

INSPECTION OF ENVIRONMENTAL PROTECTION

Monitoring of natural habitats

Methodological guide

for natural habitat

**9180 Sycamore and maple-lime forests of slopes, screes and
ravines *Tilio platyphyllis-Acerion pseudoplatani***

by **Krzysztof Świerkosz, Jan Bodziarczyk**

Translated by

Roman Tertil, Letterman Sp. z o.o.,

ul. Kramerowska 15/2, 31-130 Kraków

LIBRARY OF ENVIRONMENTAL MONITORING

Warszawa 2017

CONTENTS

9180* Sycamore and maple-lime forests of slopes, screes and ravines <i>Tilio platyphyllis-Acerion pseudoplatani</i>	3
I. INFORMATION CONCERNING THE NATURAL HABITAT	3
1. <i>Phytosociological identifiers</i>	3
2. <i>Description of the natural habitat</i>	3
3. <i>Ecological conditions</i>	4
4. <i>Typical plant species</i>	4
5. <i>Distribution in Poland</i>	7
II. METHODOLOGY	7
1. <i>Methodology of monitoring studies</i>	7
2. <i>Assessment of parameters of the conservation status of a natural habitat and the indicators of its specific structure and functions</i>	9
3. <i>An example of a filled-in habitat observation sheet for a monitored location</i>	14
4. <i>Habitats of similar ecological characteristics</i>	19
5. <i>Conservation of the natural habitat</i>	19
6. <i>References</i>	20

9180* Sycamore and maple-lime forests of slopes, screes and ravines

Tilio platyphyllis-Acerion pseudoplatani

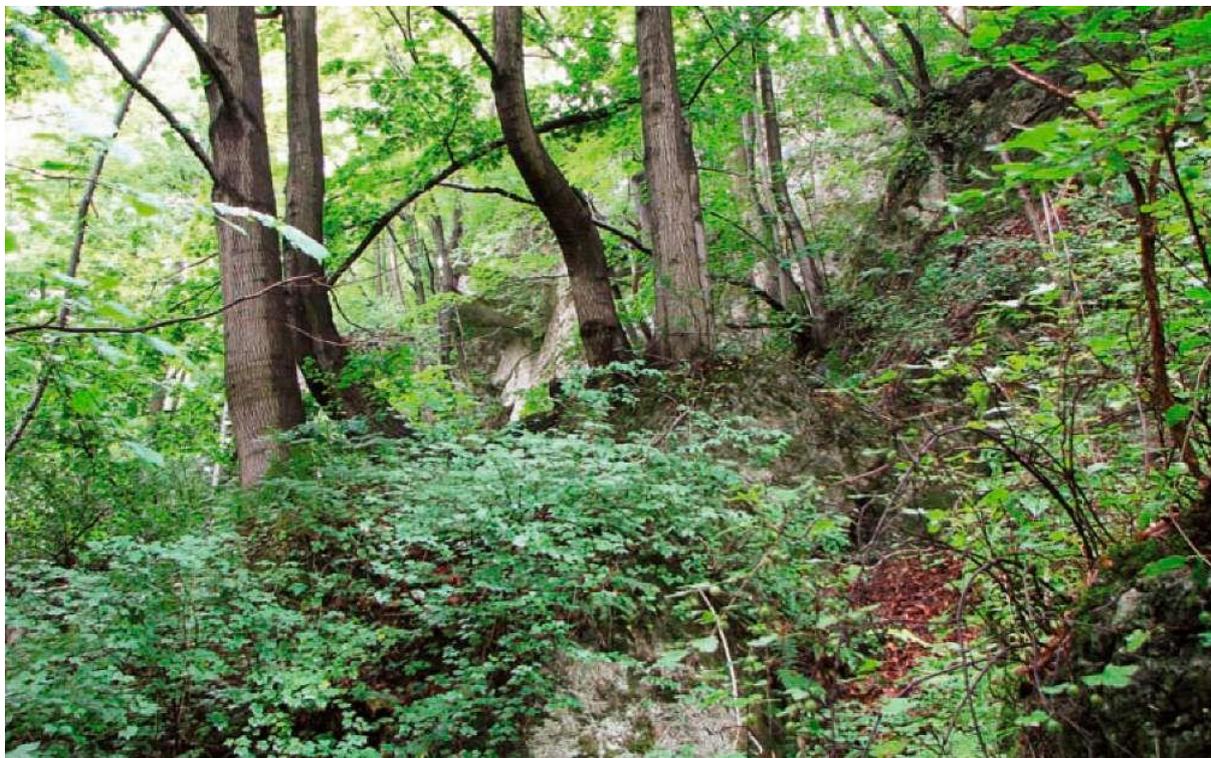


Photo 1 An example of natural habitat code 9180. Ostoja Środkowojurajska refuge (© J. Bodziarczyk).

I. INFORMATION CONCERNING THE NATURAL HABITAT

1. Phytosociological identifiers

Class: *Querc-Fagetea*

Order: *Fagetalia sylvaticae*

Alliance: *Tilio platyphyllis-Acerion pseudoplatani*

Phyllitido-Aceretum

Lunarno-Aceretum

Sorbo aucupariae-Aceretum pseudoplatani

Aceri platanoidis-Tilietum platyphylli

Community: *Acer pseudoplatanus-Aruncus sylvestris*

2. Description of the natural habitat

Multi-species, fertile, sycamore maple, sycamore maple-beech, and maple-lime forests developing on steep slopes and screes, as a rule at inclinations from 20-50°, on strongly skeletal soils, often superficially covered with rubble, boulders, and blocks of rock, and with active erosion processes. The forest stands are dominated by sycamore maple, Norway maple, or broad-leaved

lime. These forests are limited in occurrence to mountain and foothill regions of Southern Poland. Forest habitat type: upland forest and mountain forest.

3. Ecological conditions

Type of substrate – rocky, rock rubble with variable diameter, and bare rocks; chiefly on calcareous, basalt and greenstone substrates, rarely on other types of rocks (noted also on porphyries and gneisses).

Soils – shallow, initial, strongly skeletal.

Inclination – great, 20° to 40° (70°).

Exposure – most often facing north, or near north.

Microclimate – greatly diversified – from microclimates of a thermophilous nature (some forms of maple-lime forests *Aceri-Tilietum* on slopes) through moderately cold and subhumid climates (sycamore maple forest *Phyllitido-Aceretum*, sycamore maple forest *Lunario-Aceretum*, and most forms of maple-lime forests *Aceri-Tilietum* on slopes) up to alpine microclimates (Carpathian sycamore maple forest *Sorbo-Aceretum*).

4. Typical plant species

Depending on subtype:

9180-1 Maple-lime forests of the Sudety mountains, their foothills, and foreland, marked with mixed, multi-species forest stands with domination of broad-leaved lime, Norway maple, sycamore maple, and European ash.

Trees and shrubs: large-leaved lime *Tilia platyphyllos*, Norway maple *Acer platanoides*, European ash *Fraxinus excelsior*, sycamore maple *Acer pseudoplatanus*, Scotch elm *Ulmus glabra*, chestnut oak *Quercus petraea*, Alpine currant *Ribes alpinum*, European fly honeysuckle *Lonicera xylosteum*.

Herbaceous plants: German vetch *Vicia dumetorum*, creeping bellflower *Campanula rapunculoides*, wood vetch *Vicia sylvatica*, giant bellflower *Campanula latifolia*, wonder violet *Viola mirabilis*, black baneberry *Actaea spicata*, spilcet fern *Polystichum aculeatum*, Benekeni brome *Bromus benekenii*, hedge garlic *Alliaria petiolata*, throatwort *Campanula trachelium*, narrow-leaved bellflower *Campanula persicifolia*, dog's mercury *Mercurialis perennis*, sweet woodruff *Galium odoratum*.

9180-2 Sycamore maple forest with hart's tongue *Phyllitis scolopendrium* – habitat of foothill and mountain type, with stand principally of sycamore maples although with admixture of many other tree species, with the occurrence of the rare fern species hart's tongue *Phyllitis scolopendrium* as a differential feature.

Trees and shrubs: sycamore maple *Acer pseudoplatanus*, large-leaved lime *Tilia platyphyllos*, Scotch elm *Ulmus glabra*, European ash *Fraxinus excelsior*, common beech *Fagus sylvatica*, hornbeam *Carpinus betulus*, silver fir *Abies alba*, common elder *Sambucus nigra*, gooseberry *Ribes uva-crispa*.

Herbaceous plants: hart's tongue *Phyllitis scolopendrium*, perennial honesty *Lunaria rediviva*, male fern *Dryopteris filix-mas*, dog's mercury *Mercurialis perennis*, weaselsnout *Galeobdolon luteum*, spilcet fern *Polystichum aculeatum*, black baneberry *Actaea spicata*, European wild ginger *Asarum europaeum*, false crowfoot *Geranium robertianum*, common lungwort *Pulmonaria obscura*, stinging nettle *Urtica dioica*.

9180-3 Carpathian sycamore maple forests with perennial honesty *Lunaria rediviva* – sycamore maple forests of the Carpathian arc, developing principally on acid and neutral substrates with dominant perennial honesty *Lunaria rediviva*, and with many Carpathian forest floor species:

Trees and shrubs: sycamore maple *Acer pseudoplatanus*, common beech *Fagus sylvatica*.

Herbaceous plants: perennial honesty *Lunaria rediviva*, male fern *Dryopteris filix-mas*, wood ragwort *Senecio nemorensis*, dog's mercury *Mercurialis perennis*, touch-me-not *Impatiens noli-tangere*, weaselsnout *Galeobdolon luteum*, sweet woodruff *Galium odoratum*.

9180-4 Sudetian sycamore maple forests with perennial honesty *Lunaria rediviva - sycamore maple forests of the Sudety mountains, with *Lunaria rediviva*, more often found on calcium carbonate-rich substrates, characterised by the occurrence of species with western type of distribution, generally poorer in terms of floristics than the corresponding Carpathian sycamore maple forests, with very small proportions of species of the *Betulo-Adenostyletea* class, and generally much thinner:

Trees and shrubs: sycamore maple *Acer pseudoplatanus*, Scotch elm *Ulmus scabra*, Norway maple *Acer platanoides*, black-fruited honeysuckle *Lonicera nigra*.

Herbaceous plants: perennial honesty *Lunaria rediviva*, cow parsley *Anthriscus nitida*, sweet spurge *Euphorbia dulcis*, enneapetalous toothwort *Dentaria enneaphyllos*, reed fescue *Festuca altissima*, wood starwort *Stellaria nemorum*, lady fern *Athyrium filix-femina*, male fern *Dryopteris filix-mas*, broad buckler fern *Dryopteris dilatata*, white bryony *Petasites albus*.

***9180-5 Carpathian sycamore-maple forest** – habitat of a low-coppice sycamore maple-mountain ash forest, with abundant tall-herb forest floor vegetation, limited to lower- and higher montane habitats of the Carpathian arc.

Trees and shrubs: sycamore maple *Acer pseudoplatanus*, rowan *Sorbus aucuparia*, *Ribes petraeum*, black-fruited honeysuckle *Lonicera nigra*, Alpine rose *Rosa pendulina* (regionally).



Photo 2 Sycamore maple forest with hart's tongue *Phyllitis scolopendrium* – an example of natural habitat subtype code 9180-2. Ostoja Jaślińska refuge (© J. Bodziarczyk)

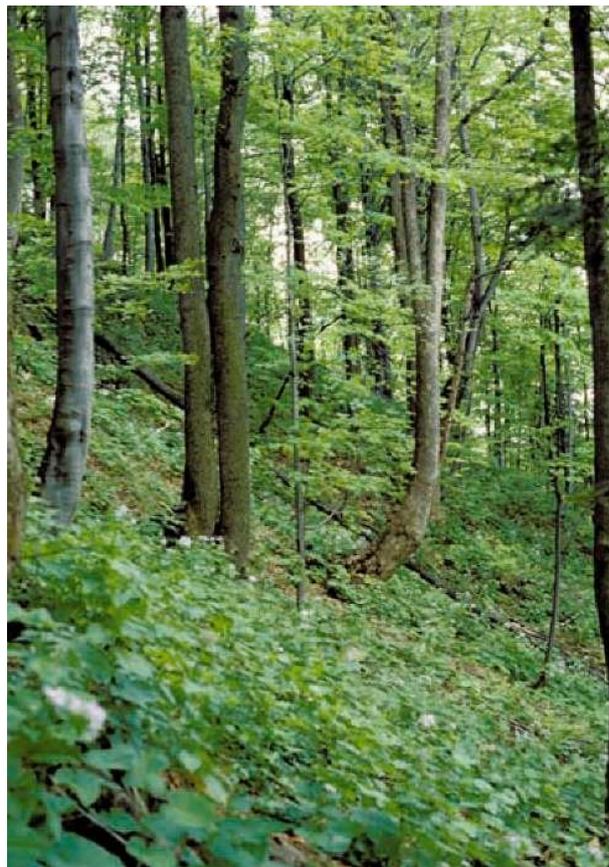


Photo 3 Carpathian sycamore maple forests with perennial honesty *Lunaria rediviva* - an example of natural habitat subtype code 9180-3. Kostrza (© J. Bodziarczyk)

Herbaceous plants: adenostyles *Adenostyles alliariae* (locally), Alpine lady fern *Athyrium distentifolium*, sylvan goatbeard *Aruncus sylvestris* (locally), wood millet *Milium effusum*, white bryony *Petasites albus*, common lungwort *Pulmonaria obscura* (locally), columbine meadow-rue *Thalictrum aquilegifolium* (locally), great wood rush *Luzula sylvatica*, American false hellebore *Veratrum lobelianum* (locally), reed grass *Calamagrostis arundinacea*.

***9180-6 Sudetian sycamore maple forests and tall-herb beech forests** – extremely rare type of habitat, known so far only from three isolated patches, much different from the floristic viewpoint but showing a high proportion of species of the *Betulo-Adenostyletea* class, particularly sylvan goatbeard *Aruncus sylvestris* and American false hellebore *Veratrum lobelianum* as a common feature.

Trees and shrubs: sycamore maple *Acer pseudoplatanus*, common beech *Fagus sylvatica*, rowan *Sorbus aucuparia*, black-fruited honeysuckle *Lonicera nigra*, Alpine rose *Rosa pendulina*.

Herbaceous plants: Alpine sow-thistle *Cicerbita alpina*, mountain dock *Rumex alpestris*, white buttercup *Ranunculus platanifolius*, clasp-leaf twisted-stalk *Streptopus amplexifolius*, American false hellebore *Veratrum lobelianum*, Manchurian monkshood *Aconitum variegatum*, sylvan goatbeard *Aruncus sylvestris*, goldenrod *Solidago virgaurea*, bilberry *Vaccinium myrtillus*, common hairgrass *Deschampsia flexuosa*.

5. Distribution in Poland

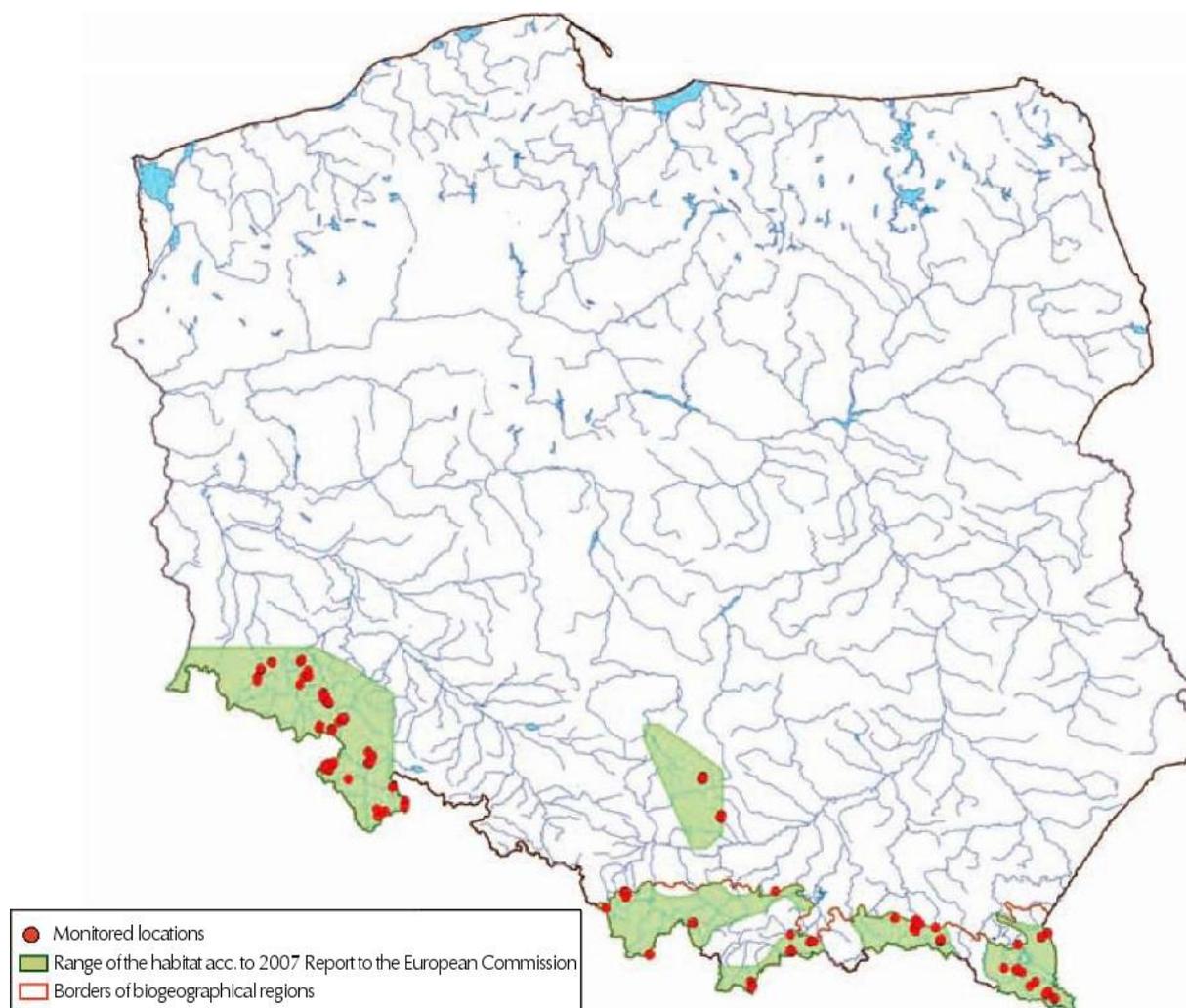


Fig. 1 Distribution of the habitat in Poland and locations monitored from 2006 to 2008

In Poland, the habitat was described from the Sudety mountains, their foreland and foothills, on the Kraków-Częstochowa Jura, and on the entire Carpathian arc.

II. METHODOLOGY

1. Methodology of monitoring studies

Selection of monitoring locations

A distinct patch of the environment should be regarded as a monitoring location (a scree, boulder field, rocky slope) with a surface area of at least 100 m².

The monitoring sites should be situated within the main regions of the occurrence of a given type of habitat, which cover the following Natura 2000 areas:

in the continental region: Kaczawskie mountains and foothills, Kamienne mountains, Ostoja nad Bobrem refuge, Ostrzyca Proboszczowicka, Nysa Kłodzka river ravine near Morzyszów, Śnieżnik mountain area, and Bialskie mountains, Czarne Urwisko near Lutynia, Ostoje Nietoperzy Gór Sowich

bat refuges in Sowie mountains, Bardzkie mountains, Krowiarki mountain range, Pełcznica gorge, Stołowe mountains, Środkowojurajska refuge, Prądnik river valley.

in the alpine region: Tatry mountains, Ostoja Jaślicka refuge, Babia Góra mountain, Pieniny Klippen Belt, Ostoja Popradzka refuge, Kostrza, Bieszczady mountains, Słonne mountains, Ostoja Magurska refuge, Łysa Góra mountain, Beskid Żywiecki and Beskid Śląski mountains.

Study method

Because of the insular nature of habitat 9180 distribution, two methodological approaches are possible:

- in watercourse valleys on steep slopes more than 200 m long, it is possible to establish a standard 200 m long transect, along which 3 relevés are made: at its beginning, in the middle part, and at the end of the transect;
- in the case of the distribution of patches in a small area, delineating the transect may prove impossible (e.g. Ostrzyca Proboszczowicka or the majority of Carpathian sites). In such cases transect studies are usually impossible because the size of the combined patch of the habitat can be smaller than the potential transect. The observations can, however, be carried out on individual patches of the habitat and the total surface area can be regarded as a monitored location (analogically as on a transect). The sum of surface areas of individual patches on the site (e.g. in a ravine) may be treated as the monitored area.

The sums of surface areas of 3 patches in which the relevés were made covering these patches, may thus be deemed to be the area of the habitat irrespective of whether they are situated in the transect or not.

Timing and frequency of studies

The best time for conducting studies is from May to July when the forest floor vegetation is in an easily identifiable state, and when a significant proportion of plants are flowering. Studies conducted during the later portion of the vegetation season are possible, but account should be taken of the possibility to commit erroneous estimates of coverage by some species, and the impossibility of identifying a few of them.

Equipment required

The studies do not require any specialised equipment. Necessary items include: a notebook (with empty forms to be filled in), a GPS device, a measuring tape, and a camera.

2. Assessment of parameters of the conservation status of a natural habitat and the indicators of its specific structure and functions

Table 1 Description of parameters of specific structure and functions, as well as “conservation prospects” for natural habitat 9180 – sycamore maple and maple-lime forests on steep slopes and screes (*Tilio platyphyllo-Acerion pseudoplatani*)

Parameter/ Index	Description
Specific structure and functions	
Characteristic species	<p>On account of the great syntaxonomic, ecological, and elevational diversity of the habitat, expressed in a large number of subtypes, the characteristic species differentiating the subtypes show great variability. The most valuable are:</p> <p>Tree and shrubs: large-leaved lime <i>Tilia platyphyllos</i>, Norway maple <i>Acer platanoides</i>, sycamore maple <i>Acer pseudoplatanus</i>, Scotch elm <i>Ulmus glabra</i>, Alpine currant <i>Ribes alpinum</i>, black-fruited honeysuckle <i>Lonicera nigra</i>, <i>Alpine rose</i> <i>Rosa pendulina</i>, in higher mountain situations – <i>rowan</i> <i>Sorbus aucuparia</i> subsp. <i>glabrata</i>.</p> <p>Herbaceous plants: in foothill and lower mountain subtypes – <i>German vetch</i> <i>Vicia dumetorum</i>, <i>creeping bellflower</i> <i>Campanula rapunculoides</i>, <i>wood vetch</i> <i>Vicia sylvatica</i>, great bellflower <i>Campanula latifolia</i>, <i>black baneberry</i> <i>Actaea spicata</i>, spilcet fern <i>Polystichum aculeatum</i>, <i>hedge garlic</i> <i>Alliaria petiolata</i>, <i>hart’s tongue</i> <i>Phyllitis scolopendrium</i>, and perennial honesty <i>Lunaria rediviva</i>;</p> <p>in mountain and high-mountain subtypes: Alpine sow-thistle <i>Cicerbita alpina</i>, mountain dock <i>Rumex alpestris</i>, <i>white buttercup</i> <i>Ranunculus platanifolius</i>, clasp-leaf twisted-stalk <i>Streptopus amplexifolius</i>, <i>American false hellebore</i> <i>Veratrum lobelianum</i>, Manchurian monkshood <i>Aconitum variegatum</i>, sylvan goatbeard <i>Aruncus sylvestris</i>, <i>adenostyles</i> <i>Adenostyles alliariae</i> (locally), and <i>Alpine lady fern</i> <i>Athyrium distentifolium</i>.</p>
Dominant species	<p>This group of species is difficult to define because of major local differences between the dominant species on particular sites. They coincide generally with expansive or characteristic species. For habitat 9180 it is natural to find the occurrence of some species of herbaceous plants in facies (depending on subtype: <i>sweet woodruff</i> <i>Galium odoratum</i>, <i>dog’s mercury</i> <i>Mercurialis perennis</i>, weaselsnout <i>Galeobdolon luteum</i>, perennial honesty <i>Lunaria rediviva</i>, stinging nettle <i>Urtica dioica</i>, <i>hedge garlic</i> <i>Alliaria petiolata</i>, Benekeni brome <i>Bromus benekenii</i>, <i>wood melic grass</i> <i>Melica uniflora</i> etc.). Similarly, the forest stand of the patches is very diversified which is a feature of the natural form of forests – patches where 6-8 tree species coexist can be found parallel to patches where just one species dominates (e.g. sycamore maple <i>Acer pseudoplatanus</i>, small-leaved lime <i>Tilia cordata</i>, <i>Norway maple</i> <i>Acer platanoides</i>). In principle, the ‘dominant species’ parameter cannot be quantified in relation to the species typical of the habitat, but only with respect to the invasive species or those alien to this type of habitat. The situation is complicated still further by the fact that in forests retaining their natural dynamics, particularly on western slopes, the emergence of species typical of clearings, in gaps left by falling trees, is also a natural phenomenon. Quantifying these indicators requires great experience and knowledge of various habitat types and the full range of their variability.</p>
Alien invasive species	<p>In forests growing on slopes, invasive species are rare among the components of flora, but the occurrence of <i>small balsam</i> <i>Impatiens parviflora</i> is highly probable (particularly in the western part of the range) while other species are much rarer. Areas with the occurrence of one alien species were sporadically noted in the Piekielna valley and Ostoja Srodkowojurajska refuge areas.</p> <p>The proportion of invasive species is generally low – if they occur their quantities are below 10% of coverage (again in the case of <i>small balsam</i> <i>Impatiens parviflora</i>), the status of the index should be regarded as Unfavourable inadequate (U1), and only in the case of massive occurrence – as Unfavourable bad (U2).</p>

Parameter/ Index	Description
Native expansive species of herbs	The values of 'dominant species' and 'expansive species of herbaceous plants' parameters partially overlap. In 9180 habitats we should talk about expansive species only in relation to the appearance of massively occurring species typical of forest clearings (<i>reed grass</i> Calamagrostis arundinacea, <i>wood small-reed</i> C. epigeios, <i>bramble</i> Rubus spp., <i>fireweed</i> Chamaenerion angustifolium), whose massive occurrence may (but does not have to) result from degenerative processes. It should be remembered, however, that in insolated exposures, these species may emerge naturally in gaps of forest stands, representing a natural element of the habitat dynamics.
Tall herb and nitrophilous species	The permanent presence of such species as: <i>hedge garlic</i> Alliaria petiolata, false crowfoot Geranium robertianum, stinging nettle Urtica dioica, and wood avens Geum urbanum is desirable. Their occurrence in facias is possible in some patches of the habitat thus – similarly as in the case of riparian forests – the frequent occurrence of nitrophilous species is a feature positively differentiating the habitat. It pertains even more to herbaceous species of the Betulo-Adenostyletea class which are characteristic, differentiating or even dominant species in mountain and high-mountain subtypes of the habitat.
Structure of forest stand	In the typical forms of the habitat, the forest stand should be highly diversified with respect to height and breast height diameter of trees. It should, however, be remembered that sycamore maple forests and slope forests occurring in difficult ecological conditions are not characterised by high age structure with a major proportion of old forests. The presence of at least several old trees in a study area indicate the natural character of the habitat and the low intensity of forest management practices or their complete absence in the past.
Vertical structure of vegetation	The properly developing patch of habitat 9180 should consist of at least 5 layers: bryophytes, forest floor vegetation, shrubs, and at least two layers in the forest stand. The density of these layers fluctuates, however, in very broad limits, and strongly depends upon local conditions and the internal dynamics of phytocoenoses. Habitat patches where the bryophyte layer is limited to single occurrences are frequent whereas on wet slopes and those on more stable substrates, and with more gentle inclination, they can – together with liverworts – occupy up to 50% of the surface. The lack of „a2" or „b" layers may – in most cases – testify to the degeneration of the habitat resulting from management measures (the simplified vertical structure of a forest stand) carried out in the past, or those pursued currently (lack of underwood and shrubs). However, it can also result from extreme conditions of growth of the species contributing to the development of phytocoenosis and intensive disturbing processes which can significantly affect the species composition and structure of the whole system and its dynamics.
Alien species in the forest stand	In forest stands growing on steep slopes and screes, alien species appear very rarely. Nevertheless, their occurrence represents a clear indication of habitat degeneration. These situations are very rare – in 75 of the examined sites none was found to contain introduced alien species of the invasive type. In mountain areas, Norway spruce Picea abies can be admixed, but in many cases it is a natural component of the habitat. Therefore, it may be difficult to establish the origin of the species in case of the occurrence of single trees. It may often be associated with the surrounding habitats which, in a certain way, provide the background for small-area habitats.

Parameter/ Index	Description
Natural regeneration of the forest stand	<p>Most often this occurs as large numbers of seedlings of which only few (because of difficult habitat conditions) enter the stage of brushwood or underwood. In properly developed habitat patches, the presence of regeneration is necessary – depending on the patch, its percentage proportion in the herbaceous plant and shrub layers may fluctuate from several to several dozen. Sycamore maple <i>Acer pseudoplatanus</i> and Norway maple <i>Acer platanoides</i> usually dominate in the regeneration but most of the seedlings show very low survivability, except in places in open gaps and on at least partially stabilised fragments of slope surfaces. In such places, the rapid development of these species is observed, and they enter the undergrowth layer. The disturbances which markedly affect the formation and diversification of structure are important factors influencing the successful growth and development of a new generation of trees in this habitat. Under these conditions, the fast-growing species (sycamore maple <i>Acer pseudoplatanus</i>, Norway maple <i>Acer platanoides</i>, large-leaved lime <i>Tilia platyphyllos</i>, small-leaved lime <i>Tilia cordata</i>, European ash <i>Fraxinus excelsior</i> and rowan <i>Sorbus aucuparia</i>), gain an advantage, and are capable of reaching a relatively safe height and sustainability of growth in the periods separating subsequent disturbances.</p>
Management-related transformations	<p>The occurrence of stumps, felled trunks, single-layer structure of the forest stand, the lack of dead wood in the form of trunks standing or lying – are clear symptoms of the excessive impact of management on a habitat patch. Even though commercial felling in forests on screes is very rare and has only been noted on several occasions, a shortage of dead wood is still observed, and in the case of fallen trees – the trunks are taken away and only the butt parts and root system are left.</p>
Conservation prospects	<p>The possibility of habitat conservation and keeping it in an undeteriorated state under analysed real imaginable factors affecting the habitat in the near future are assessed. The current conservation status (situated in a protected area), biotic and anthropogenic factors, the impact of economic activities and tourism were taken into account. This parameter is estimated, because often not all information is available on the management plans pertaining to the old fragment of the habitat. As a rule, locations within natural reserves or on very steep slopes guarantee good or very good conservation prospects, however, various threats may appear from human economic activities (e.g. construction of dammed reservoirs, rubble barriers, slope roads etc.).</p>

Table 2 Evaluation of status parameters and indices of specific structure and functions for the natural habitat 9180 – sycamore maple and maple-lime forests on steep slopes and screes (*Tilio platyphyllis*- *Acerion pseudoplatani*)

Parameter/ Index	Favourable status FV	Unfavourable inadequate U1	Unfavourable bad U2
Surface area of the habitat in the monitored location	Does not change or increases	Other combinations	Evident decrease in the area of the habitat compared with earlier studies or given in references
Specific structure and functions			
Characteristic species	>5 species, characteristic for local conditions including at least 2 in the forest stand	2-5 characteristic species	Lacking, or only single individuals
Dominant species	Possible occurrence of species in facies of the <i>Quercus-Fagetum</i> class, sporadic occurrence of post-felling and invasive species	Over 30% of the forest floor vegetation area is occupied by species typical of forest clearings (bramble <i>Rubus</i> sp., reedgrass <i>Calamagrostis</i> sp. and other)	Over 50% of the forest floor vegetation area is occupied by species typical of forest clearings (bramble <i>Rubus</i> sp., reedgrass <i>Calamagrostis</i> sp. and other)
Alien expansive species	Lacking	Single individuals, 1-2 species	One species or several (>2) species, growing in very high density
Native expansive species of herbs	Possible occurrence of species in facies of the <i>Quercus-Fagetum</i> class (sweet woodruff <i>Galium odoratum</i> , dog's mercury <i>Mercurialis perennis</i> , weaselnout <i>Galeobdolon luteum</i>) which is a natural phenomenon in some of the patches of this habitat; sporadic occurrence of post-felling and invasive species	Over 30% of the forest floor vegetation area is occupied by species typical of forest clearings (bramble <i>Rubus</i> sp., reedgrass <i>Calamagrostis</i> sp. and others)	Over 50% of the forest floor vegetation area is occupied by species typical of forest clearings (bramble <i>Rubus</i> sp., reedgrass <i>Calamagrostis</i> sp. and others)
Tall herb and nitrophilous species	Desired permanent presence of such species as hedge garlic <i>Alliaria petiolata</i> , false crowfoot <i>Geranium robertianum</i> , stinging nettle <i>Urtica dioica</i> , wood avens <i>Geum urbanum</i> . Possible occurrence in facies of some patches of the habitat	Single individuals of nitrophilous species	Lack of nitrophilous species
Structure of forest stand	Forest stand diversified with regard to height and diameter at breast height	Even-aged forest stand, but underwood present	Even-aged forest stand, not diversified with regard to height and diameter at breast height
Vertical structure of vegetation	All layers of vegetation occur (a1, a2, b, c, d); moss layer can be very poor in species	One layer lacking (usually a1 or b)	Simplified vertical structure made of two layers (a and c)
Alien species in the forest stand	Lacking	1 ecologically alien species, single trees	Plantings or more than 1 ecologically alien species
Natural regeneration of the forest stand	Multi-age regeneration present, minimum 3 species	Even-aged or multi-age regeneration present, no more than 2 species	Lacking, or single regenerations
Management-related transformations	Lacking	Single measures such as removal of fallen trees	Forest management, as applied, adversely affecting the structure and functions of the habitat

Parameter/ Index	Favourable status FV	Unfavourable inadequate U1	Unfavourable bad U2
Overall structure and functions	All cardinal indices evaluated as FV, the remaining indices as at least U1	All cardinal indices evaluated as at least U1	One or more cardinal indices evaluated as U2
Conservation prospects	Conservation prospects for the habitat are good or excellent, no significant impact of threatening factors predicted	Other combinations	Conservation prospects for the habitat are bad, strong impact of threatening factors observed, no survival of the habitat can be guaranteed in longer time perspective
Overall assessment	All parameters evaluated as FV	One or more parameters evaluated as U1, no U2 evaluations	One or more parameters evaluated as U2

Cardinal indices

- Characteristic species
- Invasive alien species
- Alien species in the forest stand
- Structure of the forest stand

3. An example of a filled-in habitat observation sheet for a monitored location

Natural habitat observation sheet for the monitored location	
Basic information	
Code and name of the natural habitat	*9180 Sycamore maple forests and maple-lime forests
Site name	PLC 120001 Tatry
Name of the monitored location	Waksmundzkie Ścianki
Type of the monitored location	Reference
Plant communities	Tatra sycamore maple forest
Description of the habitat on the site	The habitat occupies a steep, precipitous slope exposed to EES inclined even to as much as up to 45°, at the foot of a high wall in the Waksmundzka Valley. The patches in the site are dispersed into several small areas, they appear as isolated islands on the background of upper montane spruce forests. Each of the patches selected for monitoring is a point site but their system in the area and short distances between them give them the characteristics of a transect
Area of habitat patches	The combined area of 3 patches selected for monitoring amounts to ca. 0.15-0.2 hectare
Protected areas where the monitored location is situated	The Tatra National Park, Natura 2000
Manager of the area	The Tatra National Park
Geographical coordinates	N 49°15' ..."; E 20°04' ..."
Transect dimensions	Point site. Despite isolation, the monitored areas fit into a certain transect shape pattern. In order to make them fully representative, the particular study areas were made to match the size of developed patches. Area. No. 1: 400 m ² , No. 2: 400 m ² , No. 3: 250 m ² .
Elevation a.s.l.	Point 1. 1376 m; 2. 1378 m; 3. 1385 m.
Annual report – basic information	
Year	2008
Monitoring type	Detailed
Coordinator	Jan Bodziarczyk
Auxilliary coordinators	-
Threats	No current threats
Other natural values	The habitat includes territories of large carnivores: lynx <i>Lynx lynx</i> , grey wolf <i>Canis lupus</i> brown bear <i>Ursus arctos</i> (traces of their living there were observed repeatedly), and a refuge of a number of protected plant species, such as: spilcet fern <i>Polystichum aculeatum</i> , swallowwort gentian <i>Gentiana asclepiadea</i> , American false hellebore <i>Veratrum lobelianum</i> , monkshod <i>Aconitum</i> sp., sylvan goatbeard <i>Aruncus sylvestris</i> , mountain holly fern <i>Polystichum lonchitis</i> , common twayblade <i>Listera ovata</i> , martagon lily <i>Lilium martagon</i> , marsh felwort <i>Swertia perennis</i> , daphne <i>Daphne mezereum</i> , bear's ear sanicle <i>Cortusa matthioli</i> , adder fern <i>Polypodium vulgare</i> , hen-and-ducken houseleek <i>Jovibarba sobolifera</i> , dark red helleborine <i>Epipactis atrorubens</i> .
Is monitoring required?	Yes
Justification	The habitat is a point-type, very rare in Poland. Phytosociological status of the Tatra sycamore maple forests is not fully known so therefore further studies are recommended. Exceptionally rich habitat typewith great dynamics.
Conservation measures performed and their assessment	None

Natural habitat observation sheet for the monitored location	
Proposed conservation measures	No need of such measures
Date of inspection	6.07.2008
Comments	The habitat is situated within the limits of strictly protected areas of a national park, and is subject to natural process of the phytocoenotic dynamics. Difficult to access, exceptional area of wild nature.

Conservation status of the natural habitat on the monitored location	
Relevé I	
Geographical coordinates of the centre, elevation a.s.l. Area of the relevé, inclination, exposure Density of layers a, b, c, d Height of layers a, b, c, d Phytosociological unit	<p>Geographical coordinates: N 49°15' ..."; E 20°04' ..."; elev. 1376 m a.s.l. (centre of the patch); area 400 m², inclin. 38°, exp. E; Density of layers: a1 - 50%, a2 - 20%, b - 40%, c - 80%, d -50%;</p> <p>Height of layers : a1 - ca. 15 m, a2 - 10 m, b - up to 3 m, c - up to 1.0 m, d - 0.05 m</p> <p>Phytosociological unit: Tatra sycamore maple forest. Species: layer a1: <i>Acer pseudoplatanus</i> 3, <i>Picea abies</i> 1; layer a2: <i>Sorbus aucuparia</i> 2, <i>Picea abies</i> 2; layer b: <i>Acer pseudoplatanus</i> 2, <i>Lonicera nigra</i> +, <i>Juniperus communis</i> +, <i>Cotoneaster intergerrimus</i> +, <i>Salix silesiaca</i> +, <i>Picea abies</i> 3, <i>Sorbus aucuparia</i> +, <i>Daphne mezereum</i> +, layer c: <i>Lonicera nigra</i> +, <i>Aruncus sylvestris</i> +, <i>Sorbus aucuparia</i> +, <i>Lilium martagon</i> 1, <i>Senecio nemorensis</i> s.l. 1, <i>Digitalis grandiflora</i> 2, <i>Polystichum lonchitis</i> +, <i>Epilobium montanum</i> +, <i>Listera ovata</i> 1, <i>Galium mollugo</i> 2, <i>Asplenium ruta-muraria</i> +, <i>Sedum fabaria</i> +, <i>Asplenium viride</i> +, <i>Calamagrostis arundinacea</i> 2, <i>Calamagrostis varia</i> 3, <i>Cystopteris fragilis</i> +, <i>Ranunculus platanifolius</i> +, <i>Pimpinella saxifraga</i> 1, <i>Solidago alpestris</i> 1, <i>Mycelis muralis</i> +, <i>Gymnocarpium robertianum</i> +, <i>Clematis alpina</i> +, <i>Saxifraga paniculata</i> +, <i>Fragaria vesca</i> +, <i>Tussilago farfara</i> +, <i>Myosotis alpestris</i> +, <i>Daphne mezereum</i> +, <i>Allium montanum</i> +, <i>Polygonatum verticillatum</i> 2, <i>Anthyllis alpestris</i> +, <i>Lotus corniculatus</i> +, <i>Pinus cembra</i> +, <i>Carex sempervirens</i> +, <i>Cotoneaster intergerrimus</i> +, <i>Scabiosa lucida</i> +, <i>Orobanche</i> sp. +, <i>Melica nutans</i> +, <i>Epipactis atrorubens</i> +, <i>Carduus glaucus</i> 1, <i>Gymnadenia conopsea</i> +, <i>Paris quadrifolia</i> +, <i>Picea abies</i> +, <i>Cirsium erisithales</i> 2, <i>Vaccinium vitis-idaea</i> 1, <i>Jovibarba sobolifera</i> +, <i>Thymus carpaticus</i> +, <i>Vaccinium myrtillus</i> +, <i>Poa nemoralis</i> +, <i>Polypodium vulgare</i> +, <i>Dryopteris filix-mas</i> +, <i>Delphinium elatum</i> +, <i>Thalictrum aquilegifolium</i> 1, <i>Hieracium murorum</i> +, <i>Aconitum</i> sp., <i>Phyteuma orbiculare</i> +, <i>Galeobdolon luteum</i> +, <i>Gentiana asclepiadea</i> +, <i>Rosa pendulina</i> +, <i>Actaea spicata</i> +, <i>Swertia perennis</i> +, <i>Viola hirta</i> +, <i>Athyrium filix-femina</i> +, <i>Polystichum aculeatum</i> +, <i>Arabis alpina</i> +, <i>Sorbus aucuparia</i> +, <i>Euphrasia salisburgensis</i> +, <i>Luzula luzuloides</i> +, <i>Carduus personata</i> +, <i>Helianthemum ovatum</i> +, <i>Campanula cochlearifolia</i> +</p>

Conservation status of the natural habitat on the monitored location	
Relevé II	
Geographical coordinates of the centre, elevation a.s.l. Area of the relevé, inclination, exposure Density of layers a, b, c, d Height of layers a, b, c, d Phytosociological unit	Geographical coordinates: N 49°15' ..."; E 20°04' ..."; elev. 1378 m a.s.l.; area 400 m ² , inclin. 40°, exp. EES Density of layers: a1 - 50%, a2 - 25%, b - 20%, c - 95%, d - 20% (chiefly on rocks and in dead wood) Height of layers: a1 - 13-15 m, a2 - 10-12 m, b - up to 5 m, c- up to 0.8 m, d – 0.05 m Phytosociological unit: Tatra sycamore maple forest. Species: layer a1: <i>Acer pseudoplatanus</i> 3; layer a2: <i>Acer pseudoplatanus</i> 2, <i>Picea abies</i> 1, <i>Sorbus aucuparia</i> 1; layer b: <i>Acer pseudoplatanus</i> 3, <i>Lonicera nigra</i> +, <i>Ribes alpinum</i> 1, <i>Rosa pendulina</i> 1, <i>Picea abies</i> 2, <i>Sorbus aucuparia</i> 1, <i>Sambucus racemosa</i> +, <i>Daphne mezereum</i> 1, <i>Salix silesiaca</i> 1, <i>Rosa canina</i> +; layer c: <i>Lunaria rediviva</i> 2, <i>Senecio nemorensis</i> s.l. 1, <i>Astrantia major</i> 1, <i>Pimpinella saxifraga</i> 2, <i>Sambucus racemosa</i> +, <i>Mycelis muralis</i> 1, <i>Delphinium elatum</i> 1, <i>Veratrum lobelianum</i> +, <i>Rubus idaeus</i> 1, <i>Dryopteris filix-mas</i> +, <i>Thalictrum aquilegifolium</i> +, <i>Calamagrostis arundinacea</i> +, <i>Prenanthes purpurea</i> +, <i>Milium effusum</i> +, <i>Sorbus aucuparia</i> +, <i>Geranium robertianum</i> 1, <i>Poa nemoralis</i> +, <i>Pulmonaria obscura</i> 2, <i>Listera ovata</i> 1, <i>Cirsium erisithales</i> +, <i>Fragaria vesca</i> 1, <i>Petasites albus</i> 3, <i>Saxifraga paniculata</i> +, <i>Lilium martagon</i> 1, <i>Pleurospermum austriacum</i> +, <i>Sedum fabaria</i> +, <i>Urtica dioica</i> +, <i>Phyteuma orbiculare</i> +, <i>Melandrium rubrum</i> +, <i>Melica nutans</i> +, <i>Epilobium montanum</i> +, <i>Angelica sylvestris</i> +, <i>Daphne mezereum</i> +, <i>Polygonatum verticillatum</i> +, <i>Cystopteris fragilis</i> +, <i>Digitalis grandiflora</i> 1, <i>Solidago alpestris</i> +, <i>Sanicula europea</i> +, <i>Swertia perennis</i> +, <i>Chamaenerion angustifolium</i> +, <i>Scabiosa lucida</i> +, <i>Calamagrostis varia</i> +, <i>Asplenium trichomanes</i> +, <i>Polystichum lonchitis</i> +, <i>Cortusa matthioli</i> +, <i>Actaea spicata</i> +, <i>Luzula luzuloides</i> +, <i>Paris quadrifolia</i> +, <i>Athyrium filix-femina</i> +, <i>Polypodium vulgare</i> +, <i>Geranium sylvaticum</i> +, <i>Polystichum aculeatum</i> +, <i>Cicerbita alpina</i> +, <i>Ranunculus platanifolius</i> 1
Relevé III	
Geographical coordinates of the centre, elevation a.s.l. Area of the relevé, inclination, exposure Density of layers a, b, c, d Height of layers a, b, c, d Phytosociological unit	Geographical coordinates: N 49°15' ..."; E 20°04' ..."; elev. 1385 m a.s.l.; area 250 m ² , inclin. 40°, exp. ES; Density of layers: a1: 50%, a2: 20%, b: 30%, c: 95%, d: 20% (chiefly on rocks and in dead wood); Height of layers: a1: 13 m, a2: 10 m, b: up to 5 m, c: up to 0.8 m, d: 0.05 m; Phytosociological unit: Tatra sycamore maple forest. Species: layer a1: <i>Acer pseudoplatanus</i> 3; layer a2: <i>Acer pseudoplatanus</i> 2, <i>Picea abies</i> 1; layer b: <i>Acer pseudoplatanus</i> 2, <i>Rosa pendulina</i> +, <i>Picea abies</i> 1, layer c: <i>Lunaria rediviva</i> 1, <i>Senecio nemorensis</i> s.l. +, <i>Pimpinella saxifraga</i> 1, <i>Mycelis muralis</i> 1, <i>Delphinium elatum</i> 1, <i>Rubus idaeus</i> 1, <i>Dryopteris filix-mas</i> +, <i>Thalictrum aquilegifolium</i> 1, <i>Sorbus aucuparia</i> +, <i>Geranium robertianum</i> +, <i>Salix</i> sp. +, <i>Pulmonaria obscura</i> 1, <i>Listera ovata</i> +, <i>Cirsium erisithales</i> 1, <i>Petasites albus</i> 1, <i>Lilium martagon</i> +, <i>Sedum fabaria</i> +, <i>Phyteuma orbiculare</i> +, <i>Melandrium rubrum</i> +, <i>Epilobium montanum</i> +, <i>Daphne mezereum</i> +, <i>Polygonatum verticillatum</i> 2, <i>Cystopteris fragilis</i> +, <i>Digitalis grandiflora</i> 1, <i>Calamagrostis varia</i> 2, <i>Polystichum lonchitis</i> +, <i>Polypodium vulgare</i> +, <i>Calamagrostis arundinacea</i> 3, <i>Polystichum aculeatum</i> +, <i>Galium mollugo</i> +, <i>Orobancha</i> sp. +, <i>Valeriana tripteris</i> +, <i>Asplenium trichomanes</i> +, <i>Cardaminopsis arenosa</i> +, <i>Prunela vulgaris</i> +, <i>Rosa pendulina</i> +, <i>Myosotis</i> sp. +, <i>Carex sempervirens</i> +, <i>Circaea alpina</i> +, <i>Vaccinium vitis-idaea</i> +, <i>Epipactis atrorubens</i> +, <i>Gymnadenia conopsea</i> +, <i>Asplenium viride</i> +, <i>Campanula cochlearifolia</i> +

TRANSECT (point site)			
Parameters/ Indices	Description of index	Value of parameter/index	Assessment of parameter/index
Surface area of the habitat		The area of 0.15-0.2 hectares subject to assessment is an optimum area selected for monitoring under existing conditions	FV
Specific structure and functions			FV
Percentage proportion of the habitat in the transect	Percentage of space occupied by the habitat in transect (with accuracy to the nearest 10%)	The habitat is of a point type, in mosaic with upper montane spruce forest. The habitat occupies small-area patches whose state is correct and suitably matches the local conditions. In this case, the percentage share of the habitat cannot be used as a criterion to evaluate an index. Because of the extreme conditions and the rarity of occurrence of this community in the Tatra mountains, as well as the very good state of preservation – the highest mark is given	FV
Characteristic species	List of characteristic species (Latin names)	Layer a: sycamore maple <i>Acer pseudoplatanus</i> , rowan <i>Sorbus aucuparia</i> ; Layer b: red elder <i>Sambucus racemosa</i> , black-fruited honeysuckle <i>Lonicera nigra</i> , Silesian willow <i>Salix silesiaca</i> , Alpine rose <i>Rosa pendulina</i> , Alpine currant <i>Ribes alpinum</i> , daphne <i>Daphne mezereum</i> ; Layer c: perennial honesty <i>Lunaria rediviva</i> , whorled Solomon's-seal, <i>Polygonatum verticillatum</i> , black baneberry <i>Actaea spicata</i> , Alpine larkspur <i>Delphinium elatum</i> , swallowwort gentian <i>Gentiana asclepiadea</i> , spilcet fern <i>Polystichum aculeatum</i> , stinging nettle <i>Urtica dioica</i> , wood ragwort <i>Senecio nemorensis</i> s.l., mountain willowweed <i>Epilobium montanum</i> , mountain stonecrop <i>Sedum fabaria</i> , white buttercup <i>Ranunculus platanifolius</i> , wood starwort <i>Stellaria nemorum</i> , columbine meadow-rue <i>Thalictrum aquilegifolium</i> , white bryony <i>Petasites album</i> , red campion <i>Melandrium rubrum</i> .	FV
Dominant species	List of dominant species in the transect (Latin names); percentage proportions of areas covered by particular species in the transect should be given (with accuracy to the nearest 10%); only species with coverage $\geq 10\%$	Layer a: sycamore maple <i>Acer pseudoplatanus</i> ; locally - Layer c: mountain reed grass <i>Calamagrostis varia</i> (30%), and reed grass <i>Calamagrostis arundinacea</i> (50%). The forest floor vegetation lacks evident dominant species. The two aforementioned species outnumber the other species and co-dominate with distinctly greater coverage. As the habitat is of a point type, the details of percentage coverages are given above in phytosociological relevés.	U1

TRANSECT (point site)			
Parameters/ Indices	Description of index	Value of parameter/index	Assessment of parameter/index
Alien invasive species	List of geographically alien species (Latin names); percentage proportions of areas covered by particular species in the transect should be given (with accuracy to the nearest 10%)	None	FV
Native expansive species of herbs	List of species (Latin names); percentage proportions of areas covered by particular species in the transect should be given (with accuracy to the nearest 10%)	reed grass <i>Calamagrostis arundinacea</i> (50%), mountain reed grass <i>Calamagrostis varia</i> . Proportions of these species are of a local nature	U1
Tall herb and nitrophilous species	List of species (Latin names); percentage proportions of areas covered by particular species in the transect should be given (with accuracy to the nearest 10%)	stinging nettle <i>Urtica dioica</i> , black-fruited honeysuckle <i>Lonicera nigra</i> , Rosa pendulina, black baneberry <i>Actaea spicata</i> , false crowfoot <i>Geranium robertianum</i> , red raspberry <i>Rubus idaeus</i> , swallowwort gentian <i>Gentiana asclepiadea</i> , columbine meadow-rue <i>Thalictrum aquilegifolium</i> , whorled Solomon's-seal, <i>Polygonatum verticillatum</i> , mountain willowweed <i>Epilobium montanum</i> , red elder <i>Sambucus racemosa</i> , wood millet <i>Milium effusum</i> , sylvan goatbeard <i>Aruncus sylvestris</i> , Alpine sow-thistle <i>Cicerbita alpina</i> , monkshod <i>Aconitum</i> sp., great masterwort <i>Astrantia major</i> , purple rattlesnake root <i>Prenanthes purpurea</i> , white buttercup <i>Ranunculus platanifolius</i> , Alpine larkspur <i>Delphinium elatum</i> , marsh felwort <i>Swertia perennis</i> , mountain stonecrop <i>Sedum fabaria</i> , white bryony <i>Petasites albus</i> , pleurospermium <i>Pleurospermum austriacum</i> , American false hellebore <i>Veratrum lobelianum</i> , goldenrod <i>Solidago alpestris</i> [syn. <i>S. virgaurea</i>], <i>Cirsium erisithales</i> , mountain reed grass <i>Calamagrostis varia</i> , reed grass <i>Calamagrostis arundinacea</i>	FV
Age of forest stand	Average age of forest stand, presence, age, and percentage share of old forest	According to forest stand maps – 150 years, but on some sites this age is definitely exceeded. The age structure is very diversified, single trees may even reach an age of 200 years.	FV
Alien species in the forest stand	List of species (Latin names); percentage proportions of areas covered by particular species in the transect should be given (with accuracy to the nearest 10%)	None	FV

TRANSECT (point site)				
Parameters/ Indices	Description of index	Value of parameter/index		Assessment of parameter/index
Natural regeneration of the forest stand	Percentage coverage of the transect by natural regeneration (if by different species, provide the percentage for each species) FV – uniform occurrence of regeneration throughout the site U1 – few regenerations occur U2 – total lack of regenerations	Occurring sparsely, chiefly in underwood, more rarely in natural seeding, as single individuals: Swiss stone pine <i>Pinus cembra</i> , common spruce <i>Picea abies</i> . Regeneration occurs sporadically which is natural in these climatic conditions and elevation. The presence of even single new seedlings or young trees merits high evaluation.		FV
Vertical structure of vegetation	Natural, diversified (FV)/changed by anthropogenic effects but diversified (U1)/uniform through anthropogenic effects (U2)	Natural, diversified into multi-layer, with regeneration. Typical of the described habitat, particularly in the forest-floor vegetation layer		FV
Management-related transformations	Give the number of trees felled, or damaged through harvesting timber in the entire transect None (FV)/occur but only single (U1)/evident (U2)	None		FV
Conservation prospects		Very good. National park, area under strict protection		FV
Overall assessment		FV	100%	FV
Proportion of the habitat area representing different conservation status within the monitored location		U1	-	
		U2	-	

Human activities				
Code	Name of activity	Intensity	Impact	Description
990	Other natural processes	B	+	The habitat is subject to permanent, moderate natural disturbances, particularly in steeper parts of slopes where fallen trees, broken trees and dead wood occur more often. These types of disturbances are prerequisite for better growth and development for sycamore, mountain ash, and herbaceous species which constitute the chief physiognomic element of the habitat.

4. Habitats of similar ecological characteristics

None.

5. Conservation of the natural habitat

In order to ensure conservation of the habitat, it is recommended to leave all recognised sites under the state of strict or preserving protection, allowing – at the same time – spontaneous developmental processes in the forest stand layer and in forest-floor vegetation. Any attempts to convert the forest stand or to introduce forest management measures will result in deviation from the habitat type and, as a secondary effect, trigger erosional processes and make continuation of the

forest economic use impossible. Because of the very small area and little economic value of some parts of the forest stand, this discontinuation will not result in any significant reduction in the quantity of wood obtained in mountain and upland areas. Giving up obtaining economically valuable items from the habitats of sycamore maple and maple-lime forests is also justified by soil- and water-protecting functions contributed by these forests as well as their enormous biocoenotic value, as they provide habitats to a number of rare and valuable plant and animal species. Some of the sites are situated on slopes so steep that some of the forest tending and management activities could be dangerous to forest workers performing them.

In the case of continued economic use of selected patches, the following principles of forest management should be observed and followed:

- maintaining spontaneous diversity in the species composition of the forest stand (depending on subtype);
- leaving brushwood and underwood;
- abandoning any tending, felling and leaving the dead or dying trees as well as whole fallen trees – without cutting logs;
- adopting the principle of priority for regenerating possible windbreaks or snowbreaks from self-seeding, and only when natural regeneration is not effective, attempting to plant species typical of the given habitat. Gaps and vegetation overgrowing them constitute an essential element of the structure of that habitat, therefore possible regeneration should be applied only in cases of emerging bare lands larger than 10 hectares;
- avoiding the planting of coniferous species which are an alien element to this habitat (except sporadically occurring yews and firs);
- marking new skid roads within the habitat should be absolutely prohibited. These would be a risk to the integrity of the habitat because of its small size and could facilitate the invasion of synanthropic species along skid roads thus creating essential and hardly reversible changes in species composition.

6. References

- Anioł-Kwiatkowska J., Świerkosz K. 1992. Flora i roślinność rezerwatu Ostrzyca Proboszczowicka oraz jego otoczenia. *Acta Univ. Wratislaviensis. Bot.* 48: 45-115.
- Bodziarczyk J. 1999. Struktura i warunki występowania zespołu jaworzyny górskiej Phyllitido-Aceretum. Praca doktorska AR Kraków, msc. 1-134.
- Bodziarczyk J. 2001. Struktura drzewostanu zespołu jaworzyny górskiej z języcznikiem Phyllitido-Aceretum w Ojcowskim Parku Narodowym. Materiały Konferencyjne „Badania naukowe w południowej części Wyżyny Krakowsko-Częstochowskiej”. Ojców 2001: 156-159.
- Bodziarczyk J. 2002. Zróżnicowanie zespołu jaworzyny górskiej z języcznikiem Phyllitido-Aceretum w Polsce. *Fragm. Flor. Geobot. Polonica* 9: 187-218.
- Bodziarczyk J. 2004. Jaworzyny Pienińskiego Parku Narodowego. *Studia Naturae* 49: 61-86.
- Bodziarczyk J., Szwagrzyk J. 1995. Species composition and structure of forest stands in Phyllitido-Aceretum community. *Ekol. pol.* 43(3-4): 153-173.
- Celiński F., Wojterski T. 1983. Szata roślinna Babiej Góry [In:] Zabierowski K. (ed.), *Park Narodowy na Babiej Górze*. *Studia Nat. B*, 29. Warszawa - Kraków: 121 -177. PWN.
- Dzwonko Z. 1986. Klasyfikacja numeryczna zbiorowisk leśnych polskich Karpat. *Fragm. Flor. Geobot.* 30(2): 93-167.

- Jaworski A., Pach M., Skrzyszewski J. 1995. Budowa i struktura drzewostanów z udziałem buka i jawora w kompleksie leśnym Moczarnie oraz pod Rabią Skalą (Bieszczady). *Acta Agr. et Silv. Ser. Silv.* 33: 39-73.
- Kasprowicz M. 1996. Zróżnicowanie i przekształcenia roślinności pięter reglowych masywu Babiej Góry (Karpaty Zachodnie). *Idee Ekol. ser. Zeszyty* 9(3): 1-215.
- Kozłowska A. B., Matuszkiewicz J. M. 1993. Przegląd fitosocjologiczny zbiorowisk leśnych Polski - jaworzyny górskie. *Fragm. Flor. Geobot.* 38(1): 277-302.
- Kwiatkowski P. 2001. Zbiorowiska leśne Pogórza Złotoryjskiego [Forest communities of the Złotoryjskie Foothills (Pogórze Złotoryjskie)]. *Fragm. Flor. Geobot. Ser. Polonica* 8: 173-218.
- Matuszkiewicz A. 1958. Materiały do fitosocjologicznej systematyki buczyn i pokrewnych zespołów (związek Fagion). *Acta Soc. Bot. Pol.* 27(4): 673-725.
- Matuszkiewicz J. M. 2001. Zespoły leśne Polski. PWN, Warszawa.
- Michalik S. 1990. Zmiany powierzchni zbiorowisk roślinnych kompleksu skalnego „Czyżówki” w Ojcowskim Parku Narodowym w latach 1966-1986. *Prądnik. Prace Muz. Szafera* 2: 35-42.
- Michalik S. 1991. Zmiany powierzchni zespołów leśnych w Ojcowskim Parku Narodowym w ostatnim trzydziestoleciu. *Prądnik. Prace Muz. Szafera* 4: 65-71.
- Michalik S., Michalik R. Wstępna charakterystyka zbiorowisk leśnych Magurskiego Parku Narodowego. *Rocz. Bieszczadzkie* 6: 113-123.
- Michalik S., Szary A. 1997. Zbiorowiska leśne Bieszczadzkiego Parku Narodowego. *Monogr. Bieszczadzkie* 1:1-175.
- Świerkosz K. 2003. Materiały do rozmieszczenia i zróżnicowania lasów klonowo-lipowych (*Aceri-Tilietum* Faber 1936) w Sudetach Środkowych. *Przyroda Sudetów Zachodnich* 6: 73-82.
- Wilczek Z. 1995. Zespoły leśne Beskidu Śląskiego i zachodniej części Beskidu Żywieckiego na tle zbiorowisk leśnych Karpat Zachodnich. *Prace Nauk. Uniwer. Śląskiego w Katowicach.* Nr 1490, ss.132.
- Wilczek Z., Cabała S. 1989. Zespoły leśne grupy Klimczoka w Beskidzie Śląskim. Cz. 2. Zespoły lasów liściastych. *Acta Biol. Sil., Katowice*,12: 79-90.

Prepared by: **Krzysztof Świerkosz, Jan Bodziarczyk**