by the pests attacking root systems were reported on 35 810 hectares of stands, of which 35 728 hectares were damaged by cockchafer larvae. The threat to forest nurseries and plantations from cockchafer larvae has remained at a high level in recent years.

In contrast, the nun moth population has been maintained at a low level in the last few years. In 2009 the occurrence of this pest was reported on about 20 thousand hectares, while in

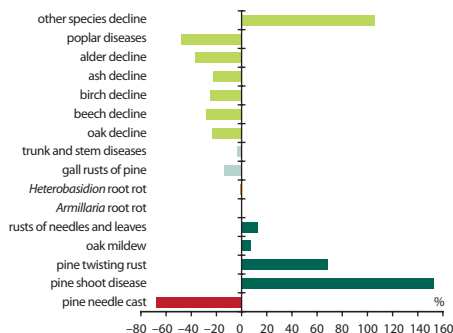
2010 this area increased to 31.3 thousand hectares. Most threatened were stands in the Toruń and Gdańsk Regional Directorates.

In recent years, the area of pine stands afflicted by pine sawflies has varied between 20 thousand and 25 thousand hectares. In 2010, damage caused by this group of insects was reported in an area of 12.3 thousand hectares, a 50% decrease on the previous year. Control treatments covered an area of 295 hectares.

In the year between 1 October 2009 and 30 September 2010, the greatest damage to forests was caused by the following secondary pests: *Phaenops cynaea*, weevils and pine-shoot beetles in pine stands, European spruce bark beetles in spruce stands, two-spotted oak borers and oak splendour beetles in oak stands. These outbreaks were associated with the weakening of stands by abiotic factors, such as wind, changes in the groundwater level, snow or low and high temperatures.

Threats to forests posed by infectious fungal diseases

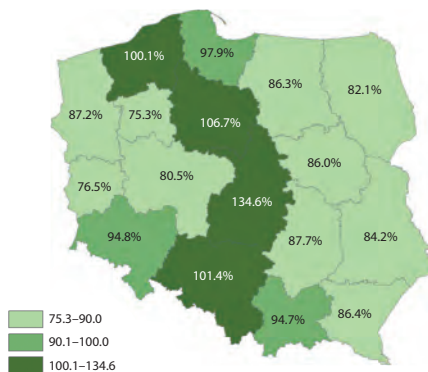
In 2010 infectious diseases were reported over a total area of 384 thousand hectares of stands, a decrease by nearly 27.5 thousand hectares (or 7%) as compared with 2009. This was due to a three-fold decrease in the areas afflicted by *Lophodermium* needle cast of pine. In turn, an increase was noted, to a varying degree, in the areas of occurrence of other diseases of assimilatory apparatus: pine shoot disease, pine twisting rust (630 hectares and 310 hectares respectively), as well as oak mildew and needle and leaf rust (by 7% and 13% respectively). The dieback of all broadleaved tree species: oak, beech, birch and ash was less severe (decrease of 23%, 28%, 25% and 23%). The area of stands showing the symptoms of alder dieback was reported to decrease by 1800 hectares and of fungal diseases in



Changes in the area of occurrence of infectious diseases in 2010 in comparison with 2009 (%)

poplars cankers and tree decline taken together) – by 48%.

A slight decrease was also noted in the area of forests affected by pine gall rust and stem and trunk diseases (14% and 4% respectively). The occurrence of root-rot diseases was reported in an



Changes in the area of occurrence of infectious diseases in 2010 expressed as a percentage of the area under threat in the previous year

area of 2.2 thousand hectares. The area of stands affected, to a varying degree, by the *Heterobasidion* root rot decreased by 2%, while the occurrence of the *Armillaria* root rot remained at the same level.

A comparison between 2010 and the previous year indicates that in the majority of Regional Directorates the health condition of forests either stabilized or improved. Only in the Łódź Regional Directorate the area of infected stands increased by 34.6%, which was due to a five-fold increase in the area afflicted by oak decline, as compared with 2009.

Damage to forests caused by game

Damage to forests caused by wild animals in the 2009/2010 season occurred in a total area of 170 thousand hectares, including 76 thousand hectares of plantations, 62 thousand hectares of young stands and 22 thousand hectares of stands in older age classes. The area of stands damaged by deer browsing or bark stripping increased by 14 thousand hectares in comparison with 2009.

In 2010, nearly 51 thousand hectares of land in the territory of the State Forests was restocked and afforested. In that year, 100 thousand hectares of forest plantations were protected (using different methods) against game animals.

The eight-year inventory of damage to forests caused by deer in forest plantations shows that after a slow but steady decline, the situation in 2009 and 2010 was reversed. An increase in the area of damage to both young and older generation of forest was observed.

Threats posed to the forest environment by anthropogenic factors

Forest fires

In 2010, the number of forest fires within the State Forests was 1 740 (37% of all forest fires in Poland) and covered an area of 380 hectares (18%

of the total). The largest number of forest fires occurred within the Regional Directorates of Zielona Góra (236), Szczecin (230) and Katowice (222). The largest burnt area (108 hectares, or 28% of all fire areas within the State Forests) was reported in the Katowice Regional Directorate. There were no large fires (covering more than 10 hectares) in the territory of the State Forests, in contrast with the rest of the country where 14 occurred.

Eight fires occurred on the military training grounds with a total burnt area of 412 hectares (compared with three fires in 2009 covering 54 hectares).

The average area of a single fire within the State Forests was 0.22 ha, whereas in forests in other forms of ownership this figure was 0.59 ha.

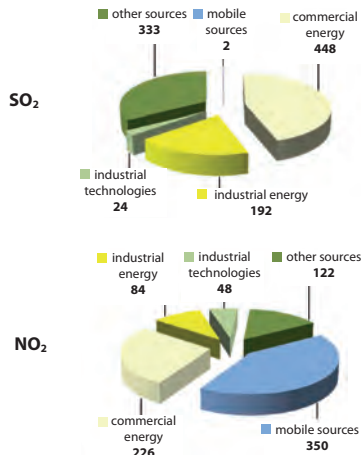
The most frequent causes of fires within the State Forests were: arson (43%) and careless adults (25%). Nearly 4% of fires spread from areas other than forests (4.3% of burnt stands). The number of fires of unknown origin (22% of fires and 22% of burnt stands) is still high.

Air pollution

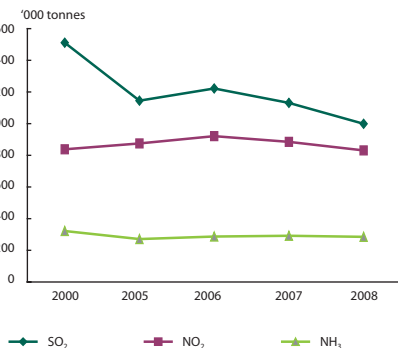
According to the Central Statistical Office, the total emission of major air pollutants in Poland is one of the highest (in absolute values) among the EU countries. In 2008, the total emissions of sulphur oxides in Poland amounted to 999 thousand tonnes, nitrogen oxides calculated as NO₂ – to 831 thousand tonnes and ammonia – to 285 thousand tonnes.

Since the late 1980s, a decrease of SO₂ emissions has been noted in Poland. Except for local incidents, they are probably not the main cause of the current deterioration of the health condition of our forests.

The Intensive Monitoring Network consists of 12 Permanent Observation Plots (POPs), five of which are located in pine forests in the Forest



The total emission of sulphur dioxide and nitrogen oxides by sources of pollution in 2008, in '000 tonnes



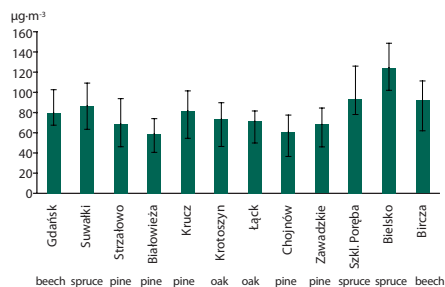
The total emission of SO₂, NO₂ and NH₃ in Poland in 2000–2008, in '000 tonnes

Districts: Chojnów (Warszawa Regional Directorate of the State Forests), Strzałowo (Olsztyn RDSF), Białowieża (Białystok RDSF), Krucz (Piła RDSF) and Zawadzkie (Katowice RDSF). Three POPs are located in the spruce stands in the Forest Districts:

Suwałki (Białystok RDSF), Bielsko (Katowice RDSF) and Szklarska Poręba (Wrocław RDSF), two – in the oak stands in the Forest Districts: Łąck (Łódź RDSF) and Krotoszyn (Poznań RDSF) and another two – in the beech stands in the Forest Districts: Gdańsk (Gdańsk RDSF) and Bircza (Krosno RDSF).

The forest monitoring network provides information on the concentrations of major pollutants in the forest environment in different regions of Poland.

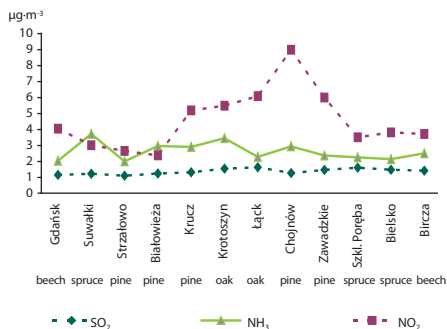
The ozone level was measured during the growing season from April to October, when high concentrations were anticipated due to the conditions conducive to its formation in the troposphere (high temperatures, strong insolation). The monthly ozone concentrations ranged from 36.6 to 149 $\mu\text{g}\cdot\text{m}^{-3}\cdot\text{m}^{-1}$ with the maximum values falling in April. With lower temperatures and poorer insolation at the end of the measurement period in September and October, the ozone concentrations were significantly reduced.



Average ozone concentrations in the air measured on the Permanent Observation Plots of Intensive Monitoring in 2010. The error bars represent monthly minimum and maximum.

The average annual concentrations of pollutants on the analysed POPs varied between 1.1–1.6 $\mu\text{g}\cdot\text{m}^{-3}$ for SO₂, 2.4–9.0 $\mu\text{g}\cdot\text{m}^{-3}$ for NO₂ and 2.0–3.7 $\mu\text{g}\cdot\text{m}^{-3}$ for NH₃. The seasonal variability was

clearly marked – during the heating season, particularly in January, February, November and December, SO_2 and NO_2 concentrations were the highest.



Average values of sulphur dioxides, ammonia, and nitrogen dioxide concentration in the air measured on the Permanent Observation Plots of Intensive Monitoring in 2010

Acidifying compounds reach the forest ecosystem from the atmosphere with precipitation (rainfall, drizzle, snow, mist, etc.). The sulphate and nitrate ions, as well as protons contained in the precipitation, have a direct impact on the tissues of the assimilatory apparatus and are generally less damaging to the environment than the gaseous deposition. However, the influx of these elements into the soil usually brings long-term consequences for the ecosystems.

Acid precipitation includes snow, hail or rain with a pH value less than 5.6. More than half of the monthly precipitation recorded on the Permanent Observation Plots of Intensive Monitoring in 2010 had a pH below 5.5. The annual ion deposition transferred with the precipitation to forest areas oscillated between 28 and 55 kg·ha⁻¹. The lowest ion deposition was recorded in the Białowieża, Krotoszyn and Chojnów Forest Districts, while the highest – in the mountain regions in the Bielsko

and Szklarska Poręba Forest Districts which also have the highest precipitation.

The deposition of elements in the under-crown precipitation was greater than in the total deposition reaching the forest floor. The annual undercrown deposition in 2010 ranged from 37 to 87 kg·ha⁻¹. The volume of annual deposition was largely attributed to the amount of precipitation during the year. The highest concentrations of undercrown deposition were recorded in the territory of Szklarska Poręba (spruce), Zawadzkie (pine), Bielsko (spruce) and Krotoszyn (oak) Forest Districts, while the lowest – in Krucz (pine).

The deposition of heavy metals, *i.e.* zinc, copper, cadmium and lead (with the quantitative prevalence of zinc), ranged from 300 to 800 g·ha⁻¹·year⁻¹. A significantly higher content of heavy metals was recorded on the two mountain POPs located in the territory of the Szklarska Poręba and Bielsko Forest Districts, which is associated with the high total deposition in these regions, as compared with the rest of the country.

Threats to forest sustainability

The impact of stress factors on forests which already have a reduced resistance of forest ecosystems (e.g. unsuitable species composition for the habitat conditions and introduction of tree ecotypes of foreign origin) may, in extreme cases, lead to their total decline. This situation occurred in 1980–1991 in the Sudety Mountains where, due to the weakening of stands by industrial emissions, long-lasting draughts and mass occurrence of secondary pest, the stands were completely removed in sanitation felling in the State Forests'





area of 15 thousand hectares and over 4 million m³ of deadwood was harvested.

The ecological disaster in the Sudety Mountains prompted the establishment of an institution which would oversee the conservation of endangered ecosystems in Poland. Its remit was developed as a result of cooperation between the representatives of the State Forests and the Institute of Dendrology of the Polish Academy of Sciences. The Kostrzyca Forest Gene Bank (LGB) was officially opened in December 1995. It is located in Miłków, at the foothill of the Karkonosze Mountains which, like the Izerskie Mountains, were severely affected by the ecological disaster in the late 1970s and early 1980s.

The Kostrzyca Forest Gene Bank was established in response to the emerging threat to the sustainability of forests from various abiotic, biotic and anthropogenic factors. Regrettably, these threats still continue and the role of foresters is to take any possible action to minimise their effects. One of the examples of such action is a programme of preventive measures developed by the Katowice RDSF for the Beskid Śląski and Beskid Żywiecki forests.

In the past 30 years work was carried out to reduce the proportion of spruce in the structure of stands. The share of spruce in the composition of stands in the Sucha, Jeleśnia and Ustroń Forest Districts was reduced by approximately 20%.

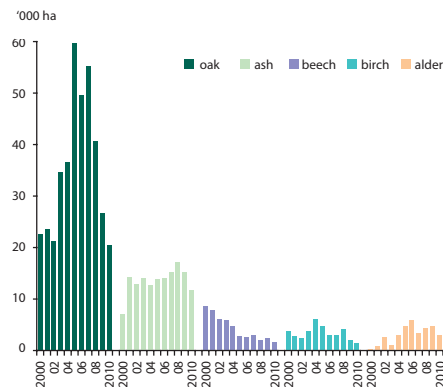
In 2003, The Programme for the Beskid Mountains was developed and implemented. The document includes the strategy for protective and silvicultural treatment for the Beskid forests and seeks improvement in the current situation of stand conversion. Nearly 3 000 hectares of spruce stands were subject to conversion. The costs of implementation of the programme in the years 2003–2006 amounted to as much as PLN 61 million.

In spite of the intensive programme of preventive measures, an increased dieback of trees

was observed in the past four years, resulting in stand decline in the Beskid forests. In 2006 in the State Forests' territory in Beskid Śląski and Beskid Żywiecki, 0.8 million m³ of timber was harvested in sanitation cuttings. The situation is being made worse by the fact that the owners of privately-owned forests (which have a significant share in the region) can be reluctant to carry out the required level of sanitation treatments.

The favourable weather conditions in the growing season of 2009 have contributed to the improvement of the health condition of the Beskid forests and the reduction of the rate of spruce stand decline.

The occurrence of many stress factors is regarded as the cause of the increased decline of broadleaved trees observed in recent years. The cyclic recurrences of oak decline, observed since the 1970s, have been attributed to extreme climate conditions, such as the very high or low temperatures, long-lasting draughts, and changes in groundwater level. Recent scientific reports point to a significant role of fungi of the genus *Phytophthora* in the decline of broadleaved stands.



Area of dieback of selected broadleaved tree species within the State Forests in the years 2000–2010

In 2010, the phenomenon of oak decline was observed on 20.4 thousand hectares, the smallest area since 2000.

Ash decline has been observed in Poland for more than a decade. In 1999, the affected area amounted to about 2 300 hectares and, since 2001, ash decline has been recorded every year in an area of 13–14 thousand hectares. In 2007, the area of dying ash stands for the first time exceeded 15 thousand hectares. In 2010, the area showing ash decline was the lowest since 2001 and amounted to 11.8 thousand hectares.

Recent years have seen a steady improvement in the situation of beech stands. In 2000, beech decline was recorded in an area of 8.6 thousand hectares, while in 2010 only on 1.7 thousand hectares.

The decline of alder was for the first time reported in 1999 in an area of 31 thousand hectares. In 2010, the area of threatened alder stands amounted to 3 000 hectares.

In total, the phenomenon of tree dieback in 2010 was observed on 40.4 thousand hectares, a decrease by about 22% compared with the previous year.

The 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

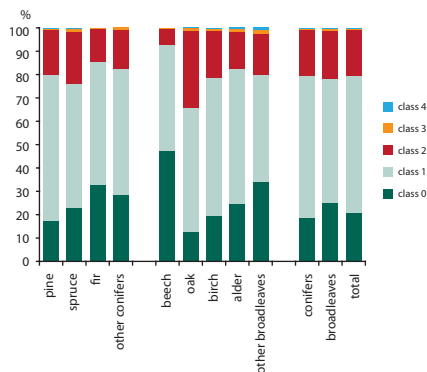
In the years 2006–2009, the forest monitoring programme was integrated with the Large-Scale Forest Inventory. A network of Level I Permanent Observation Plots (POPs) with grid density

16 x 16 km was established in accordance with recommendations by the International Co-operative Programme, ICP-Forests. In 2009 the grid density was reduced to 8 x 8 km. The forests under different forms of ownership and different protection regimes are being assessed under the forest monitoring programme. The assessment is carried out in the stands over 20 years old located on Permanent Observation Plots. Sample trees of all woody species located on the plots are selected for assessment.

The location of the Level II Permanent Observation Plots has not changed. The scope of measurements and observations on these plots is a continuation of the monitoring programme from previous years.

In 2010, an assessment of defoliation covered 39 080 trees older than 20 years in stands located on 1 954 Level I POPs (20 trees per plot).

Among the trees subjected to assessment, 21.0% showed no defoliation (defoliation class 0 – healthy trees), including 18.8% of conifers and 25.2% of broadleaves. The largest share of



Share of monitored tree species in defoliation classes on Permanent Observation Plots Level I (Forest Monitoring) in 2010 – stands of over 20 years of age under all forms of ownership

coniferous trees without defoliation was reported for fir (32.8%), and the lowest – for pine (17.6%). The largest share of healthy broadleaved trees was reported for beech (47.3%) and the lowest – for oak (12.8%).

The share of all damaged trees with defoliation over 25% (defoliation classes 2–4) was 20.7%; the share among conifers was 20.2% and among broadleaves to 21.5%. Spruce had the highest share of damaged coniferous trees (24.0% of trees with defoliation over 25%) and among broadleaves – oak (34.2%). The lowest share among the conifers had fir (14.6%), and beech (7.5%) among broadleaves.

The share of healthy trees (class 0) in the forests under the management of the State Forests accounted for 21.3% and the share of damaged trees (classes 2–4) for 19.3%.

The healthiest forests were found in the territory of the Szczecin Regional Directorate (45.7% of trees in class 0 and 8% of trees in classes 2–4, average defoliation 15.0%). Healthy were also forests administered by the Regional Directorates in Zielona Góra and Krosno (above 32% of healthy trees, 9.6% and 20.4% of damaged trees, average defoliation below 19.5%). The most damaged stands were reported in the territories of the Gdańsk and Warszawa Regional Directorates (average defoliation was 24.3% and 24.6%, the share of healthy trees 8.3% and 2.1%, while the share of damaged trees was 30.9% and 28.5% respectively).

Forest utilisation

Structure of timber harvest by category of cut

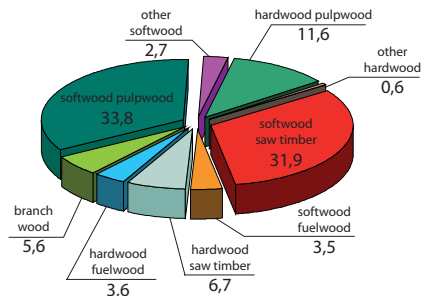
The use of forests as a renewable resource of raw material is driven not only by market demand, which ensures economic conditions for forest management, but also by silvicultural needs and

the principles by which the structure of forest resources is regulated. Forests are utilised at a level determined by natural conditions of timber production, in accordance with the principle of sustainability of forests and augmentation of their resources.

The amount of timber (gross merchantable timber) to be harvested in any forest district is defined in a cutting plan set for a 10-year period. The final yield is the prescribed maximal volume of timber to be harvested in mature stands ready for regeneration. The anticipated volume of timber obtained in intermediate cutting in younger stands is only approximate and can change depending on the current silvicultural and sanitary needs.

The volume of timber harvested in the State Forests in 2010 amounted to 33 769 thousand m³, of which 31 882 thousand m³ was net merchantable timber (about 100.2% of the approximate annual cut). In final felling 15 261 thousand m³ was harvested (93.3% of prescribed cut) and in intermediate felling 16 621 thousand m³ (107.5% of prescribed cut). The volume harvested in sanitation felling, *i.e.* deadwood obtained as a result of natural processes from wind damage, outbreaks of pest insects, disturbances in water relations, air pollution and weather anomalies, amounted to 5 686 thousand m³, or 17.8% of the total harvest of merchantable timber and was slightly higher than in 2009 (by 17.2%).

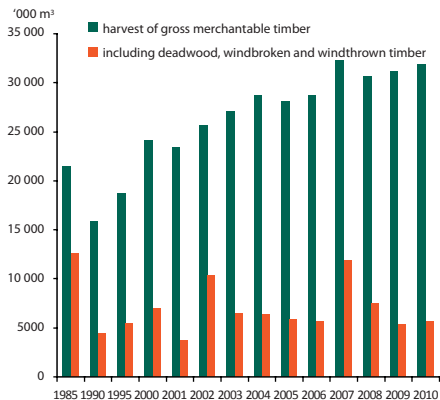
In 2010, under the clear-cut system 6.1 million m³ of merchantable timber was harvested, which accounts for 19.0% of total harvest. The clear-cut area in that year totalled 26.0 thousand hectares, which was a much lower figure in comparison with the data from the early 1980s when it was almost 43 thousand hectares. In the past decade, the area of clear-cuts averaged at 26.6 thousand hectares. The reduction in the size of the clear-cut area is indicative of the progress in the 'ecologisation' of



The structure of timber harvest in 2010

forest management; the use of clear-cuts is often the result of large-scale damage to forests caused by wind, drought, fungal infection or insect outbreak.

The volume of timber harvest calculated as net merchantable timber per hectare of forest area in the State Forests stabilised over the last five years and was 4.0–4.5 m³/ha (in 2005 – 4.00 m³/ha, in 2007 – 4.58 m³/ha, in 2010 – 4.51 m³/ha). The harvest level did not exceed the allowable amount of cut.



Share of deadwood, windbroken and windthrown timber in total utilisation in the State Forests in 1985–2010, in '000 m³ of net merchantable timber

The assortment structure of harvested and sold timber

The sale of timber in 2010 totalled 33 731 thousand m³, including 31 877 thousand m³ of gross merchantable timber, an increase of 422 thousand m³ in comparison with the previous year.

The sale of softwood pulpwood – 11 448 thousand m³ and softwood saw timber – 10 764 thousand m³ accounted for most sales.

The average sale price of wood in the State Forests in 2010 was 157 PLN/m³ and the revenues from timber sales amounted to PLN 5283.7 million. The sale of timber that year was in accordance with the provisions set out by the Director-General of the State Forests on 14 October 2009. Under this system the sale of timber was divided into six-month periods and consisted of two types: sale through limited tender on the Forestry and Timber Portal designated for buyers with the so-called purchase history (50% of the pool designated for entrepreneurs – 25% for each six-month period) and through regular Internet auctions on the e-wood website (50% of the pool designated for entrepreneurs – 25% for each six-month period).

Nature conservation in the State Forests

Preservation of biodiversity

Of all forms of nature and landscape protection, forests are the most valuable and best-represented category.

The State Forests plays an important role in protecting nature in forest areas, as the majority of most valuable and attractive objects and forms of

nature conservation are located in the territories under its management. These, as well as the rich and diverse flora and fauna which occur within the State Forests areas, demonstrate the positive impact of forest management on maintaining the biological diversity.

Complying with the Forest Act and the national policy on forests, the State Forests has for many years been carrying out a regularly updated inventory of all valuable forms of biological diversity. The current data is often supplied by individual Forest Districts whose management plans include aspects of nature conservation in their areas. The inventory covers all elements subjected to legal protection, *i.e.* nature reserves, natural monuments, areas of ecological utility and endangered and rare species.

As of 31 December 2010, the inventory carried out in the State Forests included:

- 1 250 nature reserves with an area of 122 000 hectares, of which more than half are forest reserves (693);
- 11 549 natural monuments, including 8 881 single trees, 1 562 groups of trees, 185 tree avenues, 463 erratic rocks, 226 rocks and caves, 232 areas embraced by monument protection (356 hectares);
- 9 262 areas of ecological utility with a total area of 29 485 hectares;
- 370 documentation sites with a total area of 1 630 hectares;
- 130 nature-and-landscape complexes with a total area of 46 837 hectares.

In addition, 3 195 protective zones have been created in the State Forests to protect refuges of rare birds, mammals, reptiles, insects and lichens. They cover an overall area of 152 301 hectares, of which 31 975 hectares are under permanent protection throughout the year. The largest area of

all-year protection, covering 31 095 hectares, has been designated as bird refuges.

There are also more than 222 025 hectares of stands selected for the production of seeds. These include 15 811 hectares of selected seed stands, 202 076 hectares of managed seed stands and 4 138 hectares of gene conservation stands and plantations which make possible the propagation of native ecotypes of the main forest tree species.

The State Forests has also been implementing its own programmes aimed at the preservation of biological diversity and restoration of the endangered flora and fauna species. Some of the more important initiatives are: the *Programme for the Preservation of Forest Genetic Resources*, the *Programme for the Restitution of Fir in the West Sudety Mountains*, the *Programme for the Restitution of Yew* and the *Programme for the Reintroduction of Capercaillie*. Forest Districts benefit from EU subsidies to develop and implement this type of projects.

There are five botanical gardens in the territory administered by the State Forests. These are: the Forest Arboretum of Warmia and Mazury in the Kudypy Forest District near Olsztyn; the Wirty Arboretum in the Kaliska Forest District (the oldest dendrology forest in Poland; the Dendrology Garden in Glinna in the Gryfino Forest District; the Forest Arboretum in Syców; the Park-Arboretum in the Forest Culture Centre in Gołuchów.

Game animals, whose numbers in Poland are some of the highest in Europe, are indicative of the richness of species of the forest fauna. The number of most ungulates (elk, red deer, fallow deer) has remained at a high level, and in some cases even increased, posing a threat to forests. The exceptions are the hare and partridge whose populations are currently maintained at the level of about 15% of what it was in the 1970s.

Natura 2000 network

The main goal of the European network of protected areas Natura 2000 is to prevent the extinction of endangered plant and animal species and to protect the biological diversity in Europe. All member states are obligated to establish special protection areas to be included in the Natura 2000 network. The legal basis for the implementation of this programme are two EU directives: *Birds Directive* and *Habitats Directive*. Both were incorporated into the Polish legislation as one of the forms of nature protection by the Act of 16 April 2004.

The network comprises two types of protection areas:

- Special Protection Areas (SPAs) designated for the conservation of wild birds;
- Sites of Community Importance (SCIs) for the protection of natural habitats and rare flora and fauna species.

By the end of 2010, 144 Special Protection Areas for wild birds covering 5 571 thousand hectares and 823 Sites of Community Importance covering 3 792 thousand hectares were established (General Directorate of Nature Protection GDOŚ). These areas cover nearly 20% of the country's land area.

The Natura 2000 areas account for 40% of the total forest area under the management of the State Forests. This means that the foresters are charged with the responsibility for the state of habitats and species populations. 122 Special Protection Areas for Birds cover 2 063 thousand hectares (29.2% of the State Forests area) and 662 Sites of Community Importance for protection of habitats – 1 511 thousand hectares (21.4%).

Nature and forest education in the State Forests

Nature and forest education in all organizational units of the State Forests is based on *The Programme for Forest Education of Society in Forest Districts*, in force since 1 January 2004, which helps in planning and targeting educational activities across the board. Since then, an annual *Report on the Educational Activities of the State Forests* has been published, which contains information on the educational base, the forms of educational and training courses, sources of financing and on the most important educational events of the year.

The Forest Culture Centre in Gołuchów plays a special role in providing forest education to society. Many educational and cultural events initiated by the Centre, such as the national storytelling competition "Tales from the Forest Clearing", the national amateur art competition for foresters, the educational festival "Meeting with Forest" and the "Earth Day" festival have become permanent items in the educational calendar of Poland. In 2010 nearly 140 thousand people, mainly children and young people, participated in the educational events provided by the Centre. Included in these events were 4 permanent and 11 temporary exhibitions and an international outdoor art competition entitled "Forest Inspirations II".

The educational activity using the mass media is carried out primarily by the State Forests Information Centre (CILP) and the State Forests Centre for Development and Implementation in Bedoń. This includes the forestry educational portal www.erys.pl, forest journals and book publications, as well as radio and television programmes.



Natura 2000 areas in Poland

In the past year, the portal erys.pl recorded 313 thousand visits, 26 thousands on average per month. The publishing activity of the Information Centre includes periodical titles *Echa Leśne*, *Głos Lasu* and *Biuletyn Informacyjny LP*.

The educational activity of the State Forests in 2010 was financed mainly from the Forest Districts' own resources (PLN 13.1 million). In addition, PLN 1.9 million was obtained from the national and regional funds for environmental protection and PLN 1 million from other sources. The State Forests as a whole offers the following facilities: 66 education centres, 301 forest exhibition rooms, 545 open-sided teaching shelters adapted for use by "green classes", 1 013 educational trails, 106 parks and dendrology gardens, 1 840 education points and 2 676 other facilities.

Thanks to the promotional efforts, information about educational programmes offered by the State Forests reaches more recipients and as a result more visitors participate in them. In 2010, more than 1.8 million people attended various educational events organised by foresters, including 560 thousand who took part in the activities provided by the Promotional Forest Complexes.

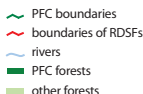
The State Forests also offers a wide range of recreational tourist facilities which are available to visitors of any age and social group. There are nearly 4 500 beds available in recreation and training centres, as well as guest rooms in foresters' and hunters' lodges. They can provide a welcome rest after a day of walking or cycling. There are many established routes in the forests for both walking and cycling: 22 thousand kilometres of walking trails, 21 thousand kilometres of cycling trails and about 3 000 kilometres of horse riding routes. There are also over 300 camping sites in forests with places for a campfire, 600 forest bivouac sites, 200 campgrounds, as well as

1 100 forest car parks and parking spaces for nearly 3 thousand cars, almost 100 sports facilities and 650 other facilities.

Information about the State Forests' tourist facilities can be found at www.czaswlas.pl.

Promotional Forest Complexes

The Promotional Forest Complexes (PFCs) are an excellent ground for implementing and pursuing the principles of forest management planning which integrate goals such as universal nature protection, support for the environment, shaping the function of forests, sustainable utilisation of forest resources, economic stabilisation of forest management and participatory management of forests as a public good. The PFCs were established within the State Forests as part of the national policy on forests and the provision of the Forest Act. Their main aim is to provide educational programmes to the society as a whole and particularly to children and young people. These programmes promote pro-ecological and multifunctional forest management and give the opportunity for direct involvement with foresters. In order to achieve this the PFCs have developed a sizeable educational and tourist infrastructure, which is usually available free of charge. This comprises: environmental education centres (22), nature-forest exhibition rooms (50), open-sided teaching shelters adapted for use by so-called "green classes" (69), educational trails (154), education points (318), dendrology parks and gardens (17), a "green school" and also overnight accommodation.



Promotional Forest Complexes in Poland in 2010 (Forest Research Institute)

The Promotional Forest Complexes also provide ground for scientific research; their knowledge base of the forest environment is used for interdisciplinary research which, in turn, informs the improvement of the forest management methods and defines the boundaries of economic interference in the forest ecosystems. They are also an alternative to the overcrowded national parks where tourist

traffic is regulated by strict rules. The State Forests, through opening the many available facilities to the public, provides an excellent opportunity for them to get acquainted with the principles of the ecological forest management and to be in direct contact with nature without any restrictions on access and movement. This is particularly important for educating children and young people.

There are 19 Promotional Forest Complexes which are located in each of the 17 Regional Directorates of the State Forests. At present, their total area is over 1 million hectares, of which 979 thousand hectares, are within the area administered by the State Forests (14% of the total area).

Projects partly funded by the EU

The State Forests National Forest Holding is the beneficiary of three infrastructure projects from the list of individual projects for the Operational Programme Infrastructure and Environment 2007–2013. Two of these projects relate to water retention and the third to the rehabilitation of degraded forest areas. They are outlined below:

1. *Increasing water storage capacity and counteracting floods and droughts in forest ecosystems in the lowlands.* The total cost of this project is PLN 195.2 million. The maximum amount of qualified expenses is PLN 160 million, while the refunded amount will be PLN 136 million. According to the agreement, 3 300 facilities with a storage capacity of 31 million cubic metres of water will be completed. On 1 October 2010, the first application for payment was submitted with qualified expenses amounting to PLN 4.9 million, of which PLN 4.2 million will be refunded. By the end of 2010, 89 facilities (about 3%) were completed. Their total retention capacity was approximately 2 million cubic metres of water (6.5%). The project involves 178 Forest Districts from all the Regional Directorates of the State Forests.

2. *Counteracting the effects of rainwater outflow in the mountain regions. Increasing the retention capacity and maintaining streams and related infrastructure in good condition.* The project value is PLN 170.8 million, the amount of qualified expenses is PLN 140 million. The project provides that 3 500 small-scale retention facilities will be created, including 410 reservoirs and that work will be conducted on 1 400 kilometres of roads and skidding roads. The area directly affected by the project will cover ca. 740 thousand hectares of mountain catchments, and the volume of retained water will be approximately 1.3 million cubic metres. The amount spent under the project in 2010 was PLN 4.4 million, which represents 3.5% of the estimated cost of fieldwork.

3. *Biological rehabilitation of degraded land, former military land and military training grounds administered by the State Forests.* The value of the project amounts to PLN 159.6 million, the amount of qualified expenses – to PLN 130 million. The aim of the project is to restore biological and utility quality to the degraded sites. The aim of the planned work is to remove the sources of threat to health and safety of people visiting and working at these sites and to minimise the effects of negative impact they have on the biotic and abiotic elements of the environment. The main task is to remove the dangerous materials (explosives) from the areas administered by the State Forests. This work will be carried out in an area of 23 thousand hectares and will involve 57 Forest Districts from 15 Regional Directorates of the State Forests.

Since 2010, the Directorate-General of the State Forests has been working on two projects which are part of the educational and information campaign named “Being aware of the threat”. Both projects, which form two stages of the campaign, aim to raise public awareness of fire hazards in the forests and how to minimize them.

The first project targets the residents of rural areas and the second is aimed at general public. Both projects have been partially funded by the LIFE + Programme.

In addition to the above projects, which are co-ordinated centrally by the Directorate-General of the State Forests, there are other initiatives within the Regional Directorates and individual Forest Districts which are co-financed by the European Union. Some examples of these are: co-operative cross-border projects between Poland and Saxony or Poland and Slovakia, regional development projects, environmental and infrastructure projects.

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 21–40 years form class II, and so on.

Amount of cut, yield – the amount (volume) of timber that may be harvested in accordance with management objectives and financial plans.

Annual prescribed cut by volume in the State Forests – a volume to be harvested in the forest in a given year, as set out in a forest management plan. It is calculated as a sum of final and pre-final (intermediate) cuts for a given 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 a given 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 in a given Forest District; this volume of harvest is set out in the forest management plan (usually established for a 10-year period) for a given Forest District 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 in a given Forest District.

Bark stripping (peeling) – a method of feeding by ungulate animals using their teeth to strip the bark off 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,
- **ecosystem 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 stand structure in which there is simultaneous utilisation of the stand and regeneration under the canopy of the parent stand, and in which the level of regeneration does not yet meet the adopted requirements.

Cleaning – a series of tending treatments consisting of the removal or thinning of the competing woody species, aimed at adjusting the composition of species and the structure and density of stands in order to improve the quality of young trees.

early cleaning – cuts performed in plantations prior to crown closure;

late cleaning – cuts performed in the period from crown closure to the beginning of self-thinning of trees.

Clear-cuts – an area from which all trees were removed in one operation (final cut) and which is designated for reforestation within the period of two years.

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

Defoliation – premature loss of leaves or needles due to a variety of environmental causes, which intensifies with a worsening health condition of a tree.

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

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

Foliophages (folivorous species) – leaf-eating insects.

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

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

Gene conservation stands (*in situ* conservation stands) – stands selected for preservation of

the entire gene pool of endangered populations of the indigenous tree species.

Managed forest – forest which is 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.

Managed seed stands – stands whose origin and good quality are expected to produce quality progeny from the seeds obtained from them; this ensures sustainable and satisfactory with regards to quality and quantity wood production under given habitat conditions.

Merchantable timber (large timber) – (1) the volume of a tree that has attained sufficient size and volume to be suitable for harvesting, *i.e.* 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 without bark of at least 5 cm (refers to harvested timber).

– **gross merchantable** – timber with bark,

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

Outbreak (gradation) – a mass occurrence of insect pests as a consequence of ecological factors favourable to the given species.

Pathogens – factors causing diseases; primary pathogens attack living organisms while secondary pathogens attack already damaged trees.

pH – acidity level, *e.g.* of soil.

Pre-final (pre-commercial, intermediate) felling (cutting) – harvesting of immature trees to improve the quality of the remaining forest stand; part of stand tending procedure.

Promotional Forest Complex – a forest area of special ecological, educational and social value, established for the purpose of promotion of sustainable forest management and protection of natural resources.

Protective forests – forests under special protection because of the functions they serve or the degree of threat they face.

Reforestation (renewal, regeneration) – re-establishment of a forest stand by natural or artificial means, following the removal of a previous stand 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.

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

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 harvest).

Selection structure (BP) – a type of vertical structure of stands, representing groups and clumps of uneven-aged and sized trees.

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.). It includes all trees with diameter (with bark) over 7 cm at breast height. The standing (growing) stock is often calculated per hectare.

Thinning – cuts made in immature stands that have passed through the cleaning period during which the economically undesirable trees were 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.

Timber resources – the total volume of the trees in a forest, most often equated with an estimated volume of merchantable timber in stands.

Tree volume – the amount of wood expressed in cubic metres (m³).

Volume increment – is 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 time interval 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).



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