

INSPECTION OF ENVIRONMENTAL PROTECTION

# Monitoring of natural habitats

**Methodological guide**

**for natural habitat**

**7230 Alkaline fens (Mountain and lowland alkaline fens of spring fen, sedge fen, and sedge-moss fen characteristics)**

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## 7230 Alkaline fens (Mountain and lowland alkaline fens of spring fen, sedge fen, and sedge-moss fen characteristics)



Photo 1 Eutrophic mountain spring fen *Valeriano-Caricetum flavae* in the Bieszczady mountains (© A. Koczur)

### I. INFORMATION CONCERNING THE NATURAL HABITAT

#### 1. Phytosociological identifiers

Class: *Scheuchzerio-Caricetea nigrae*

Order: *Caricetalia davallianae*

Alliance: *Caricion davallianae*

*Valeriano-Caricetum flavae*

*Caricetum davallianae*

*Orchido-Schoenetum nigricantis*

Community: *Schoenus ferrugineus*

Certain problems in discussing the phytosociological unit under consideration are posed by poor knowledge of the systematics of plant communities in alkaline fens. The communities listed above (after Matuszkiewicz 2001) do not show the diversity of this habitat. It is not exhaustively treated in the system suggested by Pałczyński (1975). In the course of monitoring studies completed to date, many authors have not provided definitive syntaxa but have only described the species composition of the studied communities. This also relates to the best-preserved sites, not disturbed by human

intervention. Habitat 7230 needs further phytosociological studies of the communities and the updating of their systematics, in the light of new data.

## 2. Description of the natural habitat

Habitat 7230 covers alkaline fens. The neutral and alkaline mountain spring fens, spring and valley mires, chiefly of soligenic fen type are included (Herbichowa, Wotejko 2004). Alkaline fens develop in places where underground waters, containing various quantities of alkaline (basic) ions (chiefly calcium) flow to the surface. At present, in some of these places, travertines precipitate. The habitat is permanently saturated with water, and ground water levels nears the ground level (it is either identical with it, somewhat higher or lower), and relatively stable. Some of the elements have the shape of clearly distinguishable mounds growing as a result of peat and calcareous tufa deposition. Vegetation is highly diversified, in most cases the moss layer is very well developed.

## 3. Ecological conditions

Type of rock substrate – rocks containing calcium carbonate (limestone, dolomite), and others where calcium carbonate is an admixture (some varieties of Carpathian flysch, glacial tills, loesses).

Soils – chiefly peat soils, usually containing travertines, with muck soils only occurring in degraded fens. In places where the deposition of larger quantities of peat was impossible, peaty gley soils occur. The calcium carbonate content is variable – from traces to very high levels. On well-preserved sites, the peat soils are heavily saturated with water, and the ground water level is stable and close to the ground surface. On disturbed sites, the lowered level of ground water undergoes periodic, sometimes major fluctuations. The pH of the peat and waters supplying the fen ranges from neutral to strong alkaline.

Inclination – very diversified: from 0 to ca. 30°; these fens, however, as a rule, occupy flat places and very gentle slopes.

Exposure: alkaline fens do not show preferences towards any particular exposure.

## 4. Typical plant species

Species characteristic of the *Caricetalia davallianae* order and *Caricion davalianae* alliance: common green bryum moss *Bryum pseudotriquetrum* var. *bimum*, yellow starry feather-moss *Campylium stellatum*, sedges: Davall sedge *Carex davalliana*, dioecious sedge *C. dioica*, yellow sedge *C. flava*, Hostian-sedge *C. hostiana*, lepidocarpous sedge *C. lepidocarpa*, flea sedge *C. pulicaris*, obtuse rush *Eleocharis quinqueflora*, marsh helleborine *Epipactis palustris*, broad-leaved cotton-grass *Eriophorum latifolium*, Cosson's lipmprichtia moss *Limprichtia cossonii*, Loesel's twayblade *Liparis loeselii*, Jersey orchis *Orchis palustris*, grass of Parnassus *Parnassia palustris*, butterwort *Pinguicula vulgaris*, bird's-eye primrose *Primula farinosa*, scorpidium moss *Scorpidium scorpioides*, marsh felwort *Swertia perennis*, Alpine asphodel *Tofieldia calyculata*.



Photo 2 Tomentypnum moss *Tomentypnum nitens* (© A. Koczur)

Some species characteristic of the *Scheuchzerio-Caricetea nigrae* class, inhabiting chiefly alkaline habitats: crescent moss *Drepanocladus aduncus*, slender green feather-moss *Hamatocaulis vernicosus*, Alpine rush *Juncus alpino-articulatus*, marsh housewort *Pedicularis palustris* and Charles sceptre *P. sceptrum-carolinum*, arrow pod grass *Triglochin palustre*, Warnstorfia mosses: *Warnstorfia exannulata*, *W. fluitans*, *W. sarmentosa*.

Species characteristic of particular associations and communities, e.g.: globular-leaved valerian *Valeriana simplicifolia*, rusty bog rush *Schoenus ferrugineus*, black bog rush *Schoenus nigricans*, and also miliary sedge *Carex panicea*, mollusc ctenidium moss *Ctenidium molluscum*, early marsh orchid *Dactylorhiza incarnata*, broad-leaved marsh orchid *Dactylorhiza majalis*, maidenhair moss *Fissidens adianthoides*, Blandow's feather moss *Helodium blandowii*, tufted fen-moss *Paludella squarrosa*, peat mosses: rigid bog-moss *Sphagnum teres*, Warnstorf's bog-moss *S. warnstorffii*, tomentypnum moss nitens.



Photo 3 Marsh housewort *Pedicularis palustris* (© A. Koczur)

## 5. Distribution in Poland

In Poland, alkaline fens are unevenly distributed. They occur in the southern part of the country (in the Carpathians, Sudety mountains, as well in areas bordering the Carpathians, and on uplands) as well as in the northern part of lowlands. They occur when there is limestone or other formations rich in calcium carbonate. In the Carpathians, they occur fairly often although – as a rule – they occupy rather small areas. The presence of alkaline fens has been recorded in practically all the mountain ranges of the Polish Carpathians. Over the last several decades, a decrease in the surface area of alkaline fens has been observed, coupled with the deterioration of the conservation status of most of them (Koczur 2009). The reasons behind this phenomenon include both drainage systems, excessive water extraction, and the abandonment of the practice of cutting and grazing (Herbichowa, Wołejko 2004).

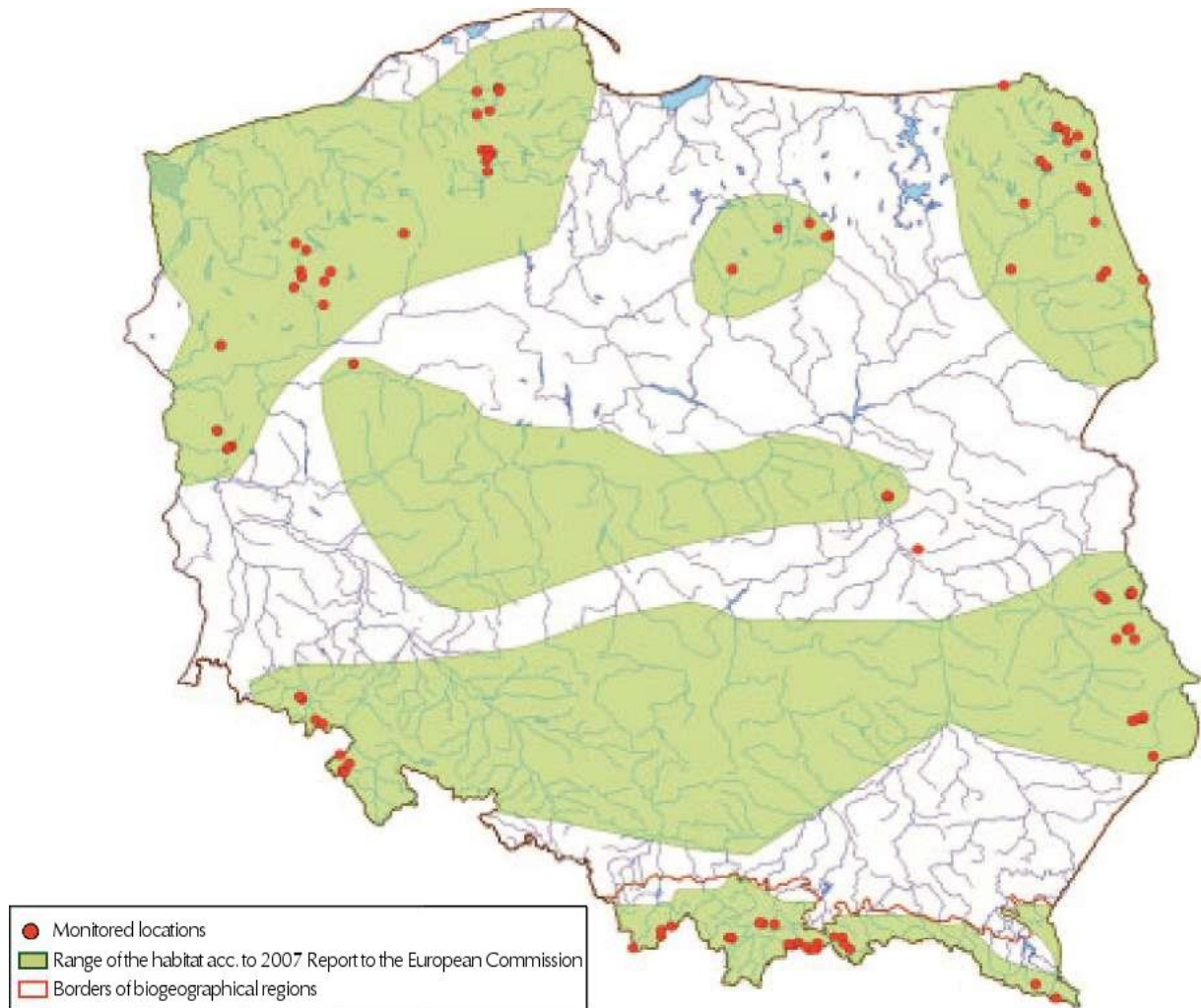


Photo 4 Distribution of the habitat in Poland and monitored locations

## II. METHODOLOGY

### 1. Methodology of monitoring studies

#### Selection of monitoring locations

The distribution of monitoring locations should correspond with the distribution of alkaline fens throughout their range of occurrence in Poland, and should also reflect the regional and elevation-related diversity of the habitat. The monitoring of alkaline fens was performed in 2009. The principle guiding the selection process was to include the greatest diversity of habitat 7230 in Poland, and to cover the whole range of habitat occurrence. As regards the continental region, the northern part of the range is fairly well represented and this sample will permit drawing conclusions about the status of habitat 7230 in this part of Poland. As far as the southern part of the range is concerned, it would be advisable to include the area of *Ponidzie* (where there are no communities with blue *Sesleria uliginosa*) as well as the *Kraków-Częstochowa* uplands and the *Podkarpacie* (the Carpathian Foothills). As it was not possible for the monitoring to cover all the Natura 2000 sites in the Carpathians, an attempt was made to select monitoring locations in a way that showed the diversity of the habitat in alpine region. Thus, spring fens which have developed on calcareous substrate (the

Pieniny Klippen Belt), flysches of various calcium carbonate contents (e.g. the Beskid Żywiecki, Gorce, and Bieszczady mountains), as well as fens that have developed in old fluvio-glacial cones (the Kotlina Orawsko-Nowotarska basin) were selected. In principle, the monitoring pertains to the whole range of occurrence of the habitat. This sample will permit drawing conclusions about the status of habitat 7230 throughout the alpine region. It would be advantageous to include locations from the Beski Niski mountains area (as the eastern part of the region is not represented fairly), and the Tatra mountains (and particularly the Biały Potok glade which deviates from the characteristics of typical mountain spring fens). In each of the areas, at least three locations should be monitored. In most cases, either the whole fen or a clearly distinguishable part of a fen in the area representing habitat 7230 should be selected as a monitoring location. In the case of very large areas (fen complexes), the monitored location should consist of a single, homogeneous fragment of fen, different from the rest of area (either having homogeneous characteristics or being separated from other locations by habitats of different type). If, in some areas the habitat occurs as small, scattered patches, all such isolated patches situated in the specific area which constituted a whole (e.g. small spring fens within a single montane glade) should be considered jointly as a monitoring location.

### **Study method**

Wherever possible, one transect with an area measuring 10x200 m should be delineated on each of the selected locations. On account of various dimensions, shapes and situations of the areas occupied by the studied habitat, a number of modifications may be applied, such as:

- changing the shape of the transect so that its longer axis is not a straight line, or the transect is shorter and wider;
- reducing the surface area of the transect in order to fit the surface occupied by the habitat;
- selecting three plots, at certain points in the transect (when the patches are isolated).

The beginning, middle, and end of the transect are places where phytosociological relevés are taken (their coordinates are determined with a GPS receiver). When the transect area is not typical, the relevés can be situated differently, and in extreme situations (the studied habitat is disappearing) their number can be reduced. The relevés are performed on 5x5 m surfaces, using a classic Braun-Blanquet's scale. Apart from these, the following measurements and assessments should be made:

- the depth of the ground water table, or – when needed – surface water table, determined (without using specialised equipment) at five points, in 50 m intervals along the transect (three at places where relevés were performed, two – between the relevés);
- pH of the surface layer of peat (measurement with either a field pH-meter or by Helig's method), at five points, in 50 m intervals along the transect (three at places where relevés were performed, and – if possible – two between the relevés);
- checking whether travertines occur;
- checking whether the field bears traces of peat extraction (determining the method of extraction, estimating the annual extraction in m<sup>3</sup>, the percentage of destroyed peat bog, and the time interval during which the peat was extracted);
- checking the presence of drainage ditches in the area, their depths, level of water in ditches, and also whether the water in ditches flows out or stagnates;
- determining the percentage coverage of the transect by mosses, and the proportion between brown mosses and peat mosses;



- determining the percentage of the surface occupied by the habitat on the transect;
- determining the percentage coverage of the transect by particular characteristic species, dominant species, alien invasive species, expansive species of herbaceous plants, tree and shrub species.

### **Timing and frequency of studies**

The best time for conducting studies is from mid-June to mid-August when a significant proportion of plant species are flowering. Studies conducted during the later portion of the vegetation season are possible, but account should be taken of the problems with identifying some species (sedge family, grasses, orchid family), and with evaluation of their coverage. Observations should be repeated every four years.

### **Equipment required**

The necessary equipment includes: a portable pH-meter, or a plate and Helig's liquid, a GPS device, a measuring tape, a camera, a small shovel, and a notebook (with empty forms to be filled in).

## 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 function, as well as “conservation prospects” for natural habitat 7230 Alkaline fens (Mountain and lowland alkaline fens of spring fen, sedge fen, and sedge-moss fen characteristics)

Parameter/Index	Description
Surface area of the habitat	An assessment should be made not of the surface area occupied by habitat 7230 but rather its size related to the potential habitat (whether it occupies the entire area where favourable habitat conditions prevail), and its dynamics (whether the surface area occupied by the habitat is stable, increases or decreases, e.g. as a result of being overgrown by shrubs).
<b>Specific structure and functions</b>	
Percentage proportion of the habitat in the transect	Percentage of surface area occupied by habitat 7230 on the transect should be determined. This parameter defines indirectly the spatial structure and the degree of fragmentation of the habitat on the monitored location.
Characteristic species	List of characteristic species for a given plant community and higher syntaxonomic units: <i>Caricetalia davallianae</i> and <i>Scheuchzerio-Caricetea</i> (species typical of alkaline habitats) should be provided together with their percentage proportions on the transect. This parameter describes the conservation status and specific richness of species composition in plant communities on the monitored location (showing to what extent the dominating plant communities are typical).
Dominant species	List of species dominating the transect and their percentage proportions should be given. This parameter describes the structure of plant communities on the monitored location as well as their conservation status (or possibly the degree of their deformation). It answers the question whether the species characteristic of the habitat dominate the monitored location.
Coverage and moss species composition	Percentage of surface area of the transect occupied by all moss species should be determined together with the percentage proportions of coverage by brown mosses versus the coverage by ( <i>Sphagnum</i> ) peat mosses. This indicator characterises the condition of the habitat on the monitored location, and – indirectly – indicates the direction of processes occurring there (the possible acidification of the habitat). Mosses typical of habitat 7230 react before any other to the adverse changes in the ground water level. The moss layer is best developed in habitats with stable ground water level not subject to great fluctuations. When the ground water table begins to move and there is more intensive drying of the surface layer of peat, the mosses begin to die out. ( <i>Sphagnum</i> ) peat mosses develop in those places where the moss layer loses contact with fertile ground water. With the water supply shifting to an ombrogenous or mixed type, a gradual acidification of the habitat occurs, usually resulting in an invasion of ( <i>Sphagnum</i> ) peat mosses.
Alien invasive species	List of invasive species (geographically and ecologically alien species) in the transect should be given together with their percentage proportions. This parameter describes the degree of deformation of the habitat.
Expansive species of herbaceous plants	List of expansive species in the transect should be given together with their percentage proportions. This parameter describes the direction and stage of succession in disturbed habitats while in the case of minor disturbances it warns about a possible threat.

Parameter/Index	Description
pH range	<p>pH of the surface layer of peat should be measured (with either a field pH-meter or by Helig's method), at five points, in 50 m intervals along the transect (three at places where relevés were performed, and – if possible – also two between the relevés);</p> <p>This parameter characterises the present status of the habitat and can document its stage of succession in cases of natural and anthropogenic transformations. It answers the question to what extent a given monitoring location represents the typical form of alkaline fens (which depends on the chemical properties of waters supplying the habitat, and – indirectly – on the geological substrate). The parameter also shows the degree of acidification of the habitat resulting from either natural (accumulation of peat and weakening contact with ground waters) or anthropogenic causes (artificial lowering of the ground water levels caused by the partial draining of the habitat).</p>
Expansion of shrubs and underwood	<p>List of tree and shrub species occurring in the transect should be given together with the approximate percentage coverage by each species and the total coverage by all trees and shrubs.</p> <p>This parameter characterises the threat that the fen will be overgrown by shrub formations and forest communities.</p>
Degree of saturation by water	<p>Depth of groundwater table – and surface water if it occurs – should be determined in the summer season (without using specialised equipment) or – if such a possibility exists – on the basis of reading from a piezometer. Measurements should be taken at five points, in 50 m intervals along the transect (three at places where relevés were performed, two – between the relevés);</p> <p>The objective of this exercise is to check at what depth the water table is in relation to the surface of the fen.</p>
Peat extraction	<p>Extent of damage caused by peat extraction should be estimated as well as the possible degree of regeneration of the habitat. It helps when the following facts are determined: the method of extraction (manual, mechanical, or on an industrial scale), annual extraction in m<sup>3</sup>, percentage of the fen surface damaged, and the time interval during which peat was extracted.</p> <p>This parameter determines the degree of the devastation of the habitat resulting from peat extraction.</p>
Drainage systems	<p>Extent of damage caused by draining should be estimated as well as the possible degree of regeneration of the habitat. In order to achieve these objectives, the existence of draining infrastructure should be found, its condition (maintenance of ditches), and its impact on water conditions in the fen should be assessed. It helps when the following items of information are determined: presence of drainage ditches, their depths, water levels in ditches, and whether water in the ditches flows out or stagnates.</p> <p>This parameter determines the degree of the devastation of the habitat resulting from draining the area.</p>
Conservation prospects	<p>Real possibilities of maintaining the proper status of the habitat as well as correcting the improper status should be assessed. The description should contain information on performed and potential conservation measures aimed at maintaining or improving the conservation status of the habitat. Typical measures of active conservation include: neutralising the impact of drainage ditches, shrub removal, grass cutting, and – in some cases – controlled burning.</p> <p>When assessing the conservation prospects for this habitat and for maintaining it in an undeteriorated state in the short-term future, apart from the current conservation status (location in a protected area, known provisions in conservation plans and working documents), the impact of biotic and anthropogenic factors and the conservation status of the habitat should be taken into account. A high evaluation of 'specific structure and functions' parameter should result in the higher evaluation of 'conservation prospects'.</p>

Table 2 Evaluation of conservation status parameters and indices of 'specific structure and functions' for the natural habitat 7230 Alkaline fens (Mountain and lowland alkaline fens of spring fen, sedge fen, and sedge-moss fen characteristics)

Parameter/Index	Favourable status FV	Unfavourable inadequate U1	Unfavourable bad U2
Surface area of the habitat at 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
<b>Specific structure and functions</b>			
Percentage proportion of the habitat in the transect	80 - 100%	50 - 80%	below 50%
Characteristic species	More than eight characteristic species, or more than 50% coverage by characteristic species in the transect.	4 - 8 characteristic species, or 20 - 50% coverage in the transect.	1 - 3 characteristic species, or below 20% coverage in the transect.
Dominant species	Species characteristic of the habitat dominate, or no dominant present but characteristic species predominate.	No evident dominants, more or less equal proportions of species characteristic of the habitat 7230 and other species.	Species. not classified as characteristic of the habitat, dominate.
Coverage and moss species composition	Total coverage by mosses – over 50%, all brown mosses occupy more than 70% of the total surface occupied by all moss species.	Total coverage by mosses in the 20 - 50% range, brown mosses occupy from 20 to 70% of the total surface occupied by all moss species.	Total coverage by mosses – below 20%, brown mosses absent or they occupy a combined surface of up to 20% of the total surface occupied by all moss species. with evident domination of (Sphagnum) peat mosses.
Alien invasive species	None	Occupy up to 5% of the area.	Occupy more than 5% of the area.
Expansive species of herbaceous plants	None or single.	Occupy up to 5% of the area.	Occupy more than 5% of the area.
pH range	Above 7	6-7	Below 6
Expansion of shrubs and underwood	None or single.	Proportion below 15%	Proportion above 15%
Degree of saturation by water	Water level measured in a piezometer – up to 2 cm above, equal or up to 10 cm below the surface of the peat bog (in practice when one walks on peat bog, water can be seen always, at least sole-deep)	Water level measured in a piezometer – 2-10 cm above or 10-20 cm below the surface of the peat bog.	Water level measured in a piezometer – more than 10 cm above, or more than 20 cm below the surface of the peat bog.
Peat extraction	No peat extraction ever, and if extracted in the past (more than 30 years ago) it was only small-scale operations (up to 5% of the peat bog), the traces of past extraction barely noticeable.	In the past, peat extracted on a much larger scale (more than 5% of the peat bog), traces of extraction clearly visible, at present – no extraction, or only sporadically and on a very small-scale.	Large-scale peat extraction by local inhabitants, or exploitation on an industrial scale.

Parameter/Index	Favourable status FV	Unfavourable inadequate U1	Unfavourable bad U2
Drainage systems	No network of drainage ditches and channels as well as other elements of infrastructure draining the peat bog, or the drainage infrastructure sufficiently "neutralized" as a result of conservation measures undertaken e.g. construction of gates, filling in ditches and the like).	Network of drainage ditches and other elements of infrastructure has little impact on the water conditions in the peat bog, because of lack of maintenance, partial damage and natural overgrowing of ditches, or owing to conservation measures undertaken e.g. construction of gates, filling in ditches and the like.	The existing drainage infrastructure evidently worsens the water conditions in the peat bog.
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 the long term.
Overall assessment	All parameters evaluated as FV, or two FV and one U1	Two or three evaluated as U1, no U2 evaluations	One or more parameters evaluated as U2

### Cardinal indices

- Characteristic species
- Coverage by mosses and their species composition
- pH range
- Expansive species of herbaceous plants
- Expansion of shrubs and tree undergrowth
- Degree of saturation by water

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

Habitat observation sheet for the monitored location	
Basic information	
Code and name of the natural habitat	7230 Alkaline fens (Mountain and lowland alkaline fens of spring fen, sedge fen, and sedge-moss fen characteristics) 7230-1 Mountain spring fens
Site name	Obszar Pieniny PLH120013
Name of the monitored location	Za Stronią
Type of the monitored location	Research
Plant communities	<i>Valeriano-Caricetum flavae</i>
Description of the habitat	The mountain spring fen on the Za Stronią glade, occupies the major part of the glade and borders directly with a forest on the eastern, western and northern sides, whereas on the southern side – with a hay meadow. The spring fen forms one large, dense patch. The glade has two distinctly different levels linked by a steep south and southeast-facing slope.
Area of habitat patches	1.44 ha
Protected areas where the monitored location is situated	The Pieniny National Park Obszar Pieniny PLH120013 Obsza Pieniny PLB120008
Manager of the area	Private landowners
Geographical coordinates	N 49°24'..." - E 20°22'..."
Transect dimensions	0.2 ha
Elevation a.s.l.	640-670 m a.s.l.
Name of the area	Pieniny
Annual report – principal information	
Year	2009
Monitoring type	Integrated
Coordinator	Grzegorz Vončina
Auxilliary coordinators	
Threats	Abandonment of land use, secondary succession.
Other natural values	In three places within the site, a glacial relict tomentypnum moss <i>Tomentypnum nitens</i> occurs. In 2009, the author found the occurrence of the white adder's mouth orchid <i>Malaxis monophyllos</i> .
Is monitoring required?	Yes
Justification	On Za Stronią glade there is a complex of floristically rich spring fens, the largest in the Pieniny area. On these fens, which display high values in terms of nature (the occurrence of protected species of vascular plants and mosses), no economic activities are pursued at present (including cutting with scythes and the removal of hay) even once every several years, because of the land ownership status, while the private owners do not manage the spring fens in a traditional manner (they only occasionally drive sheep across the glade).
Conservation measures performed	At present, no economic activities are pursued except incidental, grazing by passing sheep flocks.
Proposed conservation measures	The author does not suggest any subsequent forms of conservation. It would be justified to introduce a motivational scheme (extra payments) for the glade owners who – under present economic realities – do not have the opportunity to manage this area in commercial terms.
Date of inspection	2009.07.15
Comments	-

Conservation status of the natural habitat at the monitored location	
<b>Relevé I</b>	
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°24'..." - E 20°22'..."; elevation: 640 m a.s.l.; area of the relevé: 25 m <sup>2</sup> ; inclination: 2°; exposure: S. Density of layer C - 98%, density of layer D - 100%; height of layer C - 30 cm, height of layer D - 5 cm. Phytosociological unit - <i>Valeriano-Caricetum flavae</i> Vascular plants: <i>Achillea millefolium</i> +, <i>Briza media</i> 3, <i>Calamagrostis varia</i> +, <i>Caltha palustris</i> +, <i>Carex davalliana</i> 3, <i>C. flacca</i> 1, <i>C. flava</i> +, <i>C. nigra</i> 2, <i>C. panicea</i> 2, <i>Centaurea jacea</i> +, <i>Cirsium rivulare</i> 1, <i>Colchicum autumnale</i> +, <i>Crepis paludosa</i> 1, <i>Deschampsia caespitosa</i> +, <i>Epipactis palustris</i> 1, <i>Equisetum fluviatile</i> +, <i>E. palustre</i> 3, <i>E. variegatum</i> 1, <i>Eriophorum latifolium</i> 1, <i>Eupatorium cannabinum</i> +, <i>Festuca pratensis</i> +, <i>F. rubra</i> 1, <i>Galium mollugo</i> +, <i>Gymnadenia conopsea</i> 1, <i>Juncus articulatus</i> +, <i>J. inflexus</i> +, <i>Knautia arvensis</i> +, <i>Lathyrus pratensis</i> 1, <i>Leontodon hispidus</i> subsp. <i>hastilis</i> +, <i>Linum catharticum</i> +, <i>Lychnis flos-cuculi</i> +, <i>Lysimachia vulgaris</i> +, <i>Mentha arvensis</i> 1, <i>Ononis vulgaris</i> +, <i>Picea abies</i> c +, <i>Plantago lanceolata</i> +, <i>Poa trivialis</i> +, <i>Potentilla erecta</i> 2, <i>Prunella vulgaris</i> 1, <i>Ranunculus acris</i> 1, <i>Tussilago farfara</i> +, <i>Valeriana simplicifolia</i> 1, <i>Vicia cracca</i> +. Bryophytes: <i>Calliergonella cuspidata</i> 2, <i>Campylium stellatum</i> 2, <i>Climacium dendroides</i> 1, <i>Cratoneuron filicinum</i> +, <i>Plagiomnium elatum</i> +, <i>Tomentypnum nitens</i> 3.
<b>Relevé II</b>	
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°24'..." - E 20°22'..."; elevation 660 m a.s.l.; area of the relevé: 25 m <sup>2</sup> ; inclination: 5°; exposure: SE. Density of layer C - 100%, density of layer D - 80%; height of layer C - 40 cm, height of layer D - 5 cm. Phytosociological unit - <i>Valeriano-Caricetum flavae</i> Vascular plants: <i>Briza media</i> 1, <i>Caltha palustris</i> 1, <i>Carex davalliana</i> 2, <i>C. flacca</i> 1, <i>C. nigra</i> 1, <i>C. panicea</i> 1, <i>C. rostrata</i> +, <i>Cirsium rivulare</i> +, <i>Crepis paludosa</i> 1, <i>Cruciata glabra</i> +, <i>Dactylorhiza majalis</i> 1, <i>Deschampsia caespitosa</i> +, <i>Epipactis palustris</i> 1, <i>Equisetum palustre</i> 4, <i>E. variegatum</i> +, <i>Eriophorum latifolium</i> 1, <i>Eupatorium cannabinum</i> +, <i>Festuca rubra</i> 1, <i>Galium mollugo</i> +, <i>Gymnadenia conopsea</i> +, <i>Juncus articulatus</i> 2, <i>Lathyrus pratensis</i> +, <i>Lysimachia nummularia</i> 1, <i>L. vulgaris</i> 1, <i>Mentha arvensis</i> +, <i>Picea abies</i> c +, <i>Poa trivialis</i> 1, <i>Potentilla erecta</i> 2, <i>Prunella vulgaris</i> +, <i>Ranunculus acris</i> +, <i>Trifolium pratense</i> +, <i>Triglochin palustre</i> +, <i>Tussilago farfara</i> +, <i>Valeriana simplicifolia</i> 2. Bryophytes: <i>Bryum pseudotriquetrum</i> +, <i>Calliergonella cuspidata</i> 2, <i>Campylium stellatum</i> +, <i>Cratoneuron filicinum</i> 3, <i>Plagiomnium elatum</i> 2.
<b>Relevé III</b>	
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°24'..." - E 20°22'..."; elevation 670 m a.s.l.; area of the relevé: 25 m <sup>2</sup> ; inclination: 1°; exposure: SE. Density of layer C - 90%, density of layer D - 90%; height of layer C - 20 cm, height of layer D - 5 cm. Phytosociological unit - <i>Valeriano-Caricetum flavae</i> Vascular plants: <i>Blysmus compressus</i> +, <i>Briza media</i> 2, <i>Calamagrostis varia</i> +, <i>Carex flacca</i> 2, <i>C. nigra</i> 1, <i>C. panicea</i> 2, <i>C. paniculata</i> +, <i>Centaurea jacea</i> +, <i>Cirsium palustre</i> +, <i>Corylus avellana</i> c +, <i>Dactylorhiza majalis</i> +, <i>Eleocharis quinqueflora</i> +, <i>Epipactis palustris</i> 1, <i>Equisetum palustre</i> +, <i>Eriophorum latifolium</i> +, <i>Eupatorium cannabinum</i> +, <i>Euphrasia</i> sp. +, <i>Lathyrus pratensis</i> +, <i>Leontodon hispidus</i> subsp. <i>hastilis</i> 1, <i>Linum catharticum</i> +, <i>Picea abies</i> c +, <i>Polygala</i> sp. +, <i>Potentilla erecta</i> 3, <i>Prunella vulgaris</i> 2, <i>Triglochin palustre</i> +, <i>Valeriana simplicifolia</i> +. Bryophytes: <i>Bryum pseudotriquetrum</i> +, <i>Campylium stellatum</i> 2, <i>Limprichtia cossoni</i> 3, <i>Philonotis calcarea</i> +.

Monitoring of natural habitats

TRANSECT			
Indices	Value of index	Description of index	Assessment of index
Surface area of the habitat	Homogeneous, dense surface of habitat ensures the continued existence of eutrophic spring fen in the monitored location.		FV
<b>Specific structure and functions</b>			<b>U1</b>
Percentage proportion of the habitat in the transect	100 %	The transect was marked in the largest complex of eutrophic spring fens representing habitat 7230 in the Pieniny mountain area, in such a way that it does not encompass other communities not belonging to the habitat.	FV
Characteristic species	List of characteristic species (Latin names); percentage proportions of areas covered by each species in particular layers (a,b,c,d) should be given (with accuracy to the nearest 10%).	Layer C: Globular-leaved valerian <i>Valeriana simplicifolia</i> 5%, marsh helleborine <i>Epipactis palustris</i> 2%, obtuse rush <i>Eleocharis quinqueflora</i> - 1%, Davall sedge <i>Carex davalliana</i> - 10%, <i>Carex panicea</i> - 10%, yellow sedge <i>C. flava</i> 1%, broad-leaved cotton-grass <i>Eriophorum latifolium</i> - 2%, Layer D: tomentypnum moss <i>Tomentypnum nitens</i> - 1%, Cosson's lipmprichtia moss <i>Limprichtia cossonii</i> - 5%, yellow starry feather-moss <i>Campylium stellatum</i> - 5%	FV
Dominant species	List of dominant species (Latin names); percentage proportions of areas covered by each species in particular layers (a,b,c,d) should be given (with accuracy to the nearest 10%).	March horsetail <i>Equisetum palustre</i> - 25%	U1
Coverage and moss species composition	% of the transect surface area occupied by all moss species, also the percentage coverage by brown mosses versus percent coverage of ( <i>Sphagnum</i> ) peat mosses.	70%, only brown mosses	FV
Alien invasive species	List of species (Latin names) geographically and ecologically alien to the habitat; percentage proportions of areas covered by each species in the transect should be given (with accuracy to the nearest 10%).	No alien species found.	FV
Expansive species of herbaceous plants	List of species (Latin names); approximate percentage proportions of areas covered by each species in the transect should be given (with accuracy to the nearest 10%).	heny eupatorium <i>Eupatorium cannabinum</i> - 5%	U1
pH	Measurement made with a portable pH-meter, or a plate and Helig's liquid, measurement of the surface layer of peat.	pH 7.2-7.6	FV



TRANSECT				
Indices	Value of index	Description of index	Assessment of index	
Expansion of shrubs and underwood	List of species (Latin names) should be given together with approximate percentage cover for each species and a total coverage (to the nearest 10%).	may rose <i>Viburnum opulus</i> - 1%, common spruce <i>Picea abies</i> - 1%.	FV	
Degree of saturation by water	Depth of ground water table should be determined, or surface water if it is there.	places where relevés have been taken, water emerges from the surface when one walks on it but the area do not bear traces of flooding. Similarly, between the relevés, the soil is saturated with water but does not show traces of flooding.	FV	
Peat extraction	Method of peat extraction; Scale of peat extraction; Time interval during which peat was extracted.	No traces of peat extraction.	FV	
Drainage systems	Existing draining infrastructure and its impact on water conditions of the peat bog. Presence of draining ditches, their depths, water level in the ditches, as well as whether water flows out or stagnates.	No draining infrastructure.	FV	
Conservation prospects	Location of the habitat within the Pieniny National Park guarantees the proper conservation of the habitat. However, the habitat is now in private hands preventing the application of proper commercial measures allowing the habitat to be kept in conditions similar to those traditionally managed by humans in the past. A large homogenous patch of the plant community makes the conservation of the habitat possible even with strong pressure from tree species coming from the surrounding forest.		U1	
Overall assessment	Proportion of the habitat area representing different conservation status within the monitoring location	FV	90%	U1
		U1	10%	
		U2	0%	

Human activities				
Code	Name of activity	Intensity	Impact	Description
140	grazing	A	0	In the habitat, traces of passing sheep flocks are visible in the form of a few paths on which sward and mosses are crushed. The intensity of sheep grazing does not pose a threat to plants growing in the monitored location, but does stop the succession of tree species. Observations carried out since 1998 have not shown any adverse changes resulting from traditional human management.

#### 4. Habitats of similar ecological characteristics

Alkaline fens often occur in complexes with moist meadows of *Calthion* and *Molinion* alliances, with high-sedge rushes. In some cases, the proportion of meadow species is so high, that the identification of both habitat and its borders may become difficult. This regards, above all, patches of transient nature and those that are degraded. The habitats of similar ecological characteristics

include, before any other: 7220 – Petrifying springs with tufa formation (*Cratoneurion commutati*) and 7140 - Transition mires and quaking bogs, with which they form transient forms.

## 5. Conservation of the natural habitat

At present, the majority of alkaline fens are – to a variable degree – transformed by humans. Only a few, better preserved and fully natural can survive without the application of active conservation measures. Such measures have been carried out with great success in many alkaline fens and, therefore, their methodology is known. The basic conservation measures in habitat 7230 is extensive cutting (collecting hay and taking it away from the fen) and successive cutting down of emerging shrubs and tree seedlings. In some of the fens within the continental region, controlled burning has had some positive effects. This measure may be permitted as a conservation measure provided that a thorough analysis of each case is made individually and strict control provisions are observed during its implementation. Burning is applied in early spring or in winter, always with the water level staying below the surface of the ground, so the fire "glides" above the surface of the fen. This is to prevent damage to the moss level, lower (living parts) of herbaceous plants as well as to the seed bank deposited in the soil. Burning may never be applied to the whole surface of the fen but must be limited to relatively small spots, and be applied in a mosaic pattern to minimise the threat to animal populations living in the fen. On account of the specificity of mountain fens (situated on steep slopes and the lack of water outflows associated with these locations), this measure is inadmissible in the alpine region.

A number of fens (chiefly in the alpine region) have been drained in the past. The conservation measures in such areas should aim at returning the groundwater levels to their initial state. This is achieved by the gradual removal of the effects exerted by the existing draining infrastructure, and finally to eliminate it altogether. Water gates are constructed to drain ditches or the latter are filled in (partially or completely).

In cases of extremely degraded fens, more advanced restoration measures are necessary. They include (apart from elevating the groundwater level) the gradual removal of the surface layer of muck, and the reintroduction of plant species typical of fens.

All the measures listed above are practically applied in selected fens. It is necessary to continue it in future and to extend them to more fens.

## 6. References

- Herbichowa M., Wołejko L. 2004. Górskie i nizinne torfowiska zasadowe o charakterze młak turzycowisk i mechowisk. W: J. Herbich (red.). Wody słodkie i torfowiska. Poradniki ochrony siedlisk i gatunków Natura 2000. Tom 2. Wyd. Ministerstwo Środowiska, Warszawa, pp.178-195.
- Koczur A. 2009. Zbiorcze sprawozdanie z obserwacji monitoringowych dla siedliska 7230 Górskie i nizinne torfowiska zasadowe o charakterze młak turzycowisk i mechowisk w roku 2009. In: G. Cierlik, M. Makomaska-Juchiewicz, W. Mróz, J. Perzanowska, W. Król (eds.). Monitoring gatunków i siedlisk przyrodniczych ze szczególnym uwzględnieniem specjalnych obszarów ochrony siedlisk Natura 2000". Commissioned by: Główny Inspektorat Ochrony Środowiska, Warszawa.
- Matuszkiewicz W. 2001. Przewodnik do oznaczania zbiorowisk roślinnych Polski. - Vademecum Geobotanicum 3. PWN, Warszawa.
- Pałczyński A. 1975. Bagna Jaćwieskie. Pradolina Biebrzy. Roczn. Nauk. Rol., ser. D, Monografie PWN, p. 145.

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