National Policy on Forests in Poland and forest management in the Carpathians

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I. Legal basics of sustainable and balanced forest management.

The whole forest economy in Poland is based on a few legal acts, crucial for its implementation.
The priority legal act, being a determinant of activity conducted in the forests, is **the Forest Act of August 28th, 1991.**
Legal acts, which work closely with the Forest Act, are *inter alia*:
-Spatial Planning Act
-Natural Protection Act
-Water Law Act
-Hunting Law Act
-Forest Reproductive Material Act.
The Forest Act determines the model of Polish forestry, both in private and public sector. It indicates the aims of sustainable forest management and emphasises the significant meaning of non-productive role of forest ecosystems.

Article 8 of the Forest Act is (quotation):
"Forest management is based on the following rules:
1). Universal protection of forests.
2). Durability of sustained forests.
3). Sustained and balanced utilization of all functions of forests.
4). Increase of forest resources."

The most important professional administrative act concerning the sustainable and balanced development of Polish forestry is the **Order number 11a of General Director of State Forests National Forest Holding of May 11th 1999**, amending the Order number 11 of General Director of State Forests of February 14th 1995, **concerning an improvement of forest management on ecological basics.**
The Order constitutes that due to multilateral functions of forests in spatial planning of local, national and global meaning, the economic activity of State Forests must take into account international criteria and indicators of a balanced development of forests and forestry, leading to:

1). Keeping the biological diversity of forests.
2). Maintaining the production richness of forests.
3). Maintaining the health and vivacity of forest ecosystems.
4). Protection of soil and water resources in forests.
5). Keeping and intensification of forests' role in global carbon balance.
6). Maintaining and boosting long-term and multilateral social and economic benefits taken from forests.
7). The existence of legal, political and institutional solutions supporting durable development of forest management.

General rules of forest management, based on the principles of continuing and balanced development:

1). Limitation in the processes of water relations' degradation in forests by:
a) Keeping the approximate natural state of intra-forest water basins and watercourses, as well as restoring them.
b) Keeping, in the area of rivers' valleys, the flood plain forests, alder swamp forests and other natural plant formations as the refuges of rare species of *flora* and *fauna*, and as the regulators of habitats' humidity and local climate.
c) Keeping an intact state of intra-forest wastelands, e.g. swamps, sloughs, moors, birds' refuges, heaths, dunes and rocks, together with their *flora* and *fauna*, in order to protect full biological diversity.
d) Within the frames of the spatial management plans, intensification of endeavours to reforest the higher altitudes of drainage basins and watersheds, in order to boost water retention in forests, decrease the pollution's movement and erosion of soil.

2). To state the economic aims of forest management and correct silvicultural planning, it is essential to:
a) Undertake the researches of soil and habitat, ensuring the identification of biotope's conditions, and stating the level of degradation or devastation of habitats, and the principles of their reconstruction.
b) Undertake forest survey, as a basis for stating current and long-term aims of forest management.
c) Undertake forest site survey, enabling the classification of habitats and areas according to their value and biological quality, with a special acknowledgement of NATURA 2000 areas.

3). In the current implementation of the forest management plan, it is essential to:
a) Enrich the forest-field border, by creating the ecotone zones.
b) Initialize the natural regeneration in all site types, according to the requirements of quality and origin in case of dominant species, and to the necessary participation of admixed and biocenotic species.
c) Limit the use of clear cuts and their areas, and run the cut lines adaptable to the differentiation of forest habitats, tree stands and terrain configuration.
d) Favour the factors which increase the durability of forest in silviculture and forest protection (accordance with habitat's conditions, naturalness, local origin, diversity, vitality, genetic richness).
e) Restore the lost biodiversity of forest biocenosis and enrich the forest landscape by differentiation of, according to the natural conditions: the age, species and spatial structure of the stand.

Within all the areas of forest management, there are also detailed principles elaborated, of which some are quoted below:

- The principles of dividing the territory into seed regions, and the rule of registering seeds and seedlings must be obeyed.
- It is necessary to continue the creation of the nationwide bank of gene resources' reserves.
- Natural regeneration in all habitats must be favoured.
- Use of chemical substances for the needs of young-growth tending must be restricted only to necessary and reasonable cases.
- It is advised to limit the clear cut system in final cutting.
- The breadth of clear cut areas cannot exceed 30-60 m (allowed only on the lowlands)

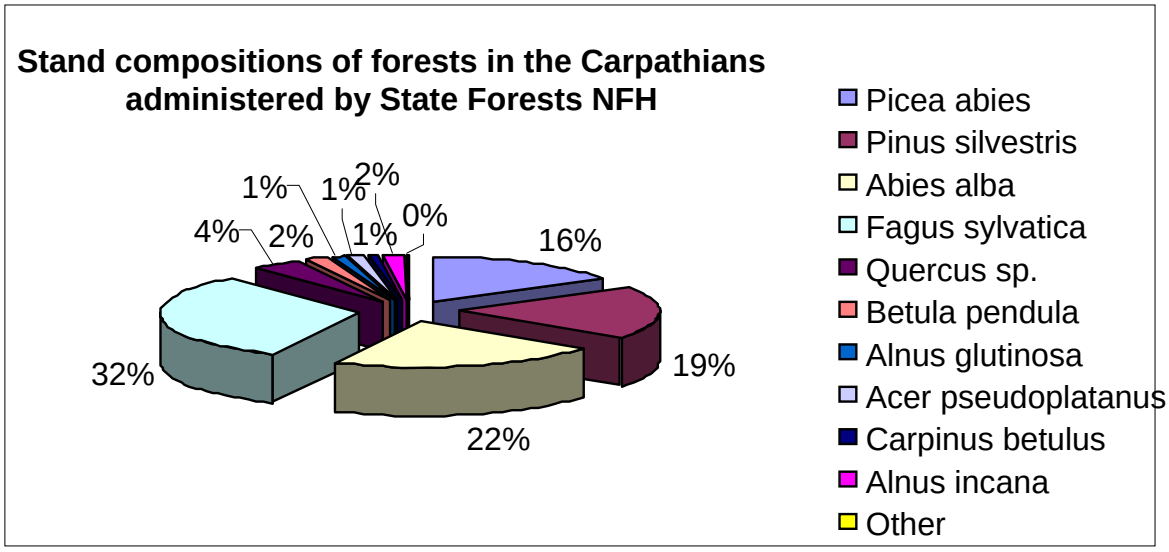
- It is forbidden to use clear cut system in the neighbourhood of communication routes, water basins and watercourses, as well as buffer zones of the nature reserves.
- 5 % of tree groups and large tree groups of admixed and biocenotic species on cutting areas, as well as trees of dominant species should be left to the following rotation cycle.
- Complex felling systems should be preferred (in the mountains as well as in the lowlands, mainly in broad-leaved tree stands), wherever they can create the best conditions for regeneration and development of stand.
- The principle of using the nature-friendly technologies during timber harvesting must be obeyed.

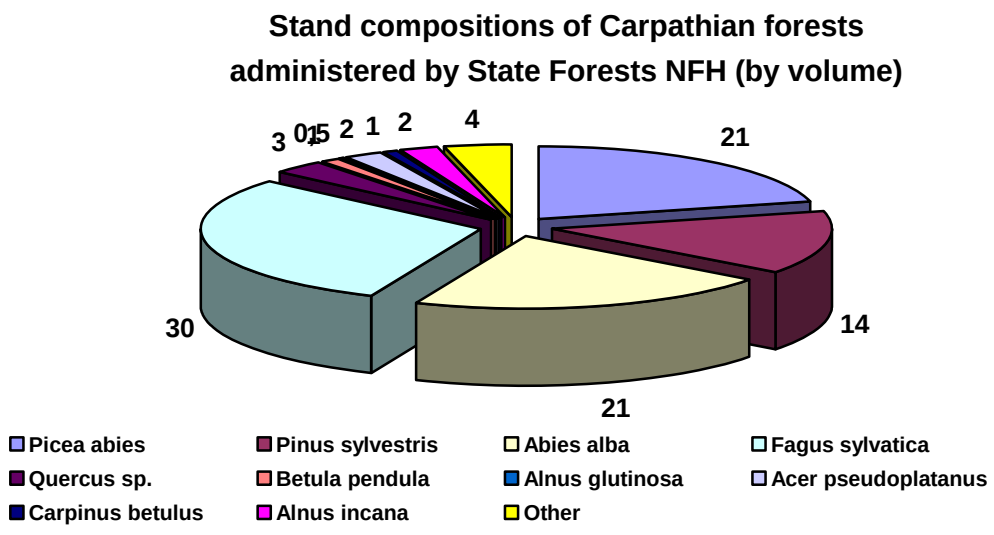
II. General data on the Carpathian forests.

There are 3 regional directorates of State Forests within the VIII, Karpacki Natural Forest region: in Katowice, Kraków and Krosno, supervising the activity of 35 forest units located in the area of the Carpathians.
The area of forest stands in the Carpathians is **691 392 hectares,** which is an equivalent to 7,7% of the total forest area in Poland, and covers 33% of the Carpathians' area*.
The State Forests National Forest Holding administers 66% of the Carpathian forests, that is **456 610 hectares.**

**The area of Polish Carpathians: 2 092 560 hectares (based on the report "Condition of the Carpathians", The Carpathian Ecological Region's Initiative , November 2001).*

Chart 1.





The western part of the Polish Carpathians' massif is covered mainly with the Norway spruce stands of an unknown origin, which are currently being converted.
The central part is a multi coloured mosaic of the stand compositions which are approximate to natural, with a very high share of a precious species, that is silver fir. In some of the forest units the share of this species reaches up to 50% of stand composition.
The eastern part of the Carpathians in Poland is dominated by common beech, with significant share of silver fir.

Forests fulfill various functions, both as a result of natural processes, and human's adjusting activities.

1. **Ecological functions of forests.**

These functions are expressed with a positive influence of forests on shaping global and local climate, atmospheric composition and water circuit in nature. They counteract the floods, erosion and avalanches. They protect the landscape from steppization, and they affect the biodiversity of *flora* and *fauna* existing in forest ecosystems.

a) Nearly all of the mountain forests are legally protected as one of categories below:

Table 1. The protective forests.

Protective forest category:	**Area in hectares**
Nature reserves	10 897
Soil-protecting	62 506
Water-protecting	281 631
Damaged by industry	28 240
Experimental areas	5016
Forests of a special ecological value	6548
Refuges	6766
Plus seed stands	2286
Total:	**403 890**

b) Protection of biodiversity:

There are 6 National Parks in the Carpathians, covering a total area of 82 573 hectares, administered by Directors who report directly to the Minister of Environment:

The Babiogórski National Park – 3 392 hectares;
The Tatrzański National Park –21 164 hectares;
The Gorczański National Park – 7 030 hectares;
The Pieniński National Park – 2346 hectares;
The Magurski National Park– 19 439 hectares;
The Bieszczadzki National Park - 29 202 hectares.

National Parks not only fulfill their most important aim, that is keeping the existing natural heritage, but also play a very important social role, that is an ecological education of the society.

Due to their unique opulence and diversity of both *flora* and *fauna*, there have been the Natura 2000 areas established in the Carpathians. These areas are natural ecological passageways between the existing National Parks and Nature Reserves.

Table 2. Natura 2000 areas.

Name of an area	**Area in hectares**
Special Protection Areas „SPA"- „Dolina Górnej Wisły" –Order of Minister of Environment of 21.07.2004 (Forest units Ustroń and Bielsko)	3535 hectares
Special Areas at Conservation „SAC" – „Beskid Śląski" – after the Alpine Conference, January 2006	26 256 hectares
Special Areas at Conservation for Habitats „SAC" – „Beskid Żywiecki"	35 326 hectares
Special Areas at Conservation „SAC" – „Beskid Mały"	7186 hectares
„Special Protection Areas for Birds and Habitats" – „Bieszczady", Order of Minister of Environment of 21.07.2004	107 318 hectares
„Special Areas at Conservation for Birds" – „Pogórze Przemyskie", Order of Minister of Environment of 21.07.2004	64 075 hectares
„Special Areas at Conservation for Birds" – Góry Słonne" –considered by the European Commission	55 220 hectares
„Special Areas at Conservation for Birds and Habitats" – „Beskid Niski" – consultations ongoing	152 750 hectares, of which about 65 000 hectares in the Krosno Regional Directorate of State Forests

Table 3. Other forms of protection of biodiversity:

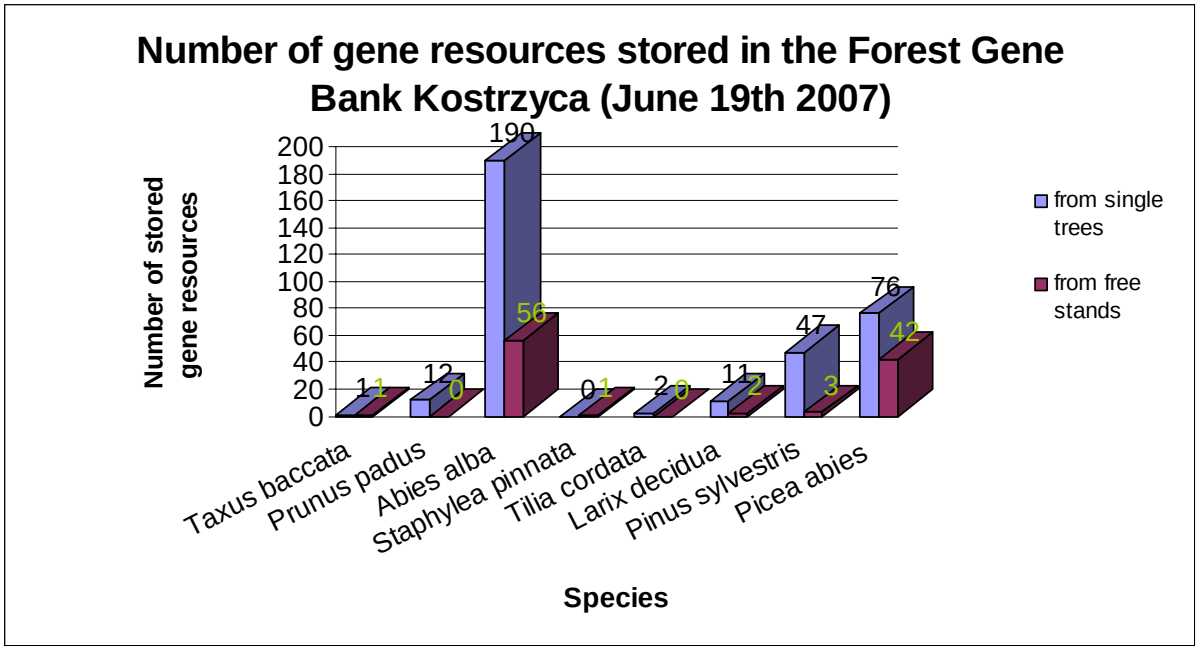
Name of an object	**Number**	**Area in hectares**
Landscape Parks	15	414 761 ha
Nature and Landscape Complexes	7	1 932 ha

Natural Monuments	439	-
Protective zones for selected animal species	153	6 179
Areas at Protected Landscape	9	812 997
Plus trees	1 222	-
Seed orchards and seedlings seed orchards	28	126 ha
Gene conservation trees	-	-
Gene conservation stands	22	521 ha

There is a Carpathian Gene Bank functioning in the Carpathian forests, carrying out the programme of preservation of the most precious gene resources in the Carpathian stands, mainly in the *in vivo* form, as the living clone and family archives, but also in the *ex situ* form, by storing seeds of the most precious origins in the cold rooms of Wisła forest unit. The gene resources stored in the Carpathian Gene Bank in February 28th, 2007, were:
2876 kg of seeds of silver fir, Norway spruce, Scots pine and European larch;
6248 kg of cones of Norway spruce and Scots pine;
142 kg of seeds of common ash and rowan.

The gene resources of the most precious trees and stands from the Carpathians are stored as well in the Forest Gene Bank Kostrzyca, which stores the genetic material of forest trees and shrubs from all over the country.

Chart 2.



Altogether there are 733 kg of gene resources from 444 single trees and stands stored in the Forest Gene Bank Kostrzyca.

2. Productive functions of forests.

a). Goals and tasks of forest management in the mountains are subject to the protective functions fulfilled by the forests. It is visible over all in the silvicultural systems. Nearly all of

the stands in the Carpathian forest units are managed with the use of complex cutting systems (shelterwood system and stepweise cutting) or they form the so-called stands by conversion. Stands by conversion include mainly artificial spruce and pine stands. In both cases, the principle of a permanent presence of forest ecosystem on the ground is in force. The first way of stands management (shelterwood system or stepweise cutting and selection cutting) makes the forest regenerate naturally. In the second case, the nurse crops (stands by conversion) are utilized by group cuttings and shelterwood cuttings, planting the target species such as: silver fir, common beech, sycamore maple, European ash, small-leaved lime, mountain elm or – more seldom – European larch. Practically in the State Forests there is no timber harvesting in the upper forest zone, above the elevation 900 m, on the steep slopes and rocks.
The annual volume of prescribed cut in State Forests in the Carpathians is 2 367 thou. m^3 of merchantable timber, and the actual average utilization of timber in the years 2002-2006 was 4 527,7 thou. m^3.

Table 4. Prescribed cut.

Regional Directorate of State Forests	Annual prescribed cut [m^3]*	Actual annual utilisation [m^3]**
Katowice	805 826	**3 529 533**
Karków	479 438	446 544
Krosno	1 081 700	596 617
Total:	**2 366 964**	**4 572 694**

**As planned for 2007.*
***Average value from years 2002-2006.*

Such a significant exceeding of a prescribed annual cut in the Regional Directorate of State Forests in Katowice is caused by the necessity of timber utilization from the outgoing, one-species, artificial spruce stands in the forests of Beskid Śląski and Beskid Żywiecki, which were introduced into these areas by their previous owners of the Habsburg dynasty. The phenomenon of a spruce stands decline in the mountains of Beskid Mały and Beskid Śląski has been observed since 1950s. The primary reason of the decline of spruce stands was industrial pollution, and the phenomenon itself induced the processes of stands conversion into the mixed stands with dominant beech and an admixture of silver fir, sycamore maple and mountain elm. Another primary reason, which results in the appearance of such a vast area of stands requiring a fast harvesting, is the rainfall deficit, in particular during summer of last year, when the rainfall amounted only 30% of an average perennial value, and the average temperature in July was 4,2ºC above the average perennial value. July's isotherm, corresponding with the temperatures reported in 2006 in the Beskidy mountains, is typical to the regions of the Black Sea and the Mediterranean Sea in Europe. Such climatic conditions weren't tolerated by a species typical to the region of taiga, especially taking into account the fact, that the above stands are not of a local provenance.

Secondary reasons of the decline of spruce stands in the Beskidy mountains were:

- mass occurrence of the mushroom root rot (*Armillaria mellea*) in the weakened stands;
- increased activity of the eight-toothed bark beetle (*Ips typographus*) and other bark beetles;
- other outbreaks of insect pests:
  the web-spinning larch sawfly (*Cephalcia alpina* Kl.): 1982-1985;
  the larch tortrix (*Zeiraphera griseana* Hbn.): 1977-1985;

the spruce pamphilid (*Cephalcia abietis* L.) and the small spruce fly (*Pristiphora abietina* Christ.) – since 1982;

- significant loss to foliage caused by the dehydration of needles.

According to the necessity of short-term harvesting of weakened, infected or dead tree stands, forest units in the Beskidy mountains were forced to elaborate a programme of counteracting the negative results of spruce stands decline and plan the conversion of monocultures into composite stands. Altogether the threatened spruce stands cover an area of 25 971 hectares, which is 44% of an area taken by this species in the Regional Directorate of State Forests in Katowice. Share of privately-owned forests in the above area is 48 000 hectares. Forests of other forms of ownership suffer from the spruce decline much more, as it is very difficult to convince their owners to take actions preventing further progress of the disastrous phenomenon. Reforestation of this area is connected with the necessity of carrying out a proper logistics, taking into account:

- gene preservation of the most valuable spruce provenances in the Forest Gene Bank Kostrzyca and in the Carpathian Gene Bank in Wisła;
- adjustments of the Forest Reproductive Material Act in order to enable the seed harvest of valuable forest tree species suggested to the conversion of stands of other provenances;
- ensuring the technical conditions to produce the planting material for the needs of conversion;
- ensuring the technical conditions for reforestation in the years going;
- proper informative and educational activities aimed to the local community, and above all to the owners of private forests, to convince them about the necessity of taken activities.

A remarkable range and speed of spruce stands decline is a reason to intensify forest work to an uncharted scale, and to their implementation in a specific mountain terrain. A very intensive timber harvesting and log transport, forced by sanitary reasons, not only will cause specific natural effects, but also will be a source of potential conflicts, demands and criticism towards forest management and foresters. Potential areas of criticism against the foresters will concern:

- worsening of esthetic value of forests and their meaning for the landscape shaping, as well as the conditions of recreation and tourism;
- disadvantageous influence of timber extraction and log transport on the condition of the roads and quality of water in watercourses and water basins.

The area of converted stands administered by the State Forests in the Carpathians was 5 070 hectares in last 5 years, of which 2600 hectares in Beskid Śląski and Beskid Żywiecki. According to the ecological disaster, there have been 19 000 hectares of tree stands appointed to the conversion in the mentioned regions.

b). Forest management tasks:

In the State Forests' area in the Carpathians, there are 4 593 hectares yearly afforested and reforested*, of which only the afforestations influencing directly the region's forest cover amount 229 hectares. Additionally, State Forests help during the afforestation of privately-owned agricultural grounds on around 721 hectares.

**average data from the years 2004-2006.*

To improve the reforestation success, especially on post-agricultural soils, State Forests implemented the programme of a driven mycorrhizal vaccine of seedlings with a mycelium of *Hebeloma crustuliniforme* fungus, produced by the laboratories of Forest Gene Bank Kostrzyca and State Forests' unit in Rudy Raciborskie. On average, there are 806 000 of seedlings per year vaccinated in the Carpathian forest units (*data from the years 2006-2008*).

Natural regeneration appears on the area of 3 928 hectares per year (*average annual area from years 2004-2006*).

c). Damages to forests.

According to the appearing disastrous phenomena, caused above all by abiotic threats (winds, hurricanes, snowfalls, hoarfrost, draught and pollution of forest environment), the biotic threats are often activated. One of the most dangerous living organisms, affecting the coniferous monocultures, especially of pine and spruce, is the mushroom root rot (*Armillaria mellea*). It is estimated that the area of stands harmed by mycelium of the above fungus in the Carpathians is 32 177 hectares, mainly in the Beskid Śląski and Beskid Żywiecki region. Other equally dangerous fungus, afflicting mountains forest ecosystems is annosus root (*Fomes annosus*). There are approximately 8 546 hectares of the Carpathian stands administered by State Forests infected by this fungal disease.

Table 5. Area of the Carpathian forests damaged by game*.

Age category	**Damage up to 20% in hectares**	**Damage level 20-50% in hectares**	**Damage over 50% in hectares**
Plantations	2356	530	124
Thickets	2205	224	28

**average value for the years 2004-2006*

The most significant damage to forest plantations and thickets is observed in the forests of the eastern Carpathians (Regional Directorate of State Forests in Krosno), while the lowest level of damage is observed in Beskid Śląski and Żywiecki. The above is probably connected with the number of the cervidas population in the regions mentioned. In the eastern part, in the Bieszczady mountains, there are also local damages caused by European bisons noted.

Forests fire in the Carpathian area are only of a marginal meaning.

a) Protected species of large mammals and birds in the Carpathians.

Species	**Number**
Bison bonasus	243
Canis lapus lupus	433
Ursus arctos	126
Lynx lynx	284
Rupicarpa rupicarpa	113
Tetrao urogallus	400
Tetrao tetrix	350

b) Number of game.

Species	Number*
Cervus elaphus	8710
Dama dama	116
Capreolus capreolus	40922
Sus scropha	4043

**after the stocktaking of game from the year 2006.*

3. Social functions of Carpathian forests.

In order to increase an ecological awareness in society, particularly among children and the youth, and to shape their sensibility to the surrounding nature, each forest unit in the State Forests organized educational units, responsible for the forest and environmental education. Benefiting from the funds of State Forests, as well as from the external sources of funding, a proper infrastructure was developed for the above goals.

Table 5. Educational infrastructure of State Forests in the Carpathians.

Facility	Amount
Educational trails	76
Environmental education centers	4
Nature/forest exhibition rooms	13
Open-air teaching sites	25
Education points	18
Total:	**136**

In the area administered by 3 Regional Directorates of State Forests, according to the proper Orders of General Director of State Forests, 3 Promotional Forest Complexes were called into being:

Promotional Forest Complex “Lasy Birczańskie”: 29 636 hectares;
Promotional Forest Complex “Lasy Beskidu Śląskiego”: 39 849 hectares;
Promotional Forest Complex “Lasy Beskidu Sądeckiego”: 19 650 hectares.

The setting-up of the Promotional Forest Complexes in the State Forests was a practical element in pursue of the National Policy on Forests. In the educational centers of the Promotional Forest Complexes the society familiarizes with the pro-ecological and multifunctional forest management carried out by the foresters. Equally important goals are the shaping of an ecological awareness and the positive attitude to foresters and forestry, as well as the development of many-sided cooperation with nature conservation organizations and environmental associations. The Promotional Forest Complexes may also be regarded as areas of particular scientific and research significance. The Promotional Forest Complexes are moreover an alternative to the crowded National Parks, what plays an important role in case of the Carpathians. Thanks to the promotion of forests and their opening up to public needs, the State Forests National Forest Holding offers not only the possibility of getting acquainted with the ecological forest management principles, but also direct contact with nature, free of many restrictions concerning access and free movement in forests, which has a significant meaning for children’s and youth’s education.