

INSPECTION OF ENVIRONMENTAL PROTECTION

Monitoring of natural habitats

Methodological guide

for natural habitat

**6520 Mountain Yellow Trisetum and Bent-grass Hay Meadows
(*Polygono Trisetion and Arrhenatherion*)**

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6520 Mountain Yellow Trisetum and Bent-grass Hay Meadows (*Polygono-Trisetion* and *Arrhenatherion*)



Photo 1 A Pieniny mountain meadow, abundant with *Anthyllidi-Trifolietum montani* - Wielka Dolina, the Pieniny mountains, southern Poland (© I. Wróbel)

INFORMATION CONCERNING THE NATURAL HABITAT

1. Phytosociological identifiers

Class: *Molinio-Arrhenatheretea*

Order: *Arrhenatheretalia*

Alliance: *Arrhenatherion elatioris*

Gladiolo-Agrostietum capillaris

Campanulo serratae-Agrostietum capillaris

Anthyllidi-Trifolietum montani

Community: *Campanula patula-Trisetum flavescens*

Community: *Festuca rubra-Holcus lanatus*

Alliance: *Polygono-Trisetion*

Meo-Festucetum rubrae (= *Geranio sylvatici-Trisetum flavescens*)

Alchemillo-Festucetum rubrae

Phyteumo (orbicularis)-Trifolietum pratensis

2. Description of the natural habitat

Unlike what is presented in the Manuals on Natura 2000 Habitats (Herbich 2004), habitat no 6520 includes bent-grass meadows occurring commonly in the Carpathians and the Pieniny stenothermic meadow which are classified to-date as lowland and mountain fresh meadows utilised extensively from alliance *Arrhenatherion* (habitat 6510). Thus, Habitat 6520 includes fresh mountain meadows, belonging to the alliances *Arrhenatherion* and *Polygono-Trisetion*, located at an elevation of over 550-600 m a.s.l., under extensive use as hay meadows that are moderately fertilized and often grazed. These include meadows located in lower or upper areas of the foothills. Extensively used fresh meadows from the foothills are usually transient between lowland (6510) and mountain (6520) meadows, and their syntaxonomic classification of specific patches is dubious at most. Sown meadows (they stand out and are distinctive due to the considerable fractions of papilionaceous plants and grasses which produce quality fodder, e.g. roughle cock's-foot *Dactylis glomerata*, timothy grass *Phleum pratense*, perennial ryegrass *Lolium perenne*) and so-called grassland, i.e. alternating areas which are ploughed from time to time, under the crop rotation scheme, cannot be classified as habitat 6520. The occurrence of numerous species from alliance *Cynosurion* which are typical for grazed areas is a disqualifying feature.

Habitat 6520 has a distinctively seminatural nature, it is secondary to forests cleared by humans. The creation and maintenance of this habitat is related to the specific type of land management encompassing mowing, fertilization and pasturage. Due to this reason the diversification of the habitat does not only reflect edaphic and climatic factors, but also the intensity of form and utilisation, as well as historical considerations. Meadows excluded from mowing and pastoral management undergo natural transformation and succession in tall-herb communities and grass communities as well as bilberry *Vaccinnia myrtillum* swards, thickets or young growth (depending on edaphic and ecological conditions). Such meadows are usually more abundant in species in the Carpathians than in the Sudety mountains.



Photo 2 Meo-Festucetum rubrae vegetation, Hala Izerska in the Sudety mountains (© J. Potocka)



Photo 3 A Sudety mountain meadow represented by a community of *Agrostis capillaris*-*Festuca rubra*, Grodczyn and Homole near Duszniki (© G. Wójcik)

3. Ecological conditions

Habitat 6520 is related to relatively fertile, unbogged and undried mineral soils. It occurs mainly in the lower montane forest of the Sudety mountains and the Carpathians, whilst it is rarer in the upper montane forest (the highest occurrences in the Tatra mountains were recorded at 1,350 m a.s.l.) and foothills. It shows regional variability. Sudety meadows grow in moderately fertile and fertile habitats, mainly in medium-depth brown soil generated from acidic silicate rock. They are located on variably exposed slopes in the lower alpine forests and in the upper sections of the foothills. *Gladiolo-Agrostietum*, the main complex of the Carpathian hay meadows and related bent-grass meadows from alliance *Arrhenatherion* occur mainly in brown soil deriving from flysch formations, no exposure is preferred. They occur in valleys, slopes and mountain summits. On the other hand, Tatra *Phyteumo-Trifolietum pratensis* in the Chochołowska Valley is associated with shallow skeletal limestone rock soil and grows in sunny places with a light to medium inclination. High insolation, the exposure of the southern sector of the horizon and soils abundant in calcium carbonate are distinguishing features of *Anthyllidi-Trifolietum montani* Pieniny meadows.

4. Typical plant species

Species typical of alliance *Arrhenatherion* (but excluding taxa typical of lowland *Arrhenatheretum elatioris*, such as tall oat grass *Arrhenatherum elatius*, meadow crane's bill *Geranium pratense*, parsnip *Pastinaca sativa*, panicle-shaped dock *Rumex thyrsiflorus*), and *Polygono-Trisetion* as well as diagnostic species for associations considered identifiers of the mountain meadows in the Sudety mountains and the Carpathians are typical for the habitat

The following species were classified as diagnostic for the Sudety mountain meadow species: baldmoney *Meum athamanticum*, red fescue *Festuca rubra*, northern hawk's beard *Crepis succisifolia*, ball-headed mixed-flower *Phyteuma orbiculare*, spiked mixed-flower *Phyteuma spicatum*, lady's mantles *Alchemilla* spp., red campion *Melandrium rubrum*, meadow rock-cress *Cardaminopsis halleri*, yellow trisetum *Trisetum flavescens*, wood crane'sw bill *Geranium sylvaticum*, *Potentilla aurea*, Chaix's-speargrass *Poa chaixii*.



Photo 4 *Meadow gladiolus* *Gladiolus imbricatus* on Gladiolo-Agrostietum meadow, Beskid Żywiecki (© J. Korzeniak)

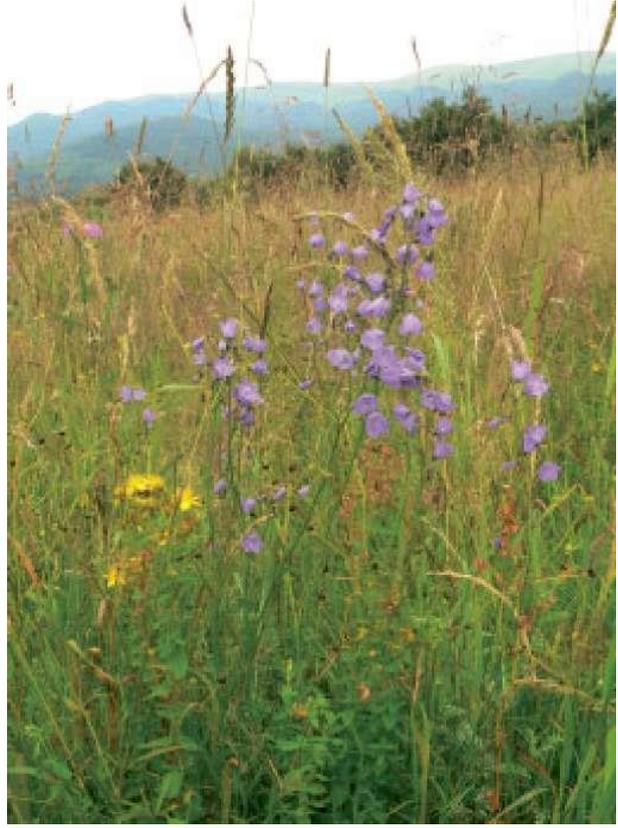


Photo 5 Vegetation of species-rich bent-grass meadow with lance-leaved bellflower *Campanula serrata*, Beskid Pass in the Bieszczady mountains (© J. Korzeniak)

For the Carpathians, diagnostic species include species connected with *Gladiolo-Agrostietum* meadows and other forms of floristically abundant bent-grass meadow: dwarf lady's mantle *Alchemilla gracilis*, pastoral lady's mantle *A. monticola*, crinite lady's mantle *A. crinita*, *A. walasii* lady's mantle, *Centaurea oxylepis* knapweed, Spiš saffron crocus *Crocus scepusiensis*, lance-leaved bellflower *Campanula serrata* (locally specific for bent-grass meadows in the Wysokie Bieszczady mountains), meadow rock-cress *Cardaminopsis halleri*, northern hawk's beard *Crepis mollis* [syn. *Crepis succissifolia*], meadow gladiolus *Gladiolus imbricatus*, Alpestrine violet *Viola saxatilis*.

Another group is formed by species which are characteristic and differentiating for thermophilous *Anthyllidi-Trifolietum montani*: kidney vetch anthyllis *Anthyllis vulneraria*, mountain clover *Trifolium montanum*, sickle medick *Medicago falcata*, tufted milkwort *Polygala comosa*, lilac sage *Salvia verticillata*, large thyme *Thymus pulegioides*, multiflowered buttercup *Ranunculus polyanthemus*.

Also plants related to the calciphilous Tetry-specific *Phyteumo (orbicularis)-Trifolietum pratensis* such as: red clover *Trifolium pratense*, primrose *Primula elatior*, lamb's tongue *Plantago media*, bitter milkwort *Polygala brachyptera*, as well as species characteristic of high mountain limestone swards: ball-headed mixed-flower *Phyteuma orbiculare*, mountain buttercup *Ranunculus oreophilus*, *Thymus pulcherrimus* thyme, verticillate lousewort *Pedicularis verticillata*, are considered locally representative for the habitat (Balcerkiewicz 1978).

5. Distribution in Poland

Mountain meadows are the most common non-forest habitat in the Alpine region. In the Carpathians they occur in mountain forests of all ranges at ca 600 to 1,350 m a.s.l. A typically formed

meadow *Gladiolo-Agrostietum* is considered an alliance endemic for the Western Carpathians, and is connected with the flysch Beskid mountain ranges, Podtatrze and the Spisko-Gubałowski Highlands.

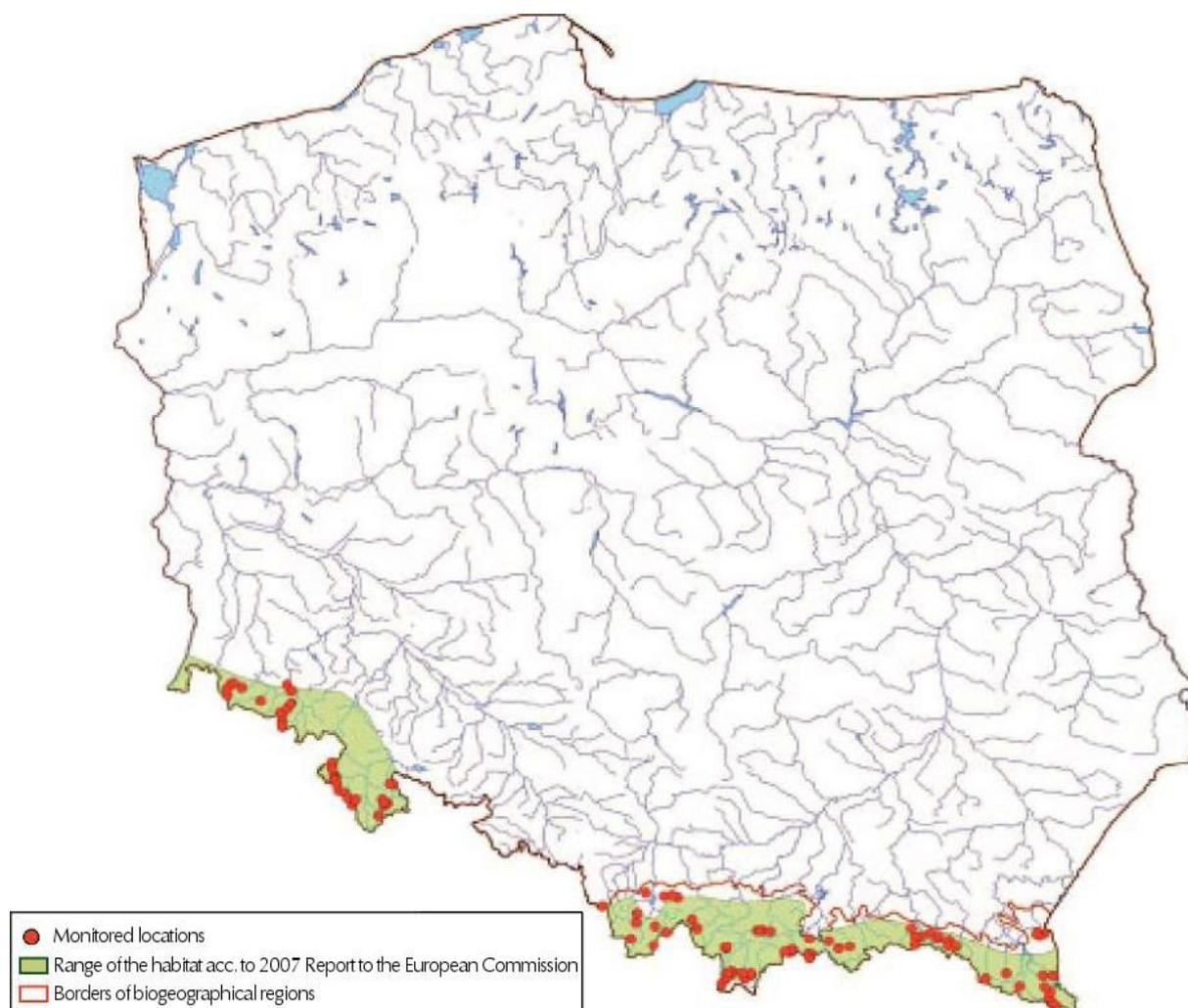


Fig. 1 Distribution of the habitat in Poland and monitored locations

The *Anthyllidi-Trifolietum montani* meadows are concentrated in the Pieniny Proper, the Male Pieniny mountains and the eastern part of the Pieniny Klippen Belt. In the Gorce mountains, Beskid Sądecki and the Lower Beskid mountains, meadow phytocenoses somewhat transient between *Gladiolo-Agrostietum* and *Anthyllidi-Trifolietum montani* occur. Mountain bent-grass meadows are common in the lower montane forest in the Bieszczady mountains (the Eastern Carpathians), in habitats analogous to *Gladiolo-Agrostietum*, typical of the Western Carpathians, and they have much in common.

In the continental region the occurrence of the habitat is limited to foothills and the lower mountain forest in the Sudety mountains. Alliance *Meo-Festucetum*, considered the most specific variety for the Sudety mountains, was rarely recorded in the Izerskie mountains, the Kaczawskie mountains and in the western part of the Karkonosze mountains. Meadows classified in the rank of the community, into alliances *Arrhenatherion* and *Polygono-Trisetion* were reported in the Western Sudety mountains, and the Middle and Eastern Sudety mountains. *Alchemillo-Festucetum rubrae* meadows occur in the Izerskie mountains.

II. METHODOLOGY

1. Methodology of monitoring studies

Selection of monitoring locations

When selecting monitoring sites and locations, subtypes of the habitat typical of the Carpathians and the Sudety mountains, its edaphic and climatic variability and diversity in terms of economic use and its history should be considered. The habitat is widespread yet strongly diversified, even at the local scale. Due to this fact, the selection of monitoring locations in a specific area is key to the assessment of the habitat conservation status. Next to the best developed patches of the habitat (reference locations), other patches, representative of the status of habitat preservation in the area, which are a good reflection of ecological transformations affecting the habitat (research locations) should be monitored.

Study method

Field observations provide both general information on the monitored location (siting, natural description of the habitat, plant associations and communities, the area of the habitat in the monitoring location, current impacts on the environment and predicted threats) and information on sensitive features of the habitat. They are analysed in a belt transect 10 m wide, 200 m long or of rectangular shape, of various shapes, with an area amounting to 2000 m². Among other things, spatial relationships of the habitat (area of mountain meadow patches, their fragmentation, the presence and character of ecotone), species composition of phytocoenosis / phytocoenoses in the transect (percentages of characteristic, expansive, dominant and invasive species, areas of shrubs and underwood), as well as environmental features which are indicative of the habitat's utilisation (the thickness of undegraded organic matter) are determined. The species composition of phytocoenoses presented in the transect is illustrated by three relevés taken at the opposite ends of the transect and in the central part of the transect (the area of the relevé is 25 m², and the quantity of species is evaluated using the Braun-Blanquet scale). The proportion between areas of the various preservation stages of the habitat against the total area of the habitat in the transect is assessed. Realistic chances for maintaining unchanged conservation status are assessed and information on the utilisation type, protective measures and their efficiency is quoted for each monitored location.

Timing and frequency of studies

The monitoring location should be investigated every 3-5 years. The optimal date for monitoring depends on region, altitude (m a.s.l.) and falls within June and July. Evaluation of the species composition, coverage by specific species depends strongly on the phenological stage of the phytocoenosis under study. Data should be collected after the earing of the grasses, but before the first crop. In the Sudety mountains and lower elevations in the Carpathians, the end of June and beginning of July is the most suitable time, while early July is better in higher locations of the lower montane forest, in the high Bieszczady mountains, the Tatra mountains and bogs in the Izerskie mountains with their specific microclimate.

Equipment required

Monitoring equipment should include: GPS receiver, a notepad, a photographic camera (preferably digital), a pocket knife for cutting turf when the thickness of the plant litter (undecomposed dead plant material on the top layer of the organic horizon of the soil) is measured, and a ruler for this measurement.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 the indicators of the specific structure and functions of the natural habitat and of “prospects for conservation” for natural habitat 6520 Mountain yellow trisetum and bent grass hay meadows (*Polygono-Trisetion and Arrhenatherion*)

Parameter/Indicator	Description
Specific structure and functions	
Characteristic species	List of species characteristic of the Arrhenatherion alliance (excluding taxa characteristic of lowland Arrhenatheretum elatioris) and Polygono-Trisetion was compiled, including the approximate coverage of the transect by a given species. Due to the insufficient studies on the Polish part of the Western Sudety mountains, studies by Czech botanists (Krahulec et al. 1996; Chytry 2007) were used for the selection of diagnostic species for patches in this area. This indicator is used for the typicality of the species composition in the phytocoenoses representing the habitat in the monitoring location and the Natura 2000 site. Its assessment is complex because apart from the number of the diagnostic species for mountain meadows, it also depends on their abundance. The following are the characteristic and differential species for the higher syntaxonomic unit (order Arrhenatheretalia, class <i>Molinio-Arrhenatheretea</i>), as well as species listed as representative of habitat 6520 in the <i>Interpretation Manual of European Union Habitats - EUR 27</i> : yellow trisetum <i>Trisetum flavescens</i> , hogweed cow parsnip <i>Heracleum sphondylium</i> , great masterwort <i>Astrantia major</i> , caraway <i>Carum carvi</i> , northern hawk's beard <i>Crepis mollis</i> [syn. <i>Crepis succissifolia</i>], bistort <i>Polygonum bistorta</i> , inflated catchfly <i>Silene vulgaris</i> , clustered bellflower <i>Campanula glomerata</i> , meadow sage <i>Salvia pratensis</i> , sweet vernal grass <i>Anthoxanthum odoratum</i> , red campion <i>Melandrium rubrum</i> , Dusky crane's bill <i>Geranium phaeum</i> , wood crane's bill <i>G. sylvaticum</i> , globe flower <i>Trollius europaeus</i> , great burnet-saxifrage <i>Pimpinella major</i> , orange lily <i>Lilium bulbiferum</i> , Alpestrine violet <i>Viola saxatilis</i> , ball-headed mixed-flower <i>Phyteuma orbiculare</i> , primrose <i>Primula elatior</i> , hairy chervil <i>Chaerophyllum hirsutum</i> , lady's mantles <i>Alchemilla</i> spp..
Dominant species	List of several species with the highest coverage in the transect and approximate percentage coverage of the transect by a specific species. The assessment of the indicator is complex, it depends on the nature of the dominants (these should be fresh meadow species typical of the habitat, mainly grass) and the level of the domination because a high domination ratio is usually connected with low species diversity, and floristically abundant meadows are subject to protection.
Alien invasive species	List of species alien in geographic and ecological terms to the habitat, with an estimated coverage percentage by a species. The assessment of the indicator incorporates biological tendencies to quick spreading of the species and its abundant occurrence. In the case of plants with the highest invasiveness, e.g. Japanese knotweed, even the presence of this species alone lowers the assessment.
Expansive species of herbs	List of native expansive herb species spreading in the habitat which can pose a threat to the habitat with the approximate coverage percentage of the transect by a given species. Special attention was paid to expansive grasses (among others tussock-grass <i>Deschampsia caespitosa</i> , wheat grass <i>Elymus repens</i>), herbs (aromatic chervil <i>Chaerophyllum aromaticum</i> , Senecio ovatus ragwort, common goatweed <i>Aegopodium podagraria</i>) and others testifying to the absence of mowing (bramble genus <i>Rubus</i> spp., fireweed <i>Chamaenerion angustifolium</i> , bracken fern <i>Pteridium aquilinum</i> , bilberry <i>Vaccinium myrtillus</i>), as well as nitrophilous species (stinging nettle <i>Urtica dioica</i> , Canada thistle <i>Cirsium arvense</i>). The assessment of this indicator is complex and, as in the case of invasive species, is the resultant of species and their coverage.
Expansion of shrubs and undergrowth	The indicator is described by the total coverage of shrubs and underwood in the transect. To provide detailed information, the list of trees and shrubs monitored in the transect and their coverage percentage are given. It is quite a sensitive indicator of the correct utilisation of the habitat. Presence of young shrubs and underwood in the meadow is indicative of the absence of cutting.

Parameter/Indicator	Description
Preservation of the ecotonal zone	Assessment of this indicator requires additional plant analysis for the area located outside the studied transect - in the ecotonal zone of the studied meadow. The evaluation of the indicator incorporates an average width of the transient zone between the meadow and neighbouring forest (in meters) and % of the shrub layer (possibly trees and shrubs), including the determination of the dominant species in the undergrowth and higher layers. The assessment draws attention to the possible dissemination of the species present in the ecotone, thus posing a potential threat to meadow phytocoenoses.
Dead litter (dead organic matter)	Measurement of undecomposed organic matter deposited above the humus layer, taken after cutting the turf, using the ruler or a folding rule (in centimetres). The value of the indicator is an average figure from twenty measurements taken in the habitat patch, and the minimum and maximum. The indicator shows whether the meadow is regularly mown. The evaluation of the indicator should also include local climatic conditions, e.g. for patches in the Hala Izerska meadow where light frost occurs practically throughout the year, lowering the decomposition rate throughout the year, milder criteria were applied.
Area occupied by the habitat in the transect	Percentage proportion of the habitat in the transect assessed in tens of per cents during experts' assessment.
Spatial structure of the habitat patches	Determination of the habitat fragmentation level in the ordering scale (high, medium or low fragmentation level) and quoting areas of specific meadow patches. The indicator shows patchiness of the habitat, which usually occurs in form of medium-sized and big patches (> several thousand square metres).
Conservation prospects	Assessment of realistic possibility for the maintenance of the habitat in an appropriate status, its current conservation status and factors that can affect it in the near future are taken into account. Determination of the extensive use by mowing or by cutting and grazing is here of special importance

Table 2 Evaluation of selected status parameters and indicators of the specific structure and function of natural habitat 6520 Mountain yellow trisetum and bent-grass hay meadows (Polygono-Trisetion and Arrhenatherion)

Parameter	Status		
	FV	U1	U2
Surface area of the habitat in the transect	80-100%	60-70%	50% and less
Spatial structure of the habitat patches	Lacking or slight fragmentation	Average fragmentation level (patches with an area of a thousand square metres or so)	High fragmentation level (patches with an area of a several hundred square metres or so)
Characteristic species	Species characteristic for alliances of Polygono-Trisetion and Arrhenatherion numerous (>5) and showing a considerable coverage numerous species typical of mountain meadows	Species characteristic for alliance Polygono-Trisetion and Arrhenatherion – moderately numerous (3-5) and other species typical of mountain meadows also present	Species characteristic for alliance Polygono-Trisetion and Arrhenatherion, <i>scarce</i> (two or fewer), scarce meadow species
Dominant species	Co-dominance of typical meadow species and habitat patches rich in species	Intermediate state	Among dominants, expansive species or species alien to the habitat in ecological terms are present the habitat very poor in species
Alien invasive species	Absent or single individuals of low invasiveness level	Species of a low invasiveness level, <5% coverage of the transect or single individuals of higher invasiveness level	Highly invasive species present or >5% of the transect occupied by species of low invasiveness
Expansive species of herbaceous plants	Lacking or species with low coverage	Average number of expansive species and/or coverage with highly expansive species <10%	Numerous expansive species, with a considerable coverage and/or highly invasive species reaching >10% coverage
Expansion of brush and underwood	Total coverage in the transect <1%	Total coverage in the transect 1-5%	Total cover in the transect >5%
Maintenance of the ecotone zone	No ecotone or absence of expansive species in the ecotone	Average level of dissemination of species that can pose a threat to meadows	Expansion of species posing a potential threat to the meadows is marked in the ecotone
Dead litter (dead organic matter)	<2 cm deep	2-5 cm deep	>5 cm deep
Habitat area in the monitored location	Does not change or increases	Other combinations	A distinct decrease in the habitat's area in comparison with previous studies or data in References
General structure and functions	All cardinal indices evaluated as FV, remaining indices as at least U1	All cardinal indices evaluated at least as U1	One or more cardinal indices evaluated as U2
Conservation prospects	Good or excellent, no significant impact of threatening factors predicted	Other combinations	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
- Expansive species of herbaceous plants
- Expansion of shrubs and underwood
- Spatial structure of the habitat patches

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

Natural habitat observation sheet for the monitored location	
Code and name of the natural habitat	6520 Mountain yellow trisetum and bent-grass hay meadows (Polygono-Trisetion and Arrhenatherion) 6520-1 Sudety yellow trisetum meadow
Name of the site	PLH020061 Dzika Orlica
Name of the monitored location	Lasówka
Protected areas where the monitored location is situated	Natura 2000 Network: SOO PLH020061 Dzika Orlica, Area of the Protected Landscape, the Bystrzyckie and Orlickie mountains
Geographical co-ordinates	Beginning: N 50° 18' ... - E 16° 26' ... Centre: N 50° 18' ... - E 16° 26' ... End: N 50° 18' ... - E 16° 26' ...
Elevation a. s. l.	705-720 m
Description of the natural habitat	The locality of Lasówka, slope of the Dzika Orlica valley, in the northern part of the village. Near the road. Mostly cut by hand mountain meadows. Slope with SW exposure and a slight inclination, ten degrees on average. Acidic clay soil.
Plant communities	Community from alliance Polygono-Trisetion, Community of common bent <i>Agrostis capillaris</i> alliance (Arrhenatheretalia), community of wood softgrass <i>Holcus mollis</i> alliance (Arrhenatheretalia)
Area of habitat patches	15000 sq. metres (± 1000 square metres). Stable area.
Dimensions of the transect	20x100 m via slope traverse
Observer	Michał Smoczyk
Dates of observations	25 July 2009
Filling-in date	24 September 2009

Relevé I	
Geographical co-ordinates 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 Phytosociological unit	<p>Geographical coordinates: N 50° 18' ... - E 16° 26' ...", elevation 710 m a.s.l., area of the relevé 5x5 m, inclination of 10 degrees, SW exposure</p> <p>Density of layers: c 100%, d 30%</p> <p>Height of layers: c 0,5 m</p> <p>Community of alliance Polygono-Trisetion</p> <p><i>Species</i>: <i>Achillea millefolium</i> 1, <i>Aegopodium podagraria</i> +, <i>Agrostis capillaris</i> 3, <i>Alchemilla monticola</i> 1, <i>Alopecurus pratensis</i> +, <i>Angelica sylvestris</i> +, <i>Avenula pubescens</i> +, <i>Briza media</i> +, <i>Campanula rotundifolia</i> +, <i>Cardaminopsis halleri</i> +, <i>Centaurea jacea</i> +, <i>Cirsium palustre</i> +, <i>Crataegus monogyna</i> juv. +, <i>Crepis succisifolia</i> +, <i>Dactylis glomerata</i> +, <i>Deschampsia caespitosa</i> +, <i>Euphrasia stricta</i> +, <i>Festuca rubra</i> 2, <i>Galeopsis tetrahit</i> +, <i>Galium mollugo</i> 1, <i>Hieracium pilosella</i> +, <i>Hieracium sulphureum</i> +, <i>Holcus mollis</i> +, <i>Hypericum maculatum</i> 2, <i>Lathyrus pratensis</i> +, <i>Leontodon autumnalis</i> +, <i>Leontodon hispidus</i> 1, <i>Leucanthemum vulgare</i> +, <i>Lotus corniculatus</i> +, <i>Luzula multiflora</i> +, <i>Nardus stricta</i> +, <i>Phleum pratense</i> +, <i>Plantago lanceolata</i> +, <i>Poa pratensis</i> 2, <i>Polygala vulgaris</i> +, <i>Potentilla erecta</i> +, <i>Ranunculus acris</i> +, <i>Rhinanthus minor</i> +, <i>Rumex acetosa</i> +, <i>Sanguisorba officinalis</i> +, <i>Stellaria graminea</i> +, <i>Trifolium pratense</i> +, <i>Trifolium repens</i> 1, <i>Trisetum flavescens</i> 1, <i>Veronica chamaedrys</i> 2, <i>Vicia cracca</i> +, <i>Vicia sepium</i> +, <i>Brachythecium</i> sp. (d) +, <i>Rhytidadelphus squarrosus</i> (d) 3</p>

Relevé II	
Geographical coordinates, elevation a.s.l., area of the relevé, inclination, exposure, Density of layers a, b, c, d, Height of layers a, b, c, Phytosociological unit	Geographical coordinates N 50° 18' ..." - E 16° 26' ...", elevation 710 m a.s.l., area of the relevé 5x5 m, inclination of 10 degrees, SW exposure Density of layers: c 100%, d 20% Height of layers: c 0,6 m Community of <i>alliance</i> Polygonum-Trisetion <i>Species:</i> Achillea millefolium 1, Agrostis capillaris 3, Alchemilla monticola 2, Alopecurus pratensis +, Angelica sylvestris +, Briza media +, Campanula patula +, Campanula rotundifolia +, Cardaminopsis halleri +, Carex spicata +, Cirsium palustre +, Crepis succisifolia 1, Dactylis glomerata +, Festuca rubra 2, Galium mollugo +, Heracleum sphondylium +, Holcus mollis 2, Hypericum maculatum 3, Knautia arvensis +, Lathyrus pratensis +, Leontodon autumnalis +, Leucanthemum vulgare +, Luzula multiflora +, Melandrium rubrum +, Nardus stricta +, Phleum pratense +, Plantago lanceolata 1, Poa pratensis 1, Polygonum bistorta +, Potentilla erecta +, Prunella vulgaris +, Ranunculus acris +, Rhinanthus minor +, Rumex acetosa +, Rumex crispus +, Senecio ovatus +, Stellaria graminea +, Taraxacum officinale +, Trifolium pratense +, Trifolium repens +, Trisetum flavescens +, Veronica chamaedrys 1, Vicia cracca +, Vicia sepium +, Brachythecium sp. (d) +, Rhytidadelphus squarrosus (d) 3
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 Phytosociological unit	Geographical coordinates N 50° 18' ..." - E 16° 26' ...", elevation 710 m. a.s.l., area of the relevé 5x5 m, inclination of 10 degrees, SW exposure, Density of layers: c 100%, d 20% Height of layers: c 0,6 m Community with Agrostis capillaris of order Arrhenatheretalia <i>Species:</i> Achillea millefolium 1, Agrostis capillaris 4, Alchemilla monticola 1, Alopecurus pratensis +, Angelica sylvestris 2, Anthoxanthum odoratum +, Avenula pubescens +, Briza media +, Campanula rotundifolia +, Cardaminopsis halleri +, Carex spicata +, Carex pallescens +, Crepis succisifolia +, Dactylis glomerata 1, Euphrasia stricta +, Festuca rubra 2, Galium mollugo +, Heracleum sphondylium +, Hieracium pilosella +, Hieracium sulphureum +, Holcus mollis 2, Hypericum maculatum 2, Knautia arvensis +, Lathyrus pratensis +, Leucanthemum vulgare +, Luzula multiflora +, Lychnis flos-cuculi +, Melandrium rubrum +, Nardus stricta 1, Phleum pratense +, Plantago lanceolata 1, Poa pratensis 1, Polygonum bistorta +, Potentilla erecta +, Ranunculus acris +, Rhinanthus minor +, Rumex acetosa +, Sanguisorba officinalis +, Senecio ovatus +, Solidago virgaurea +, Stellaria graminea +, Trifolium pratense +, Trifolium repens +, Trisetum flavescens +, Veronica chamaedrys 1, Vicia cracca +, Vicia sepium +, Rhytidadelphus squarrosus (d) 2

Conservation status of the natural habitat on the monitored location			
Parameters and indicators	Value of the indicator		Assessment of indicator
Surface area of the habitat			FV
Specific structures and functions			FV
Percentage of the habitat in the transect	80% and slowly decreasing due to impoverishment of species composition of the meadow. Increasing percentage of acidophilic species diagnostic for class Nardo-Callunetea		U1
Spatial structure of habitat patches	No fragmentation, uninterrupted patch		FV
Characteristic species	Layer c: <i>lady's mantles</i> Alchemilla spp. 10%, remaining 1% or <1%: meadow rock-cress Cardaminopsis halleri, yellow trisetum Trisetum flavescens, red campion Melandrium rubrum, northern hawk's beard Crepis succisifolia.		FV
Dominant species	Layer c: common bent Agrostis capillaris 30%, <i>four-angled St. John's-wort</i> Hypericum maculatum 30%, <i>red fescue</i> Festuca rubra 10% Layer d: springy turf-moss Rhytidiadelphus squarrosus 20%		FV
Alien invasive species	None		FV
Expansive species of herbaceous plants	<i>Four-angled St. John's-wort</i> Hypericum maculatum 30%. A very low coverage of remaining species: among others common goatweed Aegopodium podagraria, <i>curly dock</i> Rumex crispus, <i>common hemp-nettle</i> Galeopsis tetrahit		FV
Expansion of shrubs and underwood	Total coverage <1% - only single and scarce specimens of whitehorn Crataegus monogyna.		FV
Maintenance of the ecotonal zone	No ecotone		FV
Litter layer (dead organic matter)	0.5-3 cm, 1 cm on average, in herbal and grass patches thicker than in grass patches		U1
Conservation prospects	There are plans to construct a single family house in the monitored location; the possible construction will destroy the habitat in this place.		U1
Overall assessment	Proportion of the habitat area representing different conservation status within the monitored location		FV 40%
			U1 60%
			U2 0%

Human activity				
Code	Name of activity	Intensity	Impact	Description
102	Mowing /cutting	B	+	The whole area is cut by hand, hay collected, no data on mowing frequency
403	Dispersed land development	B	-	Area probably intended for single family houses. In 2007-2009, construction of gravel road section from the roadway to the meadow. In adjacent areas, in similar meadow patches, several single family houses were built – the village becomes a recreational locality
502	Roads, roadways	C	0	On the eastern part, an asphalt roadway (regional road No 389) is adjacent to the transect
511	Cable lines	C	0	In vicinity, there is an overhead cable line (poles)

4. Habitats of similar ecological characteristics

Fresh lowland hay meadows from alliance Arrhenatherion (habitat 6510) are similar in nature and ecological requirements, they also strongly depend on regular mowing, and – to a lesser extent – on grazing. The methodology of monitoring studies adopted for hay mountain meadows may be partly adapted to observations of other meadow habitats: 6410 molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion) and 6440 alluvial meadows of river valleys of the *Cnidion dubii* (Cnidion dubii).

5. Protection of natural habitats

Preservation of fresh mountain meadows depends on following traditional management: cutting grass once or twice per year combined with hay harvesting, moderate organic fertilization and low intensity grazing (sheep, cattle, horses) in late summer and autumn. The most serious threat is posed by secondary succession resulting from abandonment of traditional land use. Other threats include afforestation (the Małe Pieniny mountains, Beskid Żywiecki mountains, the Izerskie mountains), intensified grazing (the Tatra mountains and Podhale region), selling land and conversion of meadows into recreational plots in areas with attractive landscape.

Most national parks run meadow species and habitat conservation programmes, and monitor the results of applied measures. However, many mountain meadows are privately owned and thus legally enforceable protection of meadows is limited. In the two regions some revitalisation of meadow and pastoral uses compared to a very strong regress the 1990s is observed. Under the framework of the agricultural and environmental program implemented in 2004, some meadows in the Karkonosze mountains, the Sudety Zachodnie mountains, Krowiarka range in the Eastern Sudety mountains, Beskid Niski and Bieszczady mountains, are part of the "Owca plus" programme which provides the opportunity of reinstating the culture of tradition-related sheep grazing in mountain pastures and glades in montane forests.

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