5. Biodiversity

The geographical position of Belarus in the East European Plain in the forest area at the junction of the taiga and deciduous areas led to formation on its territory wide variety of natural landscapes.

The most contrasting combination of landscapes characteristic of the north of the Belarusian- lake area, where among the widespread landscapes stand out lake-glacial, moraine-lake and hilly-moraine-lake landscapes. Naroch, Braslov, Ushachi and other lake groups are located there. Lake-marsh complexes are typical and they are presented as a rule by combination of unique landscapes of upper marshes and lakes. Forest communities are often presented with fir and broadleaved-fir forests.

Central, the most sublime part of Belarus has a strong rugged landscape. Hilly-moraine-erosion, kamov-moraine-erosion and secondary-moraine landscapes are widespread here. Loamy soils are predominant with pine or broadleaved-fir forests on them. In the eastern part of Belarus the development of forest landscapes with typical plateau-like for them (on the watershed) and wavy-ridgy (near the river valleys) terrain, with the presence of suffosional dishes and ravine-beam system.

Unique landscape of the south – the Belarusian Polesie, which is represented vast swampy lowlands (Polesie and the Dnieper), dissected by rare moraine ridges. The typical feature of Polesie – wide floodplains with an abundance of oxbow lakes, wet meadows with preserved bottomland oak forests and lowland marshes.

Specially protected areas

In the conservation of biological and landscape diversity in Belarus a major role plays Specially Protected Natural Areas (PNAs). In accordance with the Law of the Republic of Belarus «On Specially Protected Natural Territories» (October 20, 1994) PNAs are part of the territory of the Republic of Belarus with unique reference or other valuable natural complexes and sites of special ecological, scientific and (or) the aesthetic value, for which established a special regime of protection.

To date various forms of protected areas have been developed. On the functions and regimes these areas are divided into the following categories:

– reserve;
– National Park,
– wildlife sanctuariy,
– natural monument.

Currently Belarus has a reserve – Berezinsky Biosphere Reserve, 4 national parks – Belovezha Forest, Pripyat, Braslav *(Figure 5.1)* and Narochansky *(Figure 5.2)*, wildlife sanctuaries and natural monuments of national and local area. The quantity of them has been changing from year to year. Basic information about the reserves and national parks of Belarus are given in *Table 5.1.*

The total number and area of protected areas for the period from 2005 to 2009 were unstable, in general, there was a decrease of both parameters. Thus, the number of protected areas has decreased by 160 of units (from 1,445 in 2005 to 1,285 in 2009), the change in the area varied from year to year: marked decrease in the period from 2006 to 2008 at 146.0 thousand hectares and a slight increase in 2006 and 2009. Major changes in the structure of PNAs associated with a decrease in the number and area of reserves of the republican and local importance. Number and area of nature reserves and National Parks for 2005-2009 remained relatively stable. As a whole in the structure of protected areas Belarus accounted for the largest area of nature reserves (*Table 5.2* and *Figure 5.3*).

In 2005-2009, the share of reserves accounted for from 4,5 to 4,0% of the country. In the this category of protected areas in 2007 was 31 landscape reserve, 38 biological and 15 hydrological reserves an area of 643.7, 119.8 and 71.0 thousand hectares, respectively

Figure 5.1 – Braslav National Park

Figure 5.2 – Narochansky National Park

Table 5.1

Wildlife and National Parks of Belarus (as at 01.01.2009)

Name	Area, ths ha	Year	Purpose
Berezinsky State Biosphere Nature Reserve	80.9	1925	Preservation of typical and unique natural landscapes are sub-broadleaved-spruce forest subtaiga, a study in which natural processes and phenomena, development of scientific bases of conservation and environmental education
Bialowiezha Forest	152.2	1939	To preserve the unique natural complex, which is typical for the Republic of Belarus and Europe, and ensuring the natural processes of evolution
Pripyat	82.3	1969	Pripyat conservation in their natural state unique to the Belarusian Polesie landscapes and studies on its basis the changes in nature due to agricultural drainage Polesie lowlands
Braslavskie Lakes	71.5	1995	Preservation of the natural complex Braslavskaya group of lakes and the genetic fund of flora and fauna
Narochansky	94.0	1999	Preservation of unique natural complexes, a more complete and efficient use of natural resources, recreational opportunities Myadel distric

(Figure 5.4). Among other categories of protected areas a substantial proportion fall for reserves and national parks, the lowest – in the natural monuments of national and local importance.

Within the regions the equity of PNAs is significantly different. Thus, over the considered period under review, their highest proportion occurs in Brest (from 13.4 to 14.1%) and Grodno (9,3-10,5%) regions,

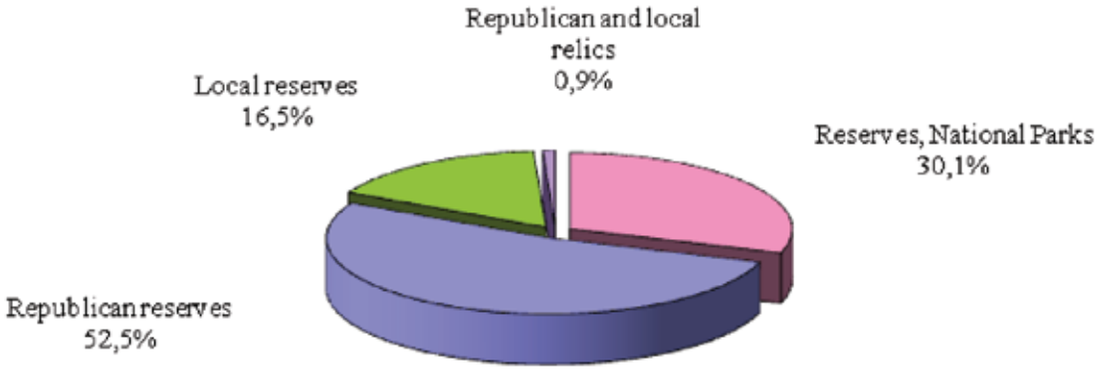


Figure 5.3 – Structure of the protected areas of Belarus in 2009

Table 5.2

Protected areas of Belarus* in 2005-2009

Category PAs	Number					Area (ths ha)					% of total area Belarus				
		2006	2007	2008	2009	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Reserves and National Parks		5	5	5	5	480,1	478,6	480,9	480,9	480,9	2,3	2,3	2,3	2,3	2,3
Republican reserves	99	99	84	84	85	936,3	936,3	834,6	834,5	837,1	4,5	4,5	4,0	4,0	4,0
Preserves local	428	414	403	349	348	295,0	292,4	245,8	250,5	263,4	1,4	1,4	1,2	1,2	1,2
Natural monuments of republican importance	337	337	306	305	305	16,6	16,5	16,5	11,9	14,3	1,0	0,1	0,1	0,1	0,1
Natural monuments of local importance	576	586	489	544	542										
Total	1445	1441	1287	1287	1285	1675,5	1723,8	1577,8	1577,8	1595,7	8,0	8,3	7,6	7,6	7,7

* Exclude Polesky Radiation Ecological Reserve.

Table 5.3

Area and percentage of protected areas in areas of Belarus in 2005-2009

Region	Protected areas,ths ha					Percentage of all area, %				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Brest	464,3	463,9	438,5	441,9	441,9	14,1	14,1	13,4	13,5	13,5
Vitebsk	348,1	348,1	343,9	354,3	351,8	8,9	8,7	8,6	8,8	8,8
Gomel	278,4	279,3	212,0	212,0	211,5	7,0	6,9	5,2	5,2	5,2
Grodno	253,5	262,0	261,7	261,4	261,4	9,3	10,5	10,5	10,5	10,4
Minsk	224,9	277,1	245,1	246,6	250,7	5,3	6,9	6,1	6,2	6,3
Mogilev	106,3	93,4	76,7	61,4	78,4	3,7	3,2	2,6	2,3	2,7
Belarus	1675,5	1723,8	1577,8	1577,8	1595,7	8,0	8,3	7,6	7,6	7,7

the lowest – in the Mogilev (2,3-3,7%) *(Table 5.3)*.

In terms of regions also noted the uneven distribution of protected area categories. In general, for the period from 2005 to 2009 distribution of categories of protected areas on administrative region vary slightly. In Brest, Vitebsk, Grodno and Gomel regions it falls for the nature reserves of national significance, in Minsk region the largest area are occupied by nature reserves and national parks, in the Mogilev – reserves of local importance *(Figure 5.5)*.

In accordance with the laws in national parks and sanctuaries biological and landscape diversity are protected, combined with limited economic activities and development of ecological tourism.

Within the boundaries of protected areas provided protection of landscapes, the most valuable plants of the communities, rare and endangered species of wild plants and animals included in the Red Data Book of Belarus. A number of protected areas has an international nature protection status: eight national reserves («Olmanskie swamp», «Mean Pripyat», «Prostyr», «Kotra», «Osveysky», «Elnya», «Sporovsky» and «Zvanets») included in the list of wetlands of international importance (Ramsar sites), six protected areas have the status of important plant areas, and fourteen – are included in the list of territories that are important for the conservation of wild birds in Europe.

When planning the development of the PNA system it used a number of international of criteria: the criteria of the International Union for Conservation of Nature, Important Bird and Botanic territories, the criteria of the Convention on Wetlands, with internationally

Symbols:

Natural Reserve: I – Berezinsky;

National Parks: II – Braslav; **III** – Narochansky; **IV** – Belovezha Forest; **V** – Pripyat;

Sanctuaries of national importance:

a) landscape: 1 – Babinovichsky; 2 – Vygonoshchanskoye; 3 – Vydritsa; 4 – Grodno Forest; 5 – Elnya; 6 – Kozyansky; 7 – Cawthra; 8 – Krasny Bor; 9 – Kupala; 10 – Lipichanskaya Forest 11 – Mozyr ravines; 12 – Nalibokskaya 13 – Novogrudok, 14 – Ozery; 15 – Olmanskie marshes; 16 – Osveysky: 17 – Pribuzhskoye Polesie; 18 – Prilepsky; 19 – Prostyr; 20 – Radostovsky; 21 – Sweetyazyansky; 22 – Selyava; 23 – Sinsha; 24 – Smychok; 25 – Sorochanskie lakes; 26 – Mid-Pripyat; 27 – Starica; 28 – Strelsky; 29 – Stronga; 30 – Treskovschina; 31 – Chernevichsky;

b) biological: 32 – Babinec, 33 – Bor-sky, 34 – Buda-Koshelevo; 35 – Bukchansky; 36 – Buslovka; 37 – Volmyansky; 38 – Glebkovka; 39 – Denisovichsky, 40 – Dnipro-Sozh; 41 – Dokudovskoye; 42 – Dubatovskoe; 43 – Elovskikh; 44 – Zamkovy Les, 45 – Zapolsky; 46 – Zvanets; 47 – Kopyshev; 48 – Lebyazhy; 49 – Lonno; 50 – Lukovo; 51 – Luninsky; 52 – Mateevichsky; 53 – Meduhovo; 54 – Moshno; 55 – Oktyabrsky, 56 – Omelnyansky; 57 – Pekalinsky; 58 – Podsady; 59 – Prilukskiy; 60 – Ruzhanskaya Forest; 61 – Slonimsky, 62 – Sporovsky; 63 – Stiklevo; 64 – Tyrvovichi; 65 – Falichsky Moss; 66 – Chernevsky; 67 – Chirkovichsky; 68 – Chistik; 69 – Yukhnovsky;

c) hydrological: 70 – Beloe; 71 – Marsh most; 72 – Verhnevileysky; 73 – Glubokoe – Big Ostrovito; 74 – Dolgoe, 75 – Zaozerye; 76 – Korytensky Moss, 77 – Krivoe; 78 – Miranka; 79 – Islands of Duleby; 80 – Podveliky Moss; 81 – Richie; 82 – Servech; 1983 – Sosno; 84 – Shvakshty.

Figure 5.4 – Natural Reserve, National Parks and republican reserves of Belarus, 2007

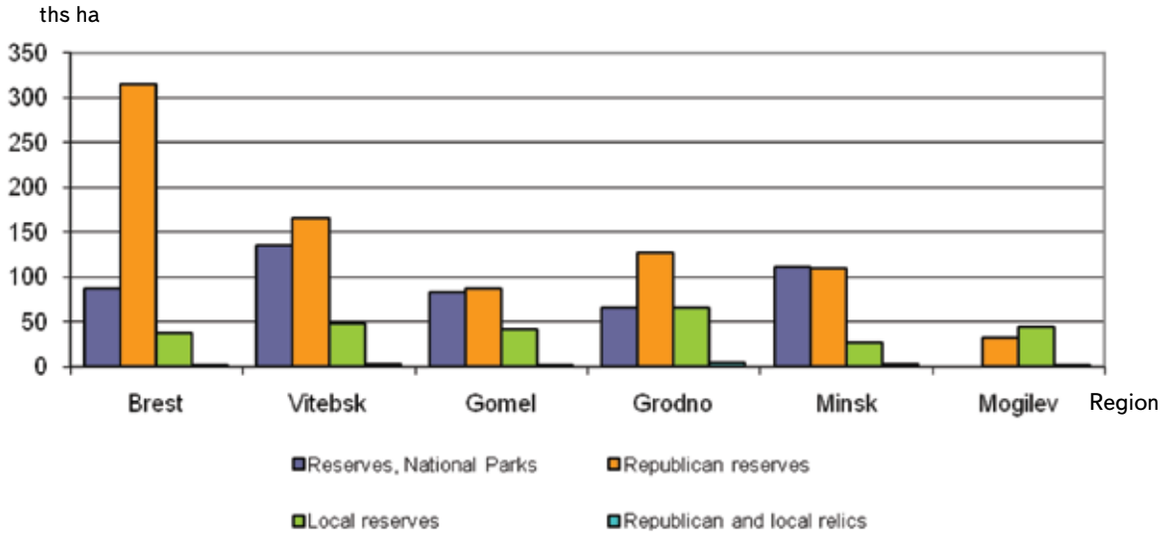


Figure 5.5 – Distribution of various categories of protected areas in administrative areas Belarus (without Polesie radiation-ecological reserve)

importance especially as water fowl being.

As a prospective PNAs were considered natural areas, within the which distributed unique and rare landscapes, valuable plant communities, are places of growth and habitat of rare and endangered plant and animal species listed in Red Data Book of Belarus, a place concentration of wild animals (primarily birds) in the period of breeding, wintering, migration, and the territory of which play an important role in the ecological system formed, are important for research.

Conservation of natural ecosystems, biodiversity and landscape of the Belarus will ensure the national ecological network. Placing the main elements of an ecological network is defined «Scheme of ecological network in the Republic of Belarus», developed by the National Academy of Sciences of Belarus in 2005.

Planned environmental network is linked to national environmental networks Poland, Lithuania, Ukraine. The placement of key elements (cores) of the ecological network, as well as list of the most important protected areas that form the core of international and national values, enshrined in the State of the complex scheme of territorial organization of the Republic of Belarus, approved by Presidential Decree on January 12, 2007 № 19. Practical measures are taken to further the formation of the National Ecological Network, as well as its integration into the European ecological network

In the framework of UNESCO's «Man and the Biosphere» a regional ecological network Polesie (Belarus-Poland-Ukraine) is formulated, as well as the concept and scheme of the formation of cross-border ecological corridors of Belarus and Russia.

On the territory of the Republic of Belarus it is established Biosphere Reserve «Pribuzhskoje Polesie». Efforts to establish a transboundary biosphere reserve (TBR) of UNESCO Western Polesie (Belarus-Poland-

Ukraine) are provided. By 2015 it provides to establish a number of transboundary protected areas, including «Cothren Chapkelyay», «Vileity-Adutishkis», «Prostyr-Pripyat-Stokhod», «Osveysky-Krasny Bor-Sebezhsky and TBR «Grodno-Augustów Forest» (Belarus-Poland- Lithuania).

PNA management is provided by government agencies in the operational management they are transferred. It is created and functioning state environmental agencies reserve, national parks and 24 nature reserves of national significance, which main tasks are to implement the measures for the conservation of natural systems, conducting observations of the state of ecosystems, and ecotourism.

The National Environmental Monitoring System in the Republic of Belarus (NEMS) in protected areas is monitored flora and fauna, forests. Moreover, in the protected area, a system of integrated monitoring of ecosystems is provided. As of 01.01.2009 monitoring systems are organized in Berezinsky biosphere reserve, national park Pripyatsky and 19 sanctuaries of Republican values.

Forest land

The composition of forest land includes forest and non-forest land. To forest lands belong lands covered by forest and not covered with forest, but intended for his regeneration (cutting, burning, dead stands, vacant lots, clearings, areas occupied by forests not united as a whole, etc.).

For non-forest lands include lands used for agricultural purposes, cuttings, roads, fire breaks, the network of reclamation, etc., as well as other lands within the boundaries of forest reserves (wetlands, ponds and streams, and other inconvenient for the cultivation of forest lands) provided for the needs of forestry.

With the aim of sustainable use of forests, their reproduction, protection, planning, forestry development and the development of cutting fund activity public accounting of forests implements and keeps state forest inventory (SFI).

The state forest inventory contains information about the environmental, economic and other quantitative and qualitative characteristics of the forest fund. Inventory data is used by the public-use forest management, the organization of its management, change the forest land to other land categories for purposes not connected with forest management, as well as withdrawal and granting of land participating, relating to forest land, determining the size of payments

for the use of wood, funds for damages forestry production, evaluate the activities of the economic forest and legal persons who engage in forestry.

Inventory is conducted since 2002 under the provisions of the Forestry Code of the Republic of Belarus and the Council of Ministers of the Republic of Belarus of July 12, 2001 № 1031.

These documents compiled for the entire forest reserve of the country on administrative-territorial units (118 administrative districts, 10 towns of regional subordination, and Minsk) on the basis of information provided in the prescribed manner 118 entities, leading forestry, in the various ministries and departments.

Over the period of 2006 to 2009 **the total area** of forest land has changed insignificantly and amounted to 9416.6 thousand hectares in 2009, that compared with 2007 more than 31.0 thousand hectares *(Table 5.4)*.

Table 5.4

Dynamics of forest land in Belarus

Forest lands	Area, ths ha			
	2006	2007	2008	2009
Forest land, total, including:	8506.0	8532.0	8560.6	8598.2
wooded, including:	7883.7	7914.3	7955.0	8002.3
cultural	1776.6	1797.1	1817.3	1838.5
sparse forests	279.5	291.0	302.0	304.0
forest plantations	4.5	4.7	4.8	4.7
non-forest, inc.:	338.3	321.9	298.9	287.2
died plants (fired)	8.0	7.1	7.1	6.7
cutting	86.0	86.0	81.8	81.5
clearings, wastelands	244.2	228.8	210.1	199.0
Non-forest land, all of which:	908.2	853.6	844.1	818.4
arable land	16.4	14.6	13.4	11.8
land under permanent crops (orchards, berries)	0.2	0.2	0.1	0.1
grasslands inc.:	28.7	24.9	20.5	17.9
hay	24.0	20.8	17.9	15.5
pasture	4.7	3.9	2.6	2.4
land swamps	546.6	544.1	542.0	527.9
lands under water bodies	72.5	72.7	70.0	69.6
land under roads, cuttings and other transport routes	169.8	125.8	124.3	122.2
land under building	2.9	2.6	1.9	1.7
broken land	6.1	5.4	4.8	3.2
unused land	20.6	23.7	31.5	33.8
other land	44.4	39.7	35.5	30.2
Total area of forest land	9414.3	9385.6	9404.7	9416.6

Changes in forest resources are due to economic activities of the forest-economic organizations, leading forestry and the natural processes of growth. During the period from 2006 to 2009 increased the area of forest (from 90.4 to 91.3%), including forested lands, and reduced the area of non-forest land (from 9,6 to 8,7%) *(Table 5.4)*.

According to the SFI there is a tendency to an increase **forest cover** on 01.01.2010 which reached the highest figure for the last 110 years – 38,5% (1901 – 37%). Forests in the regions of the country ranges from 34.8 to 45.0%. As in previous years, in 2009, the most forest cover are characterized by Gomel and Vitebsk region (45.0 and 39.5% respectively), the smallest – Grodno and Brest region (34, 8 and 35,6% respectively).

Areas with the highest percentage of forest cover (50% or more) are located in the Gomel region (Lelchitsy, Zhitkovichi, October, Mozyr, Yale and Narovlya), the central part of Vitebsk (Rossony, Polotsk, Ushachy,

Dokshitsy and Lepel areas), north-eastern part of Minsk region (Logoisk, Borisov, Krupsk and Berezinsky areas) and the western regions of Mogilev (Belanichy, Klichev, Osipovichsky and Glusk areas). Percentage of forest cover of 20-30% is typical for administrative areas are located mainly in the Brest region, areas with forest cover below 20% have all areas, except in Gomel *(Figure 5.6)*.

Based on the assessment of forest resources of Belarus, as a result of natural growth

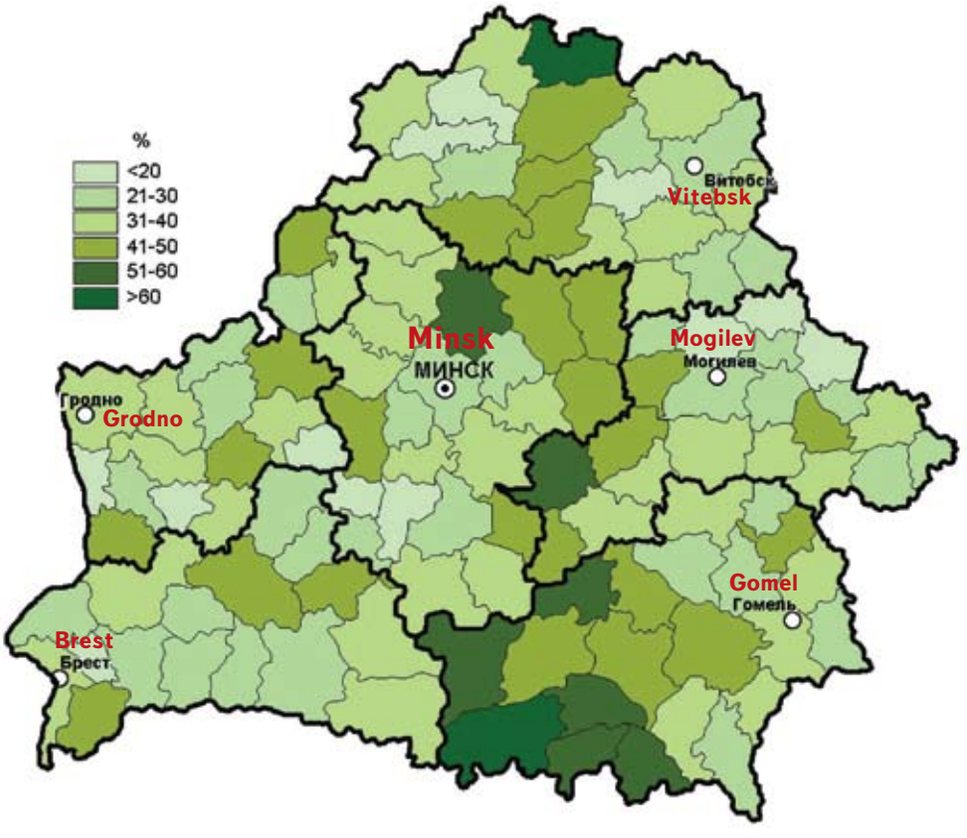


Figure 5.6 – Percentage of forest in Belarus (a division of administrative areas)

and un-use of the current year growth for the period from 2006 to 2008 there was an increase in **total timber reserves** at 99.1 million m^3 (from 1466.4 to 1.5655 billion m^3). An increase in all species groups, including mature and overmature is observed. Also noted there is an increase in potential for exploitation of stocks – from 1197.0 million m^3 in 2006 to 1.2756 billion m^3 in 2009 (at 78.6 million m^3) *(Table 5.5).*

Timber reserves are largely attributable to **the age composition**. In turn, the number of maturing and mature stands identifies opportunities for further exploitation of forests. So according to forest inventory on 01.01.2009 the average age of the Belarusian forest is 51,3 years.

During the period from 2006 to 2009 by **age category and total stocks** plantation forest area varied within the following ranges: young forests occupied from 21.2 to 21.5% of the area and were 8,1-8,7% in margin, middle-aged – 49,1-50 , 7% of the area and 53,4-55,2% in margin of ripening – 19,0-20,4% of the area and 24,6-25,9% in margin, while the share of mature and overmatured had from 8.7 to 10.1% of the area and 11,5-12,6% in margin *(Table 5.6).*

In general, during the period, the largest area of forested land and plantations accounted for the main tree species (99.5 and 99.9% respectively of the total area of wooded land and planting stock), the bushes – 0,5 and

Table 5.5

Overview of timber resources in Belarus, million m^3

Greenery	Stock timber				Suitable for exploitation			
	2006	2007	2008	2009	2006	2007	2008	2009
Main tree species, total, including:	1466.4	1497.2	1534.8	1565.5	1197.0	1220.7	1250.2	1275.6
mature and overmature	169.1	176.7	187.9	196.1	135.1	139.2	146.7	154.1
conifers, including:	975.7	997.7	1024.9	1046.6	798.0	815.7	836.1	853.4
mature and overmature	77.1	81.1	86.7	91.8	60.4	63.2	66.3	70.9
hardwoods, including:	53.8	54.4	54.8	55.7	35.6	36.0	37.0	38.0
mature and overmature	10.3	10.6	11.0	11.1	5.5	5.4	5.7	5.8
deciduous, including:	436.9	445.1	455.1	463.2	363.3	369.0	377.1	384.2
mature and overmature	81.6	85.0	90.3	93.2	69.3	70.6	74.7	77.4
Other wood species	0.03	0.03	0.04	0.04	0.0004	0.008	0.008	0.0006
Shrubs, including:	0.89	0.84	0.79	0.62	0.001	0.002	0.0006	0.0004
mature and overmature	0.87	0.81	0.75	0.59	0.001	0.002	0.0006	0.0004
Timber reserves total, including:	1467.3	1498.1	1535.6	1566.1	1197.0	1220.7	1250.3	1275.6
mature and overmature	169.9	177.5	188.7	196.7	135.1	139.2	146.7	154.1

Table 5.6

Area of forested land and stock of plantations by age of forests in 2006-2009

Greenery	Year	Forested land, ths ha	Reserve plantings million m³
Saplings	2006	1685,6	127,8
	2007	1697,7	130,4
	2008	1678,3	128,9
	2009	1656,7	127,5
Middle-aged	2006	3979,9	808,9
	2007	3945,2	815,8
	2008	3928,7	826,3
	2009	3928,2	836,7
Ripening	2006	1495,5	360,7
	2007	1527,8	374,4
	2008	1570,7	391,7
	2009	1613,1	405,2
Mature and overmature	2006	722,8	170,0
	2007	743,7	177,5
	2008	777,2	188,7
	2009	804,4	196,7
Total	2006	7883,7	1467,3
	2007	7914,3	1498,1
	2008	7955,0	1535,6
	2009	8002,4	1566,1

0,04%, respectively. Among the main tree species and the largest area of plantation stock falls on pine and aspen *(Table 5.7)*.

Forest fund, in accordance with its economic, ecological and social values of it, the location and her function is divided into two **groups of forests.**

The first group of forests includes:

– forests located in protected natural areas;

– forests of valuable forest sites, with genetic, scientific, and historical to the cultural value;

– riparian forests (the forbidden band of forests and forest within the boundaries of

Table 5.7

Area of forested land, stock, and the average age of trees in 2006-2009*

Greenery	Measu-rement	Total				Middle age			
		2006	2007	2008	2009	2006	2007	2008	2009
The main tree species	ths ha	7844,0	7878,6	7920,0	7964,6	51,7	51,7	51,5	–
	million m³	1466,4	1497,2	1534,8	1565,5				
pine	ths ha	3961,9	3977,5	3993,5	4016,7	58,4	57,9	58,2	59,0
	million m³	807,2	825,2	849,4	869,5				
fir	ths ha	742,1	743,5	747,3	747,9	54,3	54,1	54,2	55,0
	million m³	168,3	172,4	175,5	177,0				
oak	ths ha	278,0	279,6	280,2	281,1	68,1	67,8	68,1	70,0
	million m³	45,0	45,6	46,1	47,1				
birch	ths ha	1787,2	1805,6	1819,4	1834,4	40,5	40,2	40,4	41,0
	million m³	273,1	279,0	284,8	288,7				
black alder	ths ha	672,9	675,2	680,2	685,2	41,2	41,4	41,3	42,0
	million m³	111,6	113,7	116,8	119,9				
asp	ths ha	161,5	163,8	168,3	168,7	37,7	37,4	37,3	38,0
	million m³	29,1	29,7	30,8	31,3				
Other timbers	ha	537,0	538,0	536,0	536,0	25,5	26,3	25,9	27,0
	million m³	33,7	34,3	35,1	38,5				
Shrubs	ha	39 132,0	35 243,0	34 273,0	37 241,0	10,8	9,8	9,5	10,0
	million m³	897,1	848,4	793,6	617,0				
Total	ths ha	7883,7	7914,3	7955,0	8002,4	51,5	51,5	51,3	–
	million m³	1467,3	1498,1	1535,6	1566,1				

* The top line – the area of forested land, the lower – stock plantings.

protection zones for the banks of rivers, lakes, reservoirs and other water bodies);

– protective forests (protection-erosion forests, protective forest belts along the railroads and national highways);

– hygiene and health of the forest (urban forests, forest green areas around city, other settlements and industrial enterprises, including forests forest-park parts of green areas, forests, the first and second zones of sanitary protection zones sources of water supply and forest districts of sanitary protection of resorts (spaforests).

The second group of forests, which are not included in the first group are production forests.

In the forests of the first and second groups can be allocated special protection areas (forest areas along the slopes of ravines, riparian strips along water bodies, habitat and distribution of rare and endangered wild animals' and plants, protected part of the reserve, forest edge along the boundary settlements, etc.).

According to information on the distribution of forests by groups and categories

of protection, forest groups I and II for the period from 2006 to 2009 varied slightly. It is marked the reduction of area in 2007 (28.7 thousand hectares compared to 2006), and then an increase of 31.1 thousand hectares (compared to 2009) *(Table 5.8)*.

Assessing the current **state of forests** in Belarus is based on:

– observations on the objects of the National Environmental Monitoring System in the Republic of Belarus;

– materials of forest pathology monitoring, including general, detailed supervision;

– data of forest pathology surveys of plantations, reservations and hotbeds of pests, forest areas, plantations, nurseries and young stands for «Alert information»;

– reports on prophylactic, destroyers, and sanitary and recreational activities in forests;

– regional reviews of the health condition of forests and forest pathology, prepared-

represented state production forestry associations (GPFA);

– review the sanitary condition of forests and forest pathology legal entities;

– data of state statistical reporting.

Change of the main tree species in time estimates firstly on the basis of **defoliation** (the degree of loss of tree foliage). Forests in Belarus – one of the youngest in Europe and this is why they are in fairly good state

Table 5.8

Distribution of forests in Belarus by groups and categories of protection

Categories of protection forests	Area, ths ha			
	2006	2007	2008	2009
Whole forests of group I, including:	4870,0	4842,9	4806,6	4823,7
forest natural monuments of national importance	1,8	1,8	1,7	1,7
forest reserves	301,5	301,6	301,6	301,6
forest parks	348,1	348,6	348,6	348,6
urban forests	6,4	7,7	7,8	7,8
part of the forest-park green zones	255,4	250,7	251,0	251,3
forest 1-2 belts of sanitary protection zones of water sources	13,4	13,3	13,3	13,3
forest 1-2 zones of sanitary protection counties resorts	24,4	26,2	26,0	26,1
protective forest belts along railways and highways	324,9	320,4	328,3	326,2
forest reserves of the republican importance	798,4	782,5	687,9	689,2
forest third zone of sanitary protection counties resorts	17,1	17,1	17,1	17,2
forests of green zones	1308,2	1303,5	1329,0	1333,6
forbidden band of forests and forest within the boundaries of protection zones	1470,4	1469,6	1494,3	1507,1
Whole of 2nd group	4544,3	4542,7	4598,1	4593,0
Whole of 1st and 2nd groups	9414,3	9385,6	9404,7	9416,7

of individual tree species (pine, birch, black alder), determined on the basis of defoliation of crowns, which represents the sum of total long-term adverse effects. With increasing of age of trees their viability decreases and defoliation increases.

In addition to defoliation, consider **dehromation** (yellowing of foliage), which characterizes the state of the vegetation period and may be the result of exposure over a shorter period of time.

The overall level of defoliation for the period from 2006 to 2008 increased from 16,3 to 17,7%. An increase in the defoliation observed in all species except for the hardwood, where it fell slightly. Also observed reduction of dehromation for all species. In the whole country the level of dehromation decreased from 0,3 to 0,2% *(Figures 5.7* and *5.8)*.

The main factors determining the damage and destruction of forests in Belarus are outbreaks of forest pests, diseases of trees, hurricanes and fires. In 2009, in forest pathology is observed deterioration of the

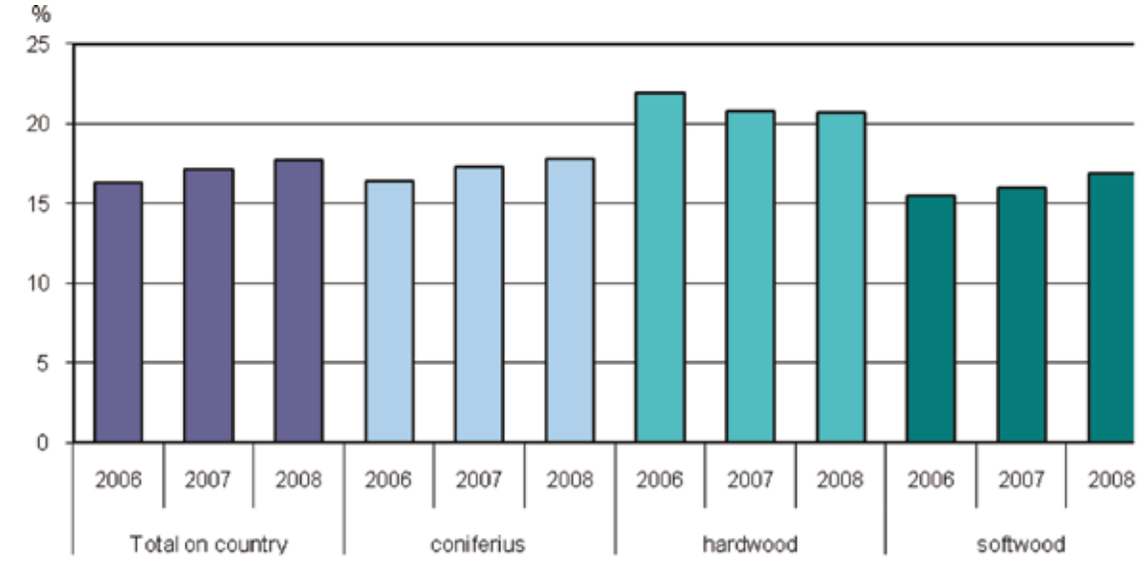


Figure 5.7 – The average percentage of defoliation of forests in 2006-2008

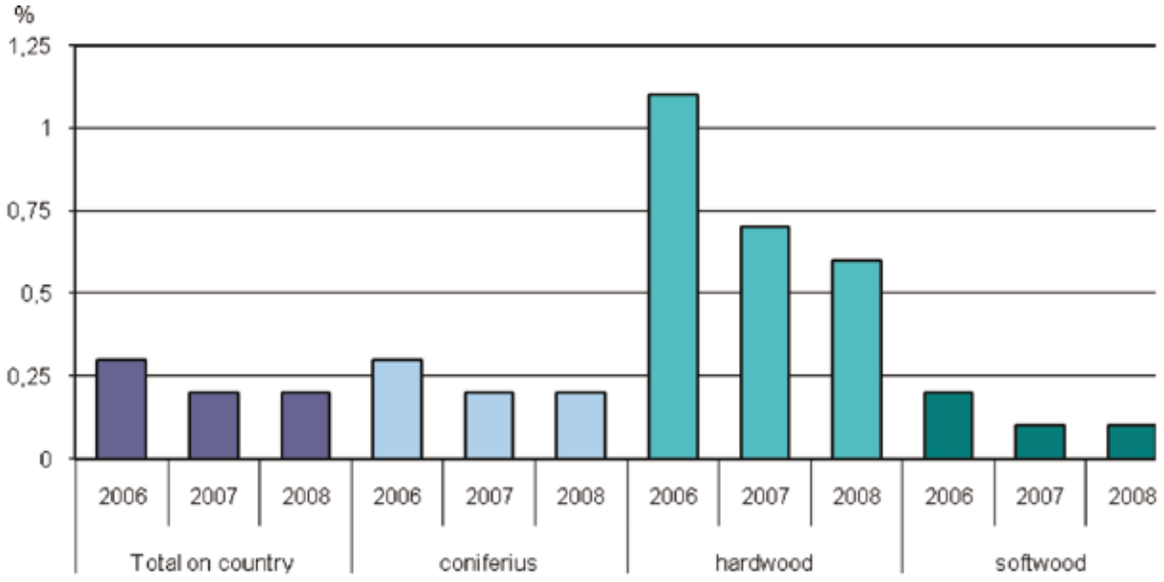


Figure 5.8 – Mean percentage of dehromation forests in 2006-2008

situation compared to previous years. During the period from 2006 to 2008 there was a reduction in the area of forest plantations is almost dead from all causes, except for the effects of adverse weather conditions, which disrupt the stability of forest ecosystems and cause deterioration in health-state forests in general. In 2009, it marked the increase in the area of forest dead from forest fires (on 593 hectares compared with 2008), from adverse weather conditions in (to 3,544 hectares compared with 2006), the damage of insect pests (44 ha compared to 2008) *(Table 5.9)*.

Timely and qualitative **regeneration of forests** is a fundamental requirement for the principle of permanence and sustainable forest management, conservation of bio-diversity of forest flora and the genetic potential of forests.

In general, for the period from 2006 to 2009 reduction of the area of reforestation and afforestation is marked. Works on reforestation and afforestation in 2009 were

held in a total area of 40760 ha, which is 15,457 hectares less than in 2006 *(Table 5.10)*.

By planting and sowing in 2009, it were established forest plantations in the area of 34,320 hectares (14,342 hectares less than in 2006), of which 16,535 hectares (less 7,306 hectares) were planted on the cuttings, on lands contaminated by radionuclides – 8721 hectares (less than in 2006 to 4,087 ha). It was established that the promotion of natural

Table 5.9

Area of dead forest plantations in the forest of Belarus, ha

Reason	Area, ha							
	total in country				including coniferius			
	2006	2007	2008	2009	2006	2007	2008	2009
Forest fires	1630	723	647	1240	1465	694	609	1207
The impact of adverse weather	2217	3084	4512	5761	1896	2702	3712	4701
Diseases of forest	616	844	638	330	509	502	393	222
Excessive humidity	606	190	173	110	404	105	115	74
Damage of wildlife	217	37	7	5	160	22	7	5
Damage by harmful insects	24	12	4	48	24	12	4	48
Anthropogenic factors	15	3	3	3	2	2	2	2
Total	5379	4893	5984	7497	4460	4039	4842	6259

Table 5.10

Change in the total area of reforestation and afforestation for 2006-2008, ha

Indicator	2006	2007	2008	2009
Total reforestation and afforestation, including:	56 217	54 988	50 006	40 760
planting and sowing, including:	48 662	48 069	43 135	34 320
clearings	23 841	21 767	20 671	16 535
on land contaminated with radionuclides	12 808	12 321	9817	8721
promoting natural forest regeneration and preservation of growth	7555	6919	6871	6440

regeneration was carried out on 6,440 hectares, which is 1,115 hectares less than in 2006.

Rare and endangered species of wild animals and wild plants

One of the areas of environmental activities is the conservation of rare and being endangered species of wild animals and wild plants.

Legal basis for the conservation of rare and endangered species of animals and wild plants are set forth on the Red Book of Belarus, approved by the Council of Ministers of the Republic of Belarus of December 27, 2007 № 1836, and the Laws of the Republic of Belarus of November 26,1992 «On the protection of environment» (Article 64), on July10, 2007 № 257-3, «On Fauna» (Article 17), on June 14, 2003 «On the vegetable world» (Article 24) and from May 5, 1998 «On the objects, which are only owned by the state» (Articles 2 and 3).

The basis of the Red Book of Belarus is a list of rare and endangered species of wild animals (188 species) and the list of rare and carbon rose species of wild plants (274 species, including fungi and algae), asserted of the decree of the Ministry of Natural Resources and protection of Environment of Republic of Belarus on June 9, 2004 № 14 «On approving the list of rare and endangered species of wild animals and wild plants are included in the Red Book of Belarus».

In order to ensure state control over the of captive animals listed in the Red Book, in 2008, it was organized the registration of animals which are in the possession of legal organizations and individuals.

State program of development of hunting on 2006-2015 approved by Presidential Decree of December 8, 2005 № 580, provides for the development of management plans of the European populations of lynx, brown bear and badger.

For the protection of European bison the Ministry of Natural Resources and Environment Program of the Republic of Belarus has developed a plan for the conservation and rational use of bison for 2010-2014.

As a result of measures taken to protect rare species, as well as strengthening state enforcement of environmental legislation over the past few years, there were positive trends in the number of species threatened with extinction, restored and expanded natural areas of their living.

To preserve wild animals and wild plants belonging to the species, including the result obtained in the Red Book, the work on the inventory, identification and transfer of custody of new areas of their living *(Table 5.11)*. On January1, 2009 the 3078 places of habitats of wild animals and habitats of wild plants belonging to the species included in the Red Data Book of Belarus (2039 habitats of 71 species of wild animals and 1039 habitats of 103 species of wild plants) were taken under protection.

Animal world – one of the most important biological resource, our national and world domain. Exceptionally important is the ecological value of wild animals that ensure soil fertility, clean water, pollination of flowering plants, the transformation of organic matter in natural and man-made ecosystems. The important role of animals is known in quality and dynamics of the environment. Unquestionable is their significance as a source of esthetic and emotional climate necessary for normal human existence.

According to the 2006 Fauna of Belarus includes 467 species of vertebrate animals and over 30 species of invertebrates of various groups. As we know, all kinds as a whole, play functionally biocoenotic role in maintaining the stability of natural-term protection.

Table 5.11

Plant and animal species included in Red Data Book of Belarus in 2005-2007

Region	2005				2006				2007			
	Plants		Animals		Plants		Animals		Plants		Animals	
	number of species	habitats of species	number of species	habitats of species	number of species	habitats of species	number of species	habitats of species	number of species	habitats of species	number of species	habitats of species
Brest	40	240	26	211	48	285	33	285	49	426	49	467
Vitebsk	36	101	37	451	47	118	41	450	43	725	48	227
Gomel	25	38	10	296	27	89	10	297	11	297	33	139
Grodno	20	74	17	140	20	74	17	140	17	140	20	74
Minsk	41	130	25	241	41	132	25	206	24	206	43	132
Mogilev	19	46	11	111	19	73	12	113	11	113	19	73
Total	86	629	71	1450	183	771	125	1491	79	1907	100	1112

Among *invertebrates* in Belarus the highest quantity of species is distinguished in diversity of insects. So far this class has the following major units: coleoptera (over 3200 species), lepidopterous (1600), hymenopterous (about 800), hemipterans (about 100), opterous (800), dipterous (200), orthopterous (58 species). From other arthropods are known more than 400 species of spiders, and about 600 mites, of soil invertebrates – 13 species of earthworms, more than 270 oribatid mites, 200 nematodes and other.

From parasitic invertebrates inhabiting organisms are noted more than 600 species of helminths, more than 100 mites that cause or are transfer different including dangerous diseases for animals and humans.

In the composition of the zooplankton of lakes and rivers of Belarus the most diverse are three groups, a leading role in aquatic ecosystems – rotifers (398 species), cladocera (over 100) and copepods (70), as well as several representatives of the benthos (crustaceans and mollusks).

Fauna of *fish* is represented by 58 species. From 46 species of native fauna 24species are widespread in the country's reservoirs, several species have limited distribution. Belarus is located in the two zoogeographic provinces – the Ponto-Caspian-Aral Sea and the Baltic. Ichthyofauna of reservoirs of Baltic province is allocated by the presence of salmonids, whereas water Ponto-Caspian-Aral Province are characterized by great variety of carp fish.

A distinctive feature of the fish fauna of Belarus is the presence within it of representatives of the both marine and freshwater faunal assemblages. In the twentieth century have disappeared the stone eel and 9 species of fish: the Atlantic sturgeon and Russian sturgeon, carp, Black Sea roach etc. During this period 11 new species have acclimatised, introduced white amur, goby, goad goby, Perpilus alepidotus, sandpiper, amur sleeper, bullhead, rainbow trout, white and silver carp, trout, carp white .

In the Red Book species such as sturgeon *(Figure 5.9)* atlantic salmon, brown trout *(Figure 5.10)*, brook trout, European grayling.

Amphibians and reptiles are represented respectively 13 and 7 species. From the amphibole 2 species are found caudiferous (eft) and 11 species of the order of tailless (frogs, toads). Of the reptiles found one species of turtles, 3 species of lizards and snakes. On the territory of Belarus there are limits of distribution of 4 types: fresh-water turtle, red-bellied toad, common hyla, natterjack. The Red Book includes 2 species of amphibians

Figure 5.9 – Sturgeon

Figure 5.10 – Trout

triturus cristatus, natterjack and 2 species of reptiles.

Status of herpetofauna of Belarus, even taking into account the identification of negative trends in the last 20 years as a result of increasing economic burden, implies satisfactory.

Fauna of *birds* have the highest diversity among vertebrates. It includes 309 species, of which 227 nest on the territory of Belarus and are presented in of core forest species and inhabitants of moist habitats – coastal rivers and lakes. Over the past 1,5-2 centuries in the country disappeared some 10 species of birds, and over the past 50 years of XX century there were 27 new nesting species, including and the previously extinct species – common cormorant, gray goose, mute swan, which indicates that the active processes of the dynamics of fauna. In this century firstly are registered pond heron, marsh crake, polar bunting, sociable lapwing, more than 100 years after its last meeting was marked ibis, 92 years – spoonbill. Particular importance has territory of Belarus for 17 endangered bird species in Europe due to the preserved here on a significant area of their habitats. Within the country is concentrated at least 5% of European populations of these species, including more than half the population of the globally disappeared specie – aquatic warbler. The third edition of the Red Book to the category № I of national environmental importance ferruginous duck *(Figure 5.11)*, greater spotted eagle, erne *(Figure 5.12),* booted eagle, red-footed falcon, duck hawk, thick-knee, roller, etc.

Mammal fauna is represented by 6 units, which include 77 species: insectivorous-12 species, bats – 18, predatory – 15, double-toothed rodents – 2, rodents – 25, artiofdactyes – 5. Raccoon dog, raccoon, mink, muskrat are acclimatized. In the middle of the XIX century elk was reakklimatized. The Red Book includes the European mink, *(Figure 5.13)*, European lynx *(Figure 5.14)*, a badger, several species of bats.

One of the most unique species of mammals is the Belovezha bison. Its numbers on 01.01.2010 amounted to 937 individuals.

Belarus has the southern boundary of

Figure 5.11 – Ferruginous duck

Figure 5. 12 – Erne

Figure 5.13 – Brown bear

Figure 5.14 – European lynx

area of brown bears. Belarusian population of this specie for 2006 estimated at 110-120 individuals, and represented as four spatially separated subpopulations, defined by large forests in the northern part of the country.

Another protected species – the European lynx in Belarus, met throughout the territory, but very rarely. Totally it counted no more than 450-500 lynxes each year.

Extremely important group by number of members of rare and endangered species are bats. Currently it is known 18 species, of which 6 species are included in the Red Book of Belarus -pond bat *(Figure 5.15)*, Nutter and Brandt bat, barbastelle *(Figure 5.16)*, lesser noctule and northern leather figure).

Animal world is an integral part of the natural environment and biodiversity, an important regulating and stabilizing component of ecosystems.

In Belarus, considerable attention is given to improving the regulatory framework aimed at ensuring the conservation of biological diversity and sustainable use of animal resources. Currently there are over 30 standard-setting instruments of different levels, governing the protection and use of animal resources.

For the protection and sustainable use of wildlife by the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus provides control over the account

Figure 5.15 – Pond bat

Figure 5.16 – Barbastelle

of wild animals, relating for hunting, in the fund reserve hunting areas, hunting grounds in the fund provided in free of payment, as well as in other areas (nature reserves, national parks, the other in protected natural areas).

One of the important types of biological resources is the resources of hunting fauna. According to the Rules of game management and hunting in the Republic of Belarus approved by the Presidential Decree № 383 of July 23, 2010 classified 50 species (21 species of animals and 29 species of birds) related to hunting animal species. Of these, 3 species of wild animals and 4 species of birds classified as undesirable for hunting or fishing industry. From wild game to the resource and significant objects and the mass hunting first and foremost, include elk, red deer, roe European, wild boar, and hares, some types of fur-bearing animals; from birds – great grouse, black grouse, hazel grouse, partridge and ducks. The object of the mass hunting is the geese, but the main hunting takes place outside the country. In this connection, the number of geese slightly

depends on the established regime of their use, and more rational management of populations is not possible without the agreed policy of the countries where the wintering birds, breeding, growing and migration routes take place.

To monitor the status of populations and retirement planning in the hunting took into account the number of the most valuable species of game animals.

Total number of game farms in 2009 amounted to 255 (for 3 more than in previous

Table 5.12

Number of major species of game animals in hunting in 2005-2009, thousands of individuals (according to the Ministry of Statistics and Analysis)

Species	2005	2006	2007	2008	2009
Elk	15,6	16,2	17,7	19,6	21,1
Deer	4,9	5,7	6,8	8,1	8,7
Boar	38,6	43,2	47,9	56,0	63,9
Roe	50,4	50,9	53,0	59,1	64,3
Protein	105,9	101,5	113,4	127,3	127,8
Hare	206,5	198,7	181,3	179,0	170,7
Fox	39,3	47,1	40,0	41,0	46,0
Muskrat	70,9	59,9	54,4	50,3	42,0
Mink	20,5	19,7	19,3	20,3	21,6
Beaver	48,0	52,5	58,8	59,6	62,3
Capercaillie	9,1	9,3	9,2	8,9	8,6
Blackcock	47,0	45,7	41,6	41,2	37,9

Table 5.13

Dynamics of mining of the main species of game animals in 2005-2009, individuals (according to the Ministry of Statistics and Analysis)

Species	2005	2006	2007	2008	2009
Elk	659	744	990	1159	1318
Deer	186	412	329	441	613
Boar	5826	7861	13 371	18 914	24 105
Roe	3105	2912	3562	4402	5073
Protein	2220	1859	2220	2555	2896
Hare	53 130	43 432	55 804	53 710	50 612
Fox	22 790	28 040	31 999	25 838	25 258
Muskrat	2903	2506	3409	2860	1932
Mink	1682	1765	2267	2309	2435
Beaver	243	413	2129	2220	3494
Capercaillie	123	81	140	151	154
Blackcock	1179	314	247	332	364

year), the total area counts of 16.8 million hectares (2008 –16.5 million hectares). The nature of the state of the main resource species hunting fauna and the dynamics of their population according to data presented in *Tables 5.12* and *5.13.*

According to the Ministry of Statistics and Analysis, in 2009, hunting farms in the country remained with positive trends in population dynamics and production of key resource species of game animals.

Significant population growth occurs in a wild boar. Thus, from 2005 to 2009 the number of wild boars has increased by 25.3 thousand individuals. This is primarily due to weather conditions, conditions (mild winters), the availability of sufficient fodder, increased control over the exploitation of its population (the fight against poaching, the increase in penalties for non-legitimate prey).

There is also growth in population and other hoofed animals. From 2005 to 2009 number of elk increased by 5,5 thousand

individuals, roes – on 3,8, deer – by 13,9 thousand individuals.

A continuing decline in the number of hares – with 206.5 thousand individuals in 2005 to 179.0 in 2008 and up 170.7 thousand individuals in 2009 is probably due to the large number predators (foxes, wolf, raccoon dog, prey birds).

The number of foxes during the period from 2005 to 2009 increased by 6,7 thousand individuals.

Of the wetland animals, marked the high rate of growth of a beaver. Only in the last

5 years its population increased by 14.3 thousand individuals, which is associated primarily with the reduction of hunting and the great plasticity of the specie.

Significantly reduced the number of muskrats – from 70.9 thousand individuals in 2005 to 42,0 thousand individuals in 2009 (to 28.9 thousand individuals). The number of minks varied slightly from year to year and remained relatively stable.

The most massive group of birds used for sport hunting are water-floating. A marked reduction of most species of waterfowl in Belarus and all the neighboring regions occurred in 1950-1960. In 1970 the number of basic duck hunting species of birds has begun to stabilize, and the rare protected species, and some not very popular object of hunting – even increase. The main reasons are:

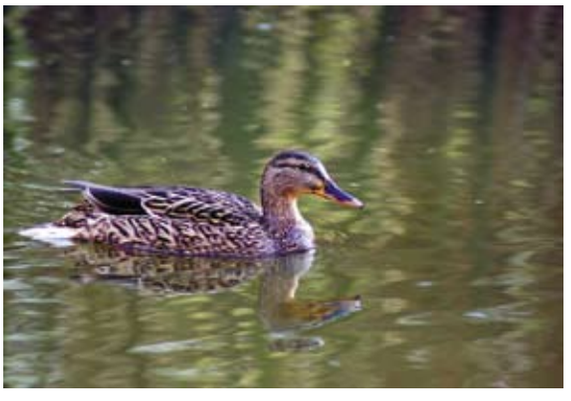
– development in Belarus a network of protected wetlands and the strengthening of common measures of bird protection;

– improving game management, regulation of time periods of hunting and size of game;

– increasing the degree of adaptation of birds to the economic changes the environment;

– extension of wintering waterfowl in the country, which under-led to a rapid increase in species diversity of wintering birds and their numbers.

Among the most abundant bird for hunting is absolutely dominated by mallard.



For waterfowl species uneven distribution on the territory in accordance with the location of the wetlands is characterized.

Among all species of upland game grouse is of special importance and is the most well-hunting trophy. Since mid-1960 in Belarus there was a noticeable reduction of the number of grouse, which have affected and protected areas. By the 1990's, the negative trend has slowed, the number of species has been stabilized and in some places has increased. This is attributed to the fact that cover of large areas of post-war plantings of pines have reached an optimal age for grouse, which increased the area of land suitable for him.

The number of great grouse in recent years (2005-2009) rests on a fairly stable level. However, in 2009 was a slight reduction in its size – up to 8,6 thousand from 9.1 thousand individuals in 2005.

Tends to decrease and the number of black grouse, which is mainly related to in weather conditions during the breeding season. So, in 2009, its population was 37.9 thousand

individuals, which is 9.1 thousand individuals less than in 2005.

Dynamics of production of game animals over the past 5 years is shown in *Table 5.13*.

According to available data for 2005-2009 it marked the increase in production of almost all major species of game animals. The exception is the hare, fox and muskrat. Maximal number of prey individuals of these species of animals has been achieved in 2007. Thus, bagging of hare in 2009 compared with 2007 decreased by 5,192 individuals, muskrats – in 1477 and foxes – to the 6741 specimen.

Among the hoofed animals in 2009, significantly increased production of wild boar – in comparison with 2005 by 4 times (18,279 individuals), 2 times – elk, more than 3 times – deer and in 1,5 times – roe (*see Table 5.13*).

In 2009 compared with 2005, a 14-fold increased production of beaver (compared to 2008 – in 1,6 times) is observed.

Extraction of great grouse and black grouse in recent years has remained relatively stable (*see Table 5.13*). It is mainly produced by foreign hunters.

According to the 2005 **fauna** of Belarus includes 11.5 thousand species. In the natural flora includes 1638 species of vascular plants, 430 bryophytes, 477 lichens, 2232 algae, fungi up to 7000. Diversity of plant communities is represented on 29 classes of themselves, 50 orders, 78 alliances and 233 associations.

As the food can be used about 400 wild plant species, technical – over 300, for medicine drugs – 900. Reserves of natural plant materials equal to or lower exceeded 1 million tons. Substantial deposits of technical tanning materials: bark of willows, oaks, buckthorn. From industrial plants are the most important tann oak, pine and spruce resiniferous; fibrous reed, cattail, big rush, sedges, nettles, reed.

Most economically important are the berry plants: blueberry, cranberry, blueberries and other; from fruit-trees- rowan.

From aromatic plants of natural flora reserves allocated calamus, river avens, water pepper, caraway,wild leek, coriander, absinthium, hops, marjoram, thyme. There are substantial deposits of black and red currant, cherry, water bean, nymphaea,common merilot.

Natural plant resources have considerable economic potential. There are significant reserves in growth and an assortment of pieces of medicinal plants and technical raw materials, food plants.

The third edition of the Red Book of Belarus are a list of plants and fungi, underlying the protection, expanded to 60 species relative to the 2nd edition. Changes in the list of protected species of plants and fungi can be represented as follows: number of species of vascular plants increased to 173 (was 156; ruled out 24 and added 41 new species), bryophytic – up to 27 species (it was 15, added 12), algae – up to 21 species (there were 9, added 12), lichen – up to 24 species (there were 17 , ruled out 4, added 11), mushrooms – and 29 (was 17, ruled 3, added 15). Totally there were excluded 31 and added 91 new species. For example, for the protection of Category I are Christopher

Figure 5.17 – Christopher herb

Figure 5.18 – Dark-winged orchis

herb *(Figure 5.17)*, bladder fern, dark-winged orchis (*Figure 5.18*), yellow marsh saxifrage, kauliniya small, shilling grass, gagea, saw grass and other.

Among plants and fungi, which were firstly included in the Republican Red Book, in overwhelming majority are extremely rare and very rare species, existing in small quantities and/or on very limited areas, resulting in the structure of biodiversity, they are the most vulnerable components with a high degree of extinction risk under the influence of adverse natural and anthropogenic factors.

One of the most significant factor of flora depletion of Belarus should be a violation or destruction of habitats of plants as a result of increasing anthropogenic impacts. The second important factor – the direct destruction of plants due to excessive production. At the same time nature transformation can lead to appearing conditions under which the form is eliminated naturally. Many rare species are characteristic of communities with sparse grass cover, have a reduced ability of a competitive and can thrive in anthropogenically disturbed areas, where there are reduced number of competitors. From this it follows that the issue of protection of species should be treated differentially based on their responses to various forms of anthropogenic impact action.