

RESTORATION OF FORESTS IN THE TATRA NATIONAL PARK

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Protected in all over the Poland is the network of 13 national parks and about 620 nature reserves. In the Polish Carpathian Mnts on the total area of 315 000 ha of forests, there are four national parks in Tatras, Pieniny, Bieszczady and Babia Góra Mntns and more than 50 forestal nature reserves established on surface of about 20 000 hectares.

The Tatras are the only massif of the Carpathian Range with habitats of a typically alpine character. The area of the whole Tatras in Poland and Slovakia, which consists the synecological unit is not large, only about 940 square kilometres. Divided into two neighborly national parks TANAP (Slovakia) and TPN (Poland) Tatra massifs is enlarged between 49°00' and 49°20' N and between 19°40' and 20°20' E. In spite of the small area the Tatras rises very steeply with considerable differences of elevations ranging from 700 to 2 663 m above sea level. The specific character of climate is decidedly determined by the marked geomorphological separateness of the Tatras against the background of the surrounding areas.

Table 1. Forest and non-forest areas in the Tatra Mountains

Forest and shrubs associations:	Area in hectares:
Dwarf pine zone (<i>Pinetum subalpinum</i>)	9 500
Stone pine woods (<i>Cembro-Piceetum</i>)	300
Carpathian Norway spruce association (<i>Piceetum tatricum</i>)	6 500
Beech and fir forests (<i>Dentario glandulosae-Fagetum</i>) (<i>Luzulo-Fagetum</i>) and (<i>Galio-Abietetum</i>)	2 600
Sycamore-maple forest (<i>Phyllitido-Aceretum</i>) and (<i>Sorbo-Aceretum</i>)	50
Scots pine woods (<i>Vario-Pinetum</i>)	40
Carpathian alder woods (<i>Alnetum incanae</i>)	300
Total modern area of natural forests	19 290 hectares
Derelict forest habitats and artificial Norway spruce stands	20 710 hectares
Alpine zone in all over the Tatras	54 000 hectares
Sum	94 000 hectares

Table 2. Forest associations of Tatras National Park

Forest association	Vertical range in metres a.s.l.	Dominating trees and shrubs	Ground flora
1. Dwarf-pine thicket on limestone: <i>Mughetum carpathicum calcicolum</i>	1,250 — 1,850	<i>Pinus montana</i> <i>Rosa pendulina</i> <i>Ribes petraeum v. carpathicum</i> <i>Sorbus aucuparia v. glabrata</i> <i>Sorbus chamaemespilus</i> <i>Rubus idaeus</i>	<i>Atbyrium alpestre</i> <i>Dryopteris austriaca</i> <i>Geum montanum</i> <i>Calamagrostis villosa</i> <i>Veratrum lobelianum</i> <i>Valeriana tripteris</i>
2. Dwarf-pine thicket on granite: <i>Mughetum carpathicum silicicolum</i>	1,250 — 1,850	<i>Pinus montana</i> <i>Sorbus aucuparia v. glabrata</i> <i>Salix silesiaca</i> <i>Juniperus nana</i>	<i>Calamagrostis villosa</i> <i>Gentiana punctata</i> <i>Listera cordata</i> <i>Homogyne alpina</i> <i>Spbagnum girgenschni</i>
3. Relict stone-pine woods: <i>Cembro-Piceetum</i> /= <i>Larici-Cembretum</i> /	1,350 — 1,700	<i>Pinus cembra</i> <i>Picea excelsa</i> <i>Larix decidua</i> <i>Betula carpatica</i> <i>Sorbus aucuparia v. glabrata</i> <i>Lonicera nigra</i> <i>Rosa pendulina</i>	<i>Vaccinium myrtillus</i> <i>Vaccinium vitis-idaea</i> <i>Vaccinium uliginosum</i> <i>Empetrum nigrum</i> <i>Gentiana punctata</i> <i>Melampyrum silvaticum</i> <i>Rhytidadelphus loreus</i>
4. Carpathian spruce forests: <i>Piceetum tatricum</i>	1,200 — 1,550	<i>Picea excelsa</i> <i>Sorbus aucuparia v. glabrata</i>	<i>Listera cordata</i> <i>Corallorhiza trifida</i> <i>Lycopodium annotinum</i> <i>Pirola uniflora</i> <i>Plagiotybecium undulatum</i> <i>Hylacomium umbratum</i> <i>Rhytidadelphus loreus</i>
5. Mountain sycamore-maple forests: <i>Phyllitido- Aceretum</i>	900 — 1,480	<i>Acer pseudoplatanus</i> <i>Sorbus aucuparia</i> <i>Picea excelsa</i> <i>Ulmus montana</i> <i>Abies alba</i> <i>Ribes grossularia</i> <i>Lonicera xylosteum</i>	<i>Lunaria rediviva</i> <i>Phyllitis scolopendrium</i> <i>Petasites albus</i> <i>Poa remota</i> <i>Pulmonaria obscura</i> <i>Symphytum tuberosum</i> <i>Adoxa moschatellina</i>

6.	Fir forests: <i>Abietetum</i>	700 — 1,280	<i>Abies alba</i> <i>Picea excelsa</i> <i>Sambucus racemosa</i> <i>Lonicera nigra</i> <i>Lonicera xylosteum</i> <i>Rubus idaeus</i>	<i>Circaea alpina</i> <i>Galium rotundifolium</i> <i>Luzula flavescens</i> <i>Blechnum spicant</i> <i>Veronica officinalis</i> <i>Matanibemum bifolium</i> <i>Hylacomium splendens</i>
7.	Moraine spruce forests: <i>Piceton excelsae</i>	800 — 1,200	<i>Picea excelsa</i> <i>Sorbus aucuparia</i>	<i>Vaccinium myrtillus</i> <i>Vaccinium vitis-idaea</i> <i>Calamagrostis arundinacea</i> <i>Ptilium crista-castrensis</i>
8.	Carpathian beech forests: <i>Fagetum carpathicum</i>	900 — 1,220	<i>Fagus sylvatica</i> <i>Abies alba</i> <i>Acer pseudoplatanus</i> <i>Picea excelsa</i> <i>Lonicera nigra</i> <i>Taxus baccata</i>	<i>Dentaria glandulosa</i> <i>Cardamine trifolia</i> <i>Dentaria bulbifera</i> <i>Polystichum lobatum</i> <i>Veronica montana</i> <i>Festuca sylvatica</i>
9.	Mountain acid-soil beech forests: <i>Luzulo-Fagetum</i>	900 — 1,250	<i>Fagus sylvatica</i> <i>Picea excelsa</i> <i>Abies alba</i> <i>Sorbus aucuparia</i>	<i>Calamagrostis varia</i> <i>Calamagrostis arundinacea</i> <i>Vaccinium myrtillus</i> <i>Luzula nemorosa v. albida</i> <i>Ranunculus platanifolius</i>
10.	Relict Scots pine woods: <i>Vario-Pinetum</i>	950 — 1,100	<i>Pinus silvestris</i> <i>Sorbus aria</i> <i>Acer pseudoplatanus</i> <i>Juniperus communis</i> <i>Cotoneaster integerrima</i>	<i>Arctostaphylos uva-ursi</i> <i>Cornallaria maiatis</i> <i>Carduus glaucus</i> <i>Carex tatarorum</i> <i>Sesleria varia</i>
11.	Carpathian alder woods: <i>Alnetum incanse</i> /= <i>Caltho-Alnetum</i> /		<i>Alnus incana</i> <i>Picea excelsa</i> <i>Fraxinus excelsior</i> <i>Salix incana</i> <i>Sambucus nigra</i> <i>Salix silesiaca</i>	<i>Galthia laeta</i> <i>Doronicum austriacum</i> <i>Chaeophyllum birsutum</i> <i>Chrysanthemum rotundifolium</i> <i>Glyceria plicata</i> <i>Petasites Kablikianus</i> <i>Festuca gigantea</i> <i>Juncus effusus</i>

The forest associations in the mixed-forest altitudinal zone are: Carpathian beech forests (*Dentario glandulosae-Fagetum*), mountain acid beech forests (*Luzulo-Fagetum*), mountain Fir forests (*Galio-Abietetum*), also azonal alder woods (*Alnetum incanae*) and „relict“ Scots pine woods (*Vario-Pinetum*), besides the highly resistant and wood-productive Norway spruce forests on granite moraines (*Vaccinio-Piceion*).

In the upper forest zone above the mixed mountain forest zone exists the spruce zonal forest (*Piceetum tatricum*) and another „relict“ spruce-stone pine woods (*Cembro-Piceetum*). Both the zonal forest associations are penetrated azonally by the sycamore-maple woods (*Phyllitido-Aceretum*) with *Acer pseudo-platanus* as a dominant tree. The subalpine zone upper than the Tatras timber line, is occupied by the association of dwarf pine thickets (*Pinetum subalpinum*).

The course of the upper forest limit in the Tatras as well as the character of this limit are influenced by many factors. Their variety and frequent counteraction cause the formation of various types of the timber line there. When determining the latter, the following upper limits should be considered: 1) That of treestands or fully stocked forests; 2) That of loose spruce forests; 3) That of single growing trees in subalpine zone.

In Tatras there were distinguished four natural types of the upper forest limit: climatic, orographical, biological and edaphical; a fifth the man-made secondary type of timber line is present enlarged on 60% its overall length, formed under influence of man's husbandry lowering the potential range of Tatra forests areas.

The severe weather conditions of alpine habitats caused not only the disappearance of deciduous tree species and forests in the Tatras since the postglacial climatic optimum but in the present age also prevented the migration of such common Central European tree species as oaks, hornbeam, lime-trees, poplars etc. in the surrounding region. Some trees as elms, ash, maple and others which even form large forests round the territory of the Tatras have only spread to the borders of their geobotanical region and persisted there in spite of the competition of other species.

To-day the forests of the Tatras devastated in more than a half of their original area, are primarily composed of Norway spruce, European beech, white fir, sycamore-maple, and mountain-ash (*Sorbus aucuparia*). Such species as white alder, European larch, mountain elm, Carpathian birch, stone pine, Scots pine, grey willow are rather rare in the described forests. Most rare of Tatra indigenous tree species are now: *Amelanchier ovalis*, *Padus petraea*, *Sorbus aria*, *Taxus baccata*. Rare shrubs are follows: *Sorbus chamaemespilus*, *Salix helvetica* a.o.

The chief aim of the national parks is the protection of the remaining natural forests and the restoration of the natural flora and fauna in the Tatra ecosystems as their primary components. From the above mentioned reasons the forest biocoenoses protected in the strict nature reserves in both National Parks: TANAP and TPN can be use as the objects serving for the restoration of forest- and non-forest ecosystems, as in the reconstruction of the economically utilized Carpathian forests on various habitats in surrounding areas too. The deciding factor is here the exclusion of Tatra forests from usual production processes associated with numerous biocenotic disturbances. Long term measurements and investigations should be connected with undisturbed forest biocoenoses. This kind of studies may be useful in the rational space management and also for the intensification of the forest production (wood production) itself, particularly in the aspect of long periods of constant

production so important under conditions of mountain forests.

The task of the managements of both national parks in all over the Tatras is to control and regulate these natural processes of the reconstruction of the proper and resistant forest cover that would be composed of as many indigenous tree species as the habitats allow.

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