

INSPECTION OF ENVIRONMENTAL PROTECTION

Monitoring of natural habitats



Methodological guide

Introduction

LIBRARY OF ENVIRONMENTAL MONITORING

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Introduction

The presented publication is the collection of selected texts from the series of methodological guides entitled *Monitoring of Natural Habitats*, issued in the framework of the Library of Environmental Monitoring. Part I, covering the monitoring methodologies of 20 types of natural habitats, was published in 2010. Parts II and III, based on the same methodological principles, concerning 40 more types of natural habitats, were published in 2012. The fourth part of the series describes subsequent types of the natural habitats (16) listed in the Annex 1 of the Habitats Directive, as well as two natural habitats not included in this Annex, i.e. alder swamps (*Carici elongatae-Alnetum*) and eutrophic wet meadows. The chapter below is the revised Introduction presented in Part II and Part III.

Definition and legal basis for monitoring

Monitoring of nature consists of regular observations and measurements of selected elements of living nature (species, ecosystems), conducted for the purpose of obtaining information on changes occurring in them at a specific time, as well as gathering and updating information about other important elements of nature, and on directions and rates of these changes. The data collected should help to prevent future adverse changes and encourage specific protection measures to be undertaken as well as to predict the responses of the studied elements of nature to further changes in the environment.

The obligation to carry out such monitoring was imposed by the Law of 16 April 2004 on nature conservation with later amendments (J. of Laws of 2004, No. 92, item 880 with later amendments). In accordance with Article 112 para 1: Within the framework of the state environmental monitoring, the monitoring of nature, biological and landscape diversity are performed. The scope of the monitoring was specified in para 2: Monitoring of nature consists of observations and assessments of the status and the changes occurring in the components of biological and landscape diversity, on selected sites, as well as in the assessment of the effectiveness of applied nature conservation methods, including the observation of natural habitats and plant and animal species for which a Natura 2000 area was established, and in Article 28 para 10, point 4 c: The plan of conservation tasks for a Natura 2000 area includes a definition of measures pertaining to the monitoring of items subject to conservation.

Article 29 para 8 provides: The plan of conservation for a Natura 2000 area includes definitions of the methods for monitoring of the conservation status of natural habitats and species of plants and animals and their habitats which are subjects to conservation.

Pursuant to the Regulation of 30 March 2010 by the Minister of the Environment on preparing a draft plan of conservation for Natura 2000 area (J. of Laws of 2010, No. 64, item 401, with later amendments), the monitoring of habitats and species is one of the indispensable elements in plans of conservation tasks and plans for Natura 2000 protection areas. Para 3.1 point 10 of this regulation defines this as establishing the methods for the monitoring of the conservation status of the subjects of conservation by indicating ways, methods, frequency and scope of the observations, and recording data.

The Annex to this Regulation provides that: The assessment of the conservation status parameters should be carried out on the basis of the monitoring referred to in Article 112 para 2 of the Act on Nature Conservation.

Analogically, pursuant to the Regulation of 17 February 2010 by the Minister of the Environment on preparing a plan of conservation tasks for a Natura 2000 area (J. of Laws of 2010, No. 34, item 186, with later amendments): *the plan of conservation tasks for a Natura 2000 area provides [...] definitions of conservation measures [...] including, in particular, the measures pertaining to [...] monitoring of the conservation status of the subjects of conservation.*

The Annexes to both these regulations provide that: In assessment of the natural character or disturbance of features of a population as well as the size and quality of habitat, for each species a separate set of indices, adopted on the basis of scientific knowledge for the purpose of monitoring referred to in Article 112 para 2 of the Act.

There is also an obligation to perform monitoring results from the legislation of the European Union, and a number of international conventions, in particular the Convention on Biological Diversity (CBD). Pursuant to Article 7 of the Convention, the contracting states are obliged to identify and monitor the components of biological diversity important for its conservation and sustainable use, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use. The provisions of the Convention were elaborated in Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) which determined legal framework for creating the European ecological network Natura 2000, a main instrument for maintaining biological diversity in the EU territory. Article 11 of the Habitats Directive provides that: *Member States shall undertake surveillance of the conservation status of the natural habitats and species referred to in Article 2 with particular regard to priority natural habitat types and priority species.* Also, in accordance with Article 17 of the Directive: *Every six years [...], Member States shall draw up a report on the implementation of the measures taken under this Directive. This report shall include, in particular, information concerning conservation measures [...] as well as an evaluation of the impact of those measures on the conservation status of the natural habitat types of Annex I and the species in Annex II and the main results of the surveillance referred to in Article 11. The report, in accordance with the format established by the committee, shall be forwarded to the Commission and made accessible to the public.*

Scope of the monitoring of nature and relevant publications

Because of the requirements under EU law, the monitoring performed should, above all, enable the assessment of the nature conservation status of natural habitats and species of Community importance and help to evaluate the effectiveness of measures applied to protect them. On account of this, all types of natural habitats, occurring in Poland, listed in Annex I to the Habitats Directive (81 types) and species listed in Annexes II, IV and V of the Habitats Directive, including 140 animal species, and 54 taxa of plants (including the entire groups of plants, such as: club mosses, peat mosses, and cladonia fungi). Particularly important is the monitoring of natural habitats and species under the Natura 2000 system (Annexes I and II of the Habitats Directive) which were described in 9 volumes of The guides of the Natura 2000 habitats and species conservation – A methodological textbook, published by the Ministry of Environment in 2004.

From the viewpoint of the needs of nature protection in Poland, the scope of monitoring should be still broader and also cover habitats and species from outside the annexes to the Habitats Directive which are endangered in Poland. This concerns such habitats as alder swamp forests or the associations of segetal weeds, and species placed in Polish Red Data Books with CR and EN

categories, rare species (including endemic species) outside of these categories, as well as other species of economic importance (e.g. taken from the wild) or alien (invasive) species.

In 2010, the first three volumes of methodological guides were published, covering the monitoring of 20 types of natural habitats, 18 animal species, and 16 plant species. Among these there were all types of habitats and species of so-called priority importance to the European Community (17 types of habitats, 14 animal species, and 10 plant species) as well as several other, important from the viewpoint of nature conservation in our country. The volumes of guides drafted in subsequent years, present methodologies of monitoring studies for the types of natural habitats, and the plant and animal species listed in Annexes to the Habitats Directive, which were covered by monitoring in 2009-2011 under the State Environmental Monitoring scheme entitled *Monitoring of species and habitat types with particular regard to the special areas of conservation of the Natura 2000 network*, commissioned by the [Chief Inspectorate of Environmental Protection Management](#) (hereinafter abbreviated as CIEP). These are both species and habitats widely distributed in Poland, numerous and known from many Natura 2000 localities and areas, as well as rare species whose occurrence is limited to single localities and areas. Among them there were also selected plants species from outside the lists in the Habitats Directive, deemed to be critically endangered in Poland, which have not been previously monitored under the State Environmental Monitoring.

Premises and organisation of monitoring

The premises of the monitoring system implemented are as follows:

- Adjusting the scope and recording information collected within the monitoring framework for the purposes of reporting required by the Habitats Directive (the collection of data which permits the evaluation of the conservation status of natural habitats and species at the level of biogeographical regions).
- Developing and applying a uniform organisational-methodological system of monitoring for particular types of habitats and species.
- Applying a common standard of data recording and gathering the data in a single database
- Linking the monitoring of the conservation status of natural habitats and species at a national level to the monitoring at Natura 2000¹ sites where the obligation of monitoring stems from national law.
- Incorporating the monitoring activities concerning natural habitats and species carried out to date by various institutions into the system adopted by the CIEP.
- Combining the monitoring of habitats and species with other types of monitoring (e.g. monitoring carried out under the Water Framework Directive, State Forest Administration Monitoring, and the like).

¹ The Nature Conservation Act requires that monitoring should be carried out under the State Environmental Monitoring (Article 112), and also in all Natura 2000 sites (Article 28) which are subject to conservation in these sites. In accordance with the requirements of the Habitats Directive, the locations selected for monitoring should be representative for the entire range of occurrence of a given natural habitat or species. Thus, the monitoring under the State Environmental Monitoring is carried out in locations situated within the Natura 2000 network as well as outside. If the required uniform methodology is maintained then the results obtained will be coherent.

The detailed assumptions concerning the organisation and the way of implementing the monitoring (including fieldwork), coordination of activities and flow of data, are prepared individually by each EU state. The only one common (all-European) formal premise of the monitoring of natural habitats and species of European importance is that it has to provide data allowing the assessment of their conservation status at the level of biogeographical region and the method of this assessment has been formalised and described in the document entitled [Explanatory Notes & Guidelines for Assessment, monitoring and reporting under Article 17 of the Habitats Directive Final draft; October 2006](#).

During the work on organising the monitoring of natural habitats and species in Poland (*Monitoring of species and habitat types with particular regard to the special areas of conservation of the Natura 2000 network*) these guidelines were adapted to the assessment of conservation status of species and natural habitats at the level of monitoring locations and Natura 2000 sites. Recently, a new, amended version of these guidelines was approved by the Habitats Committee: Assessment and reporting under [Article 17 of the Habitats Directive. Explanatory Notes & Guidelines for the period 2007-2012. Final draft July 2011](#).

The monitoring of natural habitats and species of plants and animals is organised hierarchically, on three levels: **co-ordinating institution** (one on the national level), **national coordinators** (experts, managing the monitoring of particular types of habitats and species), and **local experts** (contractors doing fieldwork: both scientist-biologists, members of nature conservation services, staff of the State Forest Administration, non-governmental organisations, students of natural history studies).

A database, common for all EU states, gathers information, including chiefly the monitoring results, in the form of reports on the state of populations and their habitats at the level of the biogeographical region. Every six years, each EU state is obliged to submit a report (the first reports were drafted in 2007). The method of gathering data resulting from monitoring at the level of monitoring locations and Natura 2000 sites in Poland was drafted in 2006-2008 by the Institute of Nature Conservation of the Polish Academy of Sciences in Kraków upon commission from the Chief Inspectorate of Environmental Protection (CIEP), under the framework of the above-mentioned task: *Monitoring of species and habitat types with particular regard to the special areas of conservation of the Natura 2000 network – Phase one and two*.

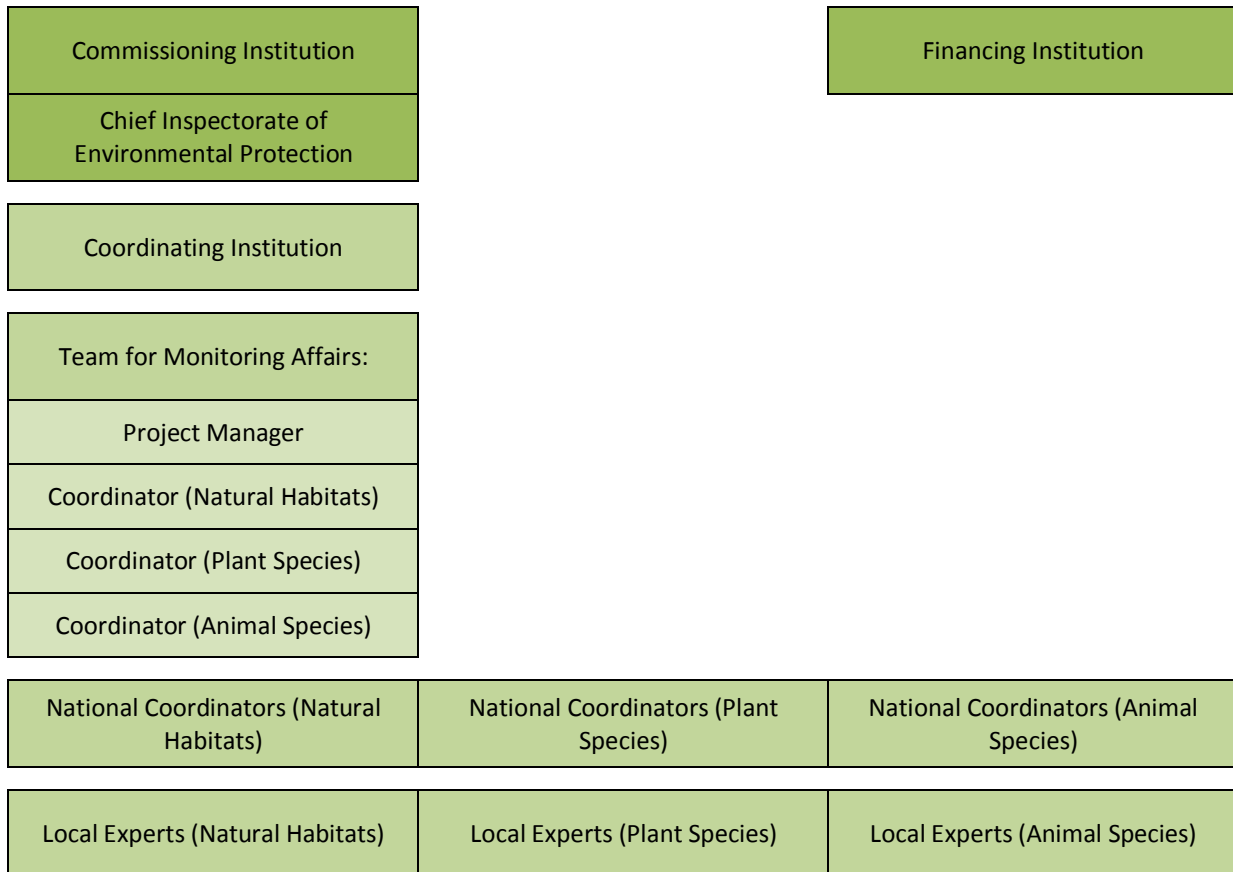


Fig. 1 The organisation chart of the monitoring of natural habitats and species at the national level.

Description of the procedure for the monitoring of natural habitats at the national level

Selection of monitoring locations

The monitoring of each natural habitat is carried out on so-called monitoring locations, which constitute a continuous fragment of natural space indicated on a topographic map. The monitoring/monitored location is a relatively uniform area of the examined natural habitat, clearly demarcated and easy to describe in the field. The size of monitoring location is very diverse, from several hectares in the case of large habitats (e.g. forest of meadow habitats) to several m² in the case of epilithic mountain swards or petrifying springs with tufa formation. Depending on the specificity of the natural habitat studied, the way of marking monitoring locations may differ significantly, as it is elaborated in the description of research methodologies.

Some monitoring locations are treated as reference. These are model monitoring locations, with very good conditions, and with typically developed, non-endangered natural habitats. The initial selection of reference locations is made by local experts after the first research cycle. This selection is then approved by national coordinators and by the coordinator for habitats.

The selection of monitoring locations is performed in a way ensuring proper representation of the places of occurrence of a natural habitat as to the number, distribution and degree of threat. The field studies carried out on these selected locations allow conclusions to be drawn on the conservation status of a natural habitat at the levels of biogeographical regions as well as of the

whole country. The monitoring locations should be situated both in the centre of the range of habitat, and on its edge, on protected areas (e.g. Natura 2000 special areas) as well outside of them. However, rare and endangered habitats which occur in just a few places in Poland, should all be monitored, without exception. In the description of the methodology of monitoring of each habitat, the number and geographical position of all locations proposed for monitoring (performed under commission from CIEP under the framework of the State Environmental Monitoring) are given.

The procedure used to date for the determination of monitoring locations is as follows: Depending on financial capabilities, the coordinator for habitats makes the initial selection of the Natura 2000 sites and other places of occurrence of a given natural habitat ensuring that, on the one hand, geographical diversity is taken into account, and on the other hand, making sure that the monitoring covers the greatest possible portion of resources of a given natural habitat. This proposal is next verified and supplemented by the national coordinator. The precise position of monitoring locations within the selected areas is established in discussions between the national coordinator and local experts.

In order to begin the monitoring of a natural habitat in Natura 2000 sites designated for their protection, or outside of these, a survey of the whole area should be performed, and its results used to estimate resources and ecological diversity of the area's habitat. This initial stage of the monitoring exercise is essential for the proper distribution of monitoring locations as well as to formulate the correct overall conclusions describing the local variability of the studied natural habitat, and also the diversity of its conservation. For this reason, the local expert should possess a good knowledge of local natural conditions. It is difficult to give detailed principles for such field exploration because it is conditioned by both the specific features of a given habitat as well as the size and diversity of the investigated area. Beyond any doubt, after searching reference publications and identifying all available sources of information, a possibly detailed on-site visit should be planned, well in advance and in a suitable part of the vegetation season, in order to make a preliminary comparison of key-features of the inspected locations. Next, on this basis one should select several (3-4 on average) locations within each of the inspected sites, diversified in terms of development and preservation, where detailed observations will be made.

During the process of drafting the list of areas where monitoring will be performed, an attempt is made to include primarily these special Natura 2000 areas of habitat conservation which are the most important to a given natural habitat. Information from the standard data form (SDF) for Natura 2000 areas is used for selecting all areas whose importance for this habitat are graded as "A" and "B" while among the areas graded in the SDF as "C" those with the largest areas are selected. It should be emphasised that good knowledge of distribution and sizes of habitat resources, using the most current data is the best basis for the proper selection of monitoring locations. Apart from the database containing data from SDF, the most important sources of data concerning natural habitats may include:

- data collected by the State Forest Administration (e.g. INVENT database);
- data taken from the protection plans of national parks, Natura 2000 areas, landscape parks, and nature reserves, as well as from plans for conservation tasks of Natura 2000 areas;
- data gathered in connection with the implementation of agri-environmental programmes, expert reports, and with the monitoring of implementation of programmes;
- major projects associated with the protection of natural habitats (for example, the projects implemented under the framework of the Life-Nature Fund, Financial Mechanism of the European

Economic Area, Norwegian Financial Mechanism, Swiss-Polish Cooperation Programme, and the Operational Programme Infrastructure and Environment);

- inventories made within the framework of the Environmental Impact Assessments (EIS);
- other research and projects implemented by scientific institutions, Regional Directorates for Environmental Protection, and non-governmental organisations;
- a range of data available in the Internet (e.g. indirect information on current distribution of habitats and e.g. shrub layer extent shown in orthophotomaps available at Geoportal, Google Maps, etc.).

The target locations of permanent areas for the described natural habitats within the State Environmental Monitoring system will be conditioned mostly by the distribution of already existing monitoring locations. It is assumed that the number of monitored sites and locations should be at least kept at the current level, and in some cases (where only pilot studies were carried out) should be significantly increased.

The scope of monitoring activities on a monitored location

The scope and the recording format of information gathered for a natural habitat on a monitored location have been adapted to the needs of reporting provided in Article 17 of the Habitats Directive, so that the results of monitoring on the level of locations facilitate the assessment of the conservation status of the habitat on the level of biogeographical regions of Poland. For this reason, also at the level of monitoring locations, the conservation status is evaluated based on three parameters: surface area of the habitat, specific structure and function of the habitat, and the perspectives of conservation. The parameters of the natural habitat status as well as the system of assessments are discussed in detail in the further part of the Introduction.

The methodology of monitoring in the majority of the described natural habitats consists of marking on each monitoring location **a 200 m long and 10 m wide transect** (covering an area of 2000 m²). The beginning, centre, and end of the transect are places where phytosociological **relevé samples** are taken. Relevés (that is standard descriptions of vegetation applied in phytosociology) enable more profound analysis of species composition of the vegetation in the studied areas and provide the possibility of later floristic comparisons between locations throughout the whole country. A detailed analysis of relevés also helps to clear doubts on the correct identification of the natural habitat under study. Additionally, the status of the natural habitat is evaluated on the whole surface area of the transect (i.e. also between the places where relevés were taken), based on the system of parameters and indices described below, and on detailed methodology of research. It is important to note that for some natural habitats with no appropriate geobotanical identifiers, phytosociological relevé samples are not taken – e.g. in the case of caves (8310). In the monitoring of *Luzulo-Fagetum* acidophilous beech forests (9110), *Asperulo-Fagetum* beech forests (9130) and *Galio-Carpinetum* oak-hornbeam forests (9170), the broader transect is assumed, i.e. 20 m, so as to enhance the representation of variability of some indices of the parameter specific structure and functions, including - first of all - those associated with deadwood and forest microhabitats.

In the case of small-area habitats which create a mosaic with other habitats, when marking a transect of the envisaged dimensions is not possible in a single patch of the habitat, several separate patches of the habitat should be selected and their summary area determined. An optimum solution (although it is not always possible) would be that the summary area is equal to the area of the transect.

Parameters and indices of conservation status

The current conservation status ('condition') of a natural habitat is assessed on the basis of three parameters:

- surface area of the habitat within the conservation area,
- specific structure and functions,
- conservation prospects of the habitat.

These names were borrowed from the forms prepared by the European Commission for the reports on the conservation status of habitats and species in biogeographical regions of particular countries. Generally, it can be stated that each of the parameters of status of a habitat presents a synthetic description of a group of the characteristics of natural habitats as well as factors affecting them.

The way of evaluating the "surface area" and "conservation prospects" parameters is the same for all natural habitats whereas the third parameter "specific structure and functions" describes primarily these features which distinguish a given natural habitat and decide about its unique nature. Taking this into account, during the pilot project implemented in Poland, it has been envisaged that the coordinators of particular natural habitats will indicate the most essential features of the studied habitats or the phenomena affecting the ecological processes of key importance for the conservation of a given habitat. Such features or phenomena were called the indices of specific structure and functions of a natural habitat (also in this study called **indices of habitat status**).

The "**surface area of the habitat**" parameter is a numerical value most often given in square metres or in hectares. It may be determined as estimated value, or on the basis of existing phytosociological maps, forest maps or other cartographic materials. The assessment of this parameter is affected primarily by data on the changes of the area occupied by the natural habitat as well as by information on the spatial structure (fragmentation) and the degree of isolation of the studied patches of vegetation.

The "specific structure and functions" parameter serves to define the typical nature of habitat development and its conformity with its specific species composition, as well as to distinguish other elements indirectly affecting its structure and functions. A number of indices, matched individually to each type of natural habitat is used to determine this parameter with required precision. Obviously, many of them are the same for various types of habitats, particularly those with resembling characteristics or these which develop under similar climatic, edaphic or other conditions. In all, several dozen of such indices were proposed. The selection of indices is primarily based on the knowledge of conditions for the occurrence and dynamics of natural habitats. The characteristics of structure and functions of the natural habitat which are sensitive to the impact of various natural and anthropogenic factors, and – at the same time – relatively easy to measure, are primarily selected for studies. These can be indices pertaining to both biotic features of a habitat (e.g. density and height of individual layers of vegetation, presence of characteristic species, alien species, and invasive species, fragmentation) and abiotic features (e.g. water saturation, purity of waters). Apart from great indicative value and objectivity, such indices should be, above all, characterized by simplicity and easy application in the practice of fieldwork with the assumption of the least cost-consuming. Additionally, the way of determining the values of such indices should take into account the limited access of future contractors to specialised equipment, and, whenever possible, be based on simple and proven research methods. The scope and methods of measuring the indices are given in tables included in the description of particular habitats. Certain indices are distinguished as so-

called **cardinal indices** that is the key indices for the assessment of structure or functions of the natural habitat.

The "conservation prospects of the natural habitat" parameter is the forecast of changes occurring in a given location and in its surroundings which can affect the perpetuation of a proper status of the conservation of natural habitat over the following 10-15 years. This is an expert evaluation taking into account, among other things, information of known impacts and predicted threats, capital investment plans, and the current and planned conservation regime as well as on the effectiveness of the conservation measures applied to date (if there have been any).

Overall assessment is the final assessment including the evaluations of three parameters mentioned above, as well as information about the rarity of occurrence of the habitat in Poland, the features of its formation which distinguish it, the particular abundance of species composition and the like. It is a mean value of all three parameters described above.

It is worth mentioning that the process of evaluating the status of a given habitat should consider the current state of vegetation rather than the potential state of vegetation. For example, if no vegetation typical for a given natural habitat is found on a monitoring location, it should be simply assumed that the habitat has either not developed there or has been completely transformed, therefore further monitoring of this patch of habitat does not make sense, and the results of field monitoring obtained in such a case may only be an indication of how to attempt the restoration of natural habitat in the given location.

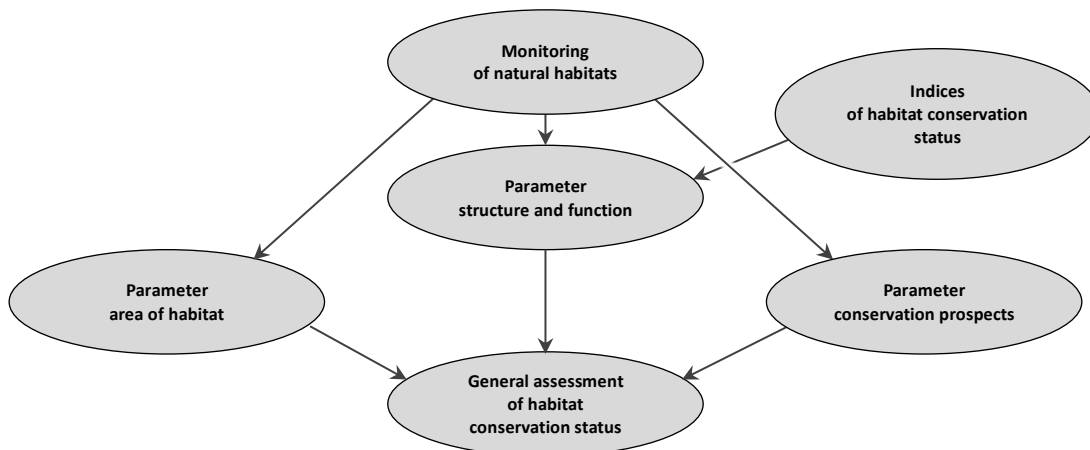


Fig. 2 Organisation chart of the monitoring of natural habitats

Evaluation of the studied indices

The values of the indices for the status of natural habitats, expressed numerically or descriptively, are evaluated similarly as parameters of the conservation status, in a three-level scale: FV favourable status; U1 unfavourable inadequate; U2 unfavourable bad (or could be **XX unknown**). The scale of assessments is the same as adopted by the European Commission for the purposes of preparing reports on the conservation status of habitats and species in biogeographical regions. Applying the scale to evaluate indices, and then three parameters of the conservation status at the level of locations will facilitate using the results of national monitoring for the purposes of drafting reports for the European Commission.

On account of this, definite assessments are ascribed to certain values (or range of values) of indices (expressed in numbers or descriptively). The 'guides' to evaluate indices, presented in accounts of particular habitats, have been formulated on the basis of knowledge and experience of

the authors, and based on the results of initial monitoring studies. As for many habitats, they will still require discussions and modifications owing to, among other things, their specific features in various parts of Poland.

Assessment of the habitat structure and functions on the basis of studied indices

The assessment of the 'specific structure and functions' of a habitat is composed of several to more than ten indices. The method of deriving the assessment of this parameter based on the assessment of particular indices is described in detail in the methodology for each of the natural habitats. The cardinal indices are of particular significance for the assessment. Considering the fact that they describe the most important features of structure and functions of a natural habitat which have a relatively narrow optimum range, the lowered assessment of any of the cardinal indices should result in the lowered assessment of the whole parameter.

The assessment of habitat conservation status at the level of a monitored location

The assessment of the structure and function of a natural habitat in combination with the assessments of its surface area and conservation prospects allow the state of conservation of the habitat at the given location to be assessed. The 'overall assessment' should be derived in accordance with the rule adopted in the guidelines for reporting the conservation status of species and natural habitats in biogeographical regions (Explanatory Notes & Guidelines... 2006, 2011). This rule provides that the overall assessment is equal to the lowest of component assessments (that is the assessments of particular parameters):

- three FV assessments (or possibly two FV assessments and one XX assessment) -> overall assessment FV
- one or more U1 assessments and no U2 assessments -> overall assessment U1
- one or more U2 assessments -> overall assessment U2

Forms for field observations on a monitored location

Maintaining the standard recording of collected data is ensured by uniform forms for the observation of habitats in a monitored location. The information contained in the form presented below reflects the scope of information entered into the monitoring database. The form consists of several parts: a natural habitat observation sheet for the monitored location, assessment of habitat conservation status at the site, list current impacts and threats (future foreseeable impacts), other information.

The first part of the form, being a specific 'display window' of the monitored location, includes information allowing its identification, describing its geographical position and short characteristics, pertaining to the previous observations of the habitat in the monitored location, and also technical data such as time and date of making the observation, the name of the observer and the like.

Natural habitat observation sheet for the monitored location	
Code and name of the natural habitat	Code of the habitat as in Annex I of the Habitats Directive; name based on guides of habitat conservation (J. Herbich 2004), available in Internet at: http://natura2000.mos.gov.pl/natura2000/pl/poradnik.php
Site name	Name of the monitored area – only applicable for locations within the Natura 2000 sites
Code of monitored location	Filled in by coordinating institution
Name of monitored location	Name of the monitored location. In giving a name to the monitored site, the best solution is to relate to the names presented in topographical maps with 1:10000 scale whereas in forested areas – the names of forest complexes and the numbers of forest subdivisions taken from forest management maps. If there is no possibility to create an easily recognizable, unambiguous name, the serial numbers of subsequent locations may be added to the name of the area (or its part).
Protected areas where the monitored location is situated	Protected areas where the monitoring location is situated: nature reserves, national and landscape parks, sites of ecological interest, documentation sites etc.
Geographical coordinates	Fill in the <i>geographical coordinates of the beginning, centre, and the end of the transect</i> .
Elevation a.s.l.	The minimum and maximum elevation a.s.l. within the entire monitored area. It may be taken from topographic maps supported with GPS measurements
Description of the natural habitat	Synthetic information on distribution, diversity as well as on topography and relief of the terrain.
Plant communities	List all <i>plant communities characterizing the natural habitat on the monitored location</i> .
Surface area of the habitat patches	The combined surface area (in hectares) of patch/patches of the habitat where the transect is located.
Dimensions of the transect	Standard dimensions: 10x200 m. Exceptionally, when resulting from point, discontinuous distribution of the habitat, the transect may be replaced by a rectangular area of any dimensions (in that case, they should be given) equal to 200 m ² (0.2 hectare).
Observer	Full name of the local expert responsible for this monitoring location (according to the contract).
Dates of observations	<i>Dates of all observations (as in partial forms)</i> .
Date of filling	Date of filling in the form by the expert.
Date of entering	Date of entering into the database (filled in by the coordinating institution).
Date of approval	<i>Date of approval</i> by the authorised person (filled in by the coordinating institution).

The principal part of the form provides for the recording of results of investigation, that is the values (given either numerically or descriptively) of the studied indices of the conservation status of the habitat, and the values of these indices, and next the assessments of particular indices, and an overall assessment of the habitat conservation status on the monitored location. For particular habitats, this portion of the sheet differs only in the number and names of indices. Examples of filled forms for 'conservation status of the natural habitat on the monitored location are included in the detailed part of each described habitat.

Additionally, for the majority of the studied natural habitats, the forms for the relevés are also filled (as in the table below). Detailed information on the methodology of performing the phytosociological relevés can be found in textbooks of plant sociology (Dzwonko 2007, Wysocki, Sikorski 2002).

Conservation status of a natural habitat at the monitored location						
Parameters and indices		Value of the index		Assessment of the index		
Area of the habitat				FV/U1/U2		
Specific structure and function	Index 1			FV/U1/U2/XX		
	Index 2			FV/U1/U2/XX		
	Index ...			FV/U1/U2/XX		
Conservation prospects				FV/U1/U2		
Overall assessment				FV/U1/U2		
Proportion of the habitat area representing different conservation status within the monitored location				FV	x%	FV/U1/U2
				U1	x%	
				U2	x%	

Relevé I	
<p>Geographical coordinates of the centre, elevation a.s.l. Area covered by the relevé, inclination, exposure. Density of layers a, b, c, d. Height of layers a, b, c, d. Phytosociological unit.</p>	<p>Species: alphabetical order, Braun-Blaquet scale: +, 1, 2, 3, 4, 5; (report only coverage) Geographical coordinates: N degrees minutes..." E degrees minutes..." e.g. N 51° 22'..." E19° 23'..." Area covered by the <i>relevé</i>: for non-forest natural habitats - 5x5 m, for forest natural habitats 10x10 m, possibly in the case of smaller patches = the area of the patch Plant species with their numbers in the <i>relevé</i>. <i>It is recommended that all species of vascular plants and terrestrial bryophytes be identified, and – for the types of natural habitats where it is of essential importance – also of lichens.</i> The names of vascular plant species should follow Mirek et al. (2002), and those of bryophytes – Ochyra et al. (2003). Important: in some cases, the transect will go across vegetation patches of the transitional type, with non-typical vegetation (predominating in the monitored area). In such cases we do not try to search for a typical patch but describe the vegetation directly in three points of the transect. Attempts should be made, however, to locate the transect in such a way that it suitably represents the vegetation of the monitored location, and to avoid making <i>relevés in patches which are not spatially uniform</i>. In cases, when – for instance – a path goes through the middle of the transect (which is the case in a Swiss mountain pine brush), the <i>relevés should be performed in the nearest possible place to the left or right of the side of the point marking the transect (the coordinates to the left or right of the transect should be noted)</i>.</p>
Relevé II	
<p>Geographical coordinates of the centre, elevation a.s.l. Area covered by the relevé, inclination, exposure. Density of layers a, b, c, d. Height of layers a, b, c, d. Phytosociological unit.</p>	<p><i>Species: alphabetical order, as above</i></p>
Relevé III	
<p>Geographical coordinates of the centre, elevation a.s.l. Area covered by the relevé, inclination, exposure. Density of layers a, b, c, d. Height of layers a, b, c, d. Phytosociological unit.</p>	<p><i>Species: alphabetical order, as above</i></p>

The next part of the form is for the recording of current impacts on the natural habitat at the monitored location, as well as predicted threats. Only the most essential information found in the

field should be filled in. In order to make the records uniform, a list of coded impacts in accordance with Annex E to the standard Data Form for Natura 2000 areas was used (the list is attached at the end of the Introduction).

Determination of intensity (high A, moderate B, low C) and the type of effect (negative – , positive +, and neutral 0) for a given impact or threat are required as well as its short description.

The list of the most important impacts on a natural habitat on the monitored location (including its use). The coding of impacts should follow the one given in Annex E to the Standard Data Form for Natura 2000 areas.

Current impacts				
Code	Name of activity	Intensity	Impact	Synthetic description
		A/B/C	+/0/-	
		A/B/C	+/0/-	

The list of factors which – in a longer perspective – may constitute a threat to the species and its habitat: future foreseeable impacts such as, for example, planned capital projects, changes in management and use, and increasing pressure from urban development. The codes of threats according to Annex E of the Standard Data Form for Natura 2000 areas should be used. If there is no suitable code, its description should be entered into the table 'other information' in the cell 'other remarks'.

Threats (future, foreseeable impacts)				
Code	Name of activity	Intensity	Impact	Synthetic description
		A/B/C	+/0/-	
		A/B/C	+/0/-	

The habitat observation sheet should also contain space for recording other essential information which has not been envisaged in previous parts of the form, including, in particular, information on natural values other than the monitored 'object' observed in the monitored area, other field observations that may affect the current monitoring studies, comments pertaining to the protection measures carried out in the area, methodological remarks or suggestions pertaining to detailed studies.

Other information	
Other natural values	Other observed species of animals and plants listed in Annexes to the Habitats and Birds Directives: endangered species (Red book) and other rare species (give their numbers in the following scale: numerous, moderately numerous, rare); other unique values in the area.
Other observations	Any information helpful for the interpretation of results, e.g. weather anomalies.
Management of the area	List the institutions, organisations, legal entities responsible for the management of the area (e.g. national park, forest directorate and forest districts, Regional Water Management Authority and the like).
Existing plans of conservation/ management/ land management	Protection plans for national parks and nature reserves, forest management plans, nature conservation plans in the State Forests, re-naturalisation plans (e.g. LIFE, EcoFund). Any documents which can be of significance to the conservation of the described natural habitat in the area.
Protection measures carried out	E.g. strict protection, mowing, increasing water level, grazing, other re-naturalisation measures.
Methodological remarks / Other remarks	Any other remarks associated with the work carried out, including, above all, information essential to the further planning of monitoring (methodology of work; indices to be studied in monitoring, regionally optimal timing of studies and the like).

Examples of filled forms for the monitoring locations of each described natural habitat have been included in the detailed part of each guide.

The assessment of the conservation status of a natural habitat at the national level

As it has been mentioned earlier, the results of monitoring of a natural habitat at particular locations provide a basis for the assessment of its conservation status at the national level and, more precisely, at the level of so-called biogeographical regions distinguished in the country. In Poland, these are the following regions: alpine (the Carpathians with part of its foothills), continental (the remaining part of the land area of Poland, and Baltic (territorial waters of the Baltic Sea). In the case of habitats whose occurrence in one given region is completely covered by monitoring (e.g. dwarf pine brush in the alpine region), its results provide the majority of data necessary for drafting a report on the conservation status of the species at the level of this region. With respect to most habitats, however, the monitoring is performed only in selected locations. If they constitute a relevant representation of resources/ locations of the given habitat in the biogeographical region (cf. detailed studies), it will only be necessary to complement the results of monitoring with information pertaining to the distribution of the habitat. If, for various reasons, the monitoring of a habitat does not include a relevant representation of its resources/ locations, then the assessment of the habitat conservation status at the regional level will require, apart from the results of monitoring, also collecting available information about the habitat from other places of its occurrence.

The assessment of the conservation status of a natural habitat is, to a considerable degree, an expert's assessment, therefore it should be performed (or at least verified) by specialists.

Description of the procedure for natural habitat monitoring at the level of a Natura 2000 site

The methodology of habitat monitoring, prepared for the purpose of assessing the conservation status of habitats at the level of biogeographical regions, may also be used in the monitoring of the habitat conservation status in Natura 2000 sites, in line with the requirements of national laws. The compatibility of data collected at the national level and at the site level enables their combined analysis, and henceforth makes possible the much better conclusions about the conservation status of the studied natural habitats on both levels. In the case of natural habitats with only on a few occurrences, national monitoring can cover all known locations of a given habitat and therefore its results can be used directly in managing a Natura 2000 site. In many cases, it is enough to supplement the locations of national monitoring with additional places, significant for the assessment of the diversity of conservation status in the Natura 2000 site. At present, data from national monitoring is often used in conservation plans for Natura 2000 sites and „national” monitoring methods and locations are included in the system of monitoring in a given Natura 2000 site. Primarily this approach reduces the cost of performing nature monitoring and makes communication between various institutions dealing with the implementation of the Natura 2000 network in Poland, much more efficient. The ultimate target should be to ensure the possibility of the joint gathering and storing of data from both levels, or developing an efficient system to exchange information obtained in various efforts implemented with the same research methodology.

Selection of locations for monitoring

Indicating locations for monitoring carried out at the level of a Natura 2000 site is one of the principal tasks for the drafters of conservation tasks and conservation plans for Natura 2000 sites. The basis for the correct selection of the monitoring locations in a Natura 2000 site is provided by current inventory data. When the locations for monitoring are selected, the following factors should be considered: the distribution of habitat sites within the area, the size of its resources in particular locations (if such data is available), and the diversity of locations in terms of pressure from various types of impacts. The number of locations for monitoring is established individually for a given Natura 2000 site, in the framework of the plan of conservation tasks or the conservation plan. Monitoring should definitely cover all places under active conservation measures. In the case of small-size sites, established for the purpose of conservation of a single type of habitat, the entire Natura 2000 area (e.g. a nature reserve for xerothermic vegetation) may constitute a monitoring location. It is also often that within a Natura 2000 site only one or several places of occurrence of a monitored habitat are known. If this is so then all of these patches should be monitored. In the case of natural habitats occurring within a Natura 2000 site in a larger number of s (or even occurring commonly) it is recommended that larger patches of it should be monitored, to consider local diversity in terms of abiotic conditions (exposure, inclination, situation in the area etc.) and from the viewpoint of phytosociology (e.g. alder and willow riparian groves occurring upon various parts of a river course, classified into the same type of habitat). Attention should also be paid to ensure the proper representation of habitats (percentages of their resources) on the selected monitoring locations. Every so often, the number of locations to be monitored with the purpose of obtaining information needed for proper site protection may be larger than that of the locations selected for the State Monitoring.

The scope of monitoring activities within a Natura 2000 site

The scope of monitoring activities at monitoring locations within a Natura 2000 site should be the same as at locations selected for the monitoring at the level of biogeographical regions (cf. chapter *The scope of monitoring activities at a monitored location*). However, taking into account site protection objectives, there may be necessary to expand the monitoring, and first of all, there should be carried out:

- more precise monitoring of some indices (e.g. regular measurements in hydrogenic sites instead of once performed estimates of hydration),
- more precise monitoring of the status of typical species or monitoring of biodiversity maintained in a given natural habitat,
- monitoring of additional indices, characteristic for local conditions (these indices should be treated as auxiliary in the assessment of the habitat status).

The assessment of the natural habitat conservation status on the level of Natura 2000 site

Pursuant to the Annex to the Regulation of 17 February 2010 by the Minister of the Environment on preparing a plan of conservation tasks for a Natura 2000 site (J. of Laws of 2010, No. 34, item 186 with later amendments), and pursuant to the Annex to the Regulation of 30 March 2010 by the

Minister of the Environment on preparing a draft plan of conservation for a Natura 2000 site (J. of Laws of 2010, No. 64, item 401, with later amendments):

The conservation status of the natural habitat in a Natura 2000 site is characterized by the following parameters:

- 1) parameter 1: surface area of the habitat;
- 2) parameter 2: structure and function;
- 3) parameter 3: conservation prospects for the habitat.

The assessment of conservation status of natural habitat at monitoring locations within a Natura 2000 area is one of the principal items of information considered in the assessment of this status at the level of Natura 2000 site.

In the case when the monitored location is the sole occurrence of the habitat within a given Natura 2000 site, the assessment of conservation status of a habitat on this location is also its assessment of conservation status in a Natura 2000 site.

In the remaining cases, when each of the indices of specific structure and functions of the habitat is assessed for the whole area as well as each of the parameters, the data from all monitored location within the given site should be taken into account. When a portion of the habitat occurrences within the site has not been monitored, it is recommended to take into account data from other sources, if available. As a rule, the final assessment of an index on the site scale will not be the simple average of assessments in the locations, and also it does not have to be the most frequent result obtained in the locations. The final decision is made by the expert who should take into consideration variability of habitat features within a Natura 2000 site as a whole, not only that in locations, as well as the characteristics of a given index. The principle for assessing the parameter of 'specific structure and functions' as well as other parameters remain the same as at the level of monitoring location.

In future, the assessment of the conservation status of a natural habitat within a Natura 2000 site, based on the data from monitored locations, may need to be established more precisely. Plans of conservation tasks or conservation plans have to be drafted first because these plans define the proper understanding of a habitat's proper conservation status in a given area. In the light of these findings, the revisions of the way in which the evaluation of the indicators of structure and function of a natural habitat can be required are defined individually for various biogeographical areas or regions.

Forms detailing the characteristics of a Natura 2000 site

The forms describing the conservation status of natural habitats within Natura 2000 sites are filled on the basis of data obtained for monitoring locations in these sites. The structure of such forms is similar to that drafted for a single location.

The first part of the form, being a specific 'display window' of the site, includes information allowing its identification, describing its situation and short characteristics, pertaining to the previous observations of the habitat in the site, and also technical data such as time and date of making the observation, the name of the observer and the like.

Natural habitat observation sheet at the site	
Code and name of the natural habitat	Code of the habitat as in Annex I of the Habitats Directive; name based on guides of habitat conservation (J. Herbich 2004), available in Internet at: http://natura2000.mos.gov.pl/natura2000/pl/poradnik.php
Site name	Name of the monitored Natura 2000 site
Site code	Filled in by coordinating institution
Names of monitored locations	Names of the monitored locations within the Natura 2000 site.
Other protected areas	Nature reserves, national and landscape parks, sites of ecological interest, documentation sites etc.
Elevation a.s.l.	The minimum and maximum elevation a.s.l. within the entire area of the site. It may be taken from topographic maps supported with GPS measurements
Description of the natural habitat on the site	Synthetic information on distribution, diversity as well as on topography and relief of the terrain.
Plant communities	List all <i>plant communities characterizing the natural habitat on the site.</i>
Surface area of the habitat patches	The combined surface area (in hectares) of monitored patch/patches of the habitat
Observer	Full name of the local expert responsible for this site (according to the contract).
Dates of observations	<i>Dates of all observations (as in partial forms).</i>
Date of filling	Date of filling in the form by the expert.
Date of entering	Date of entering into the database (filled in by the coordinating institution).
Date of approval	<i>Date of approval</i> by the authorised person (filled in by the coordinating institution).

Conservation status of a natural habitat in the site			
Parameters and indices		Value of the index	Assessment of the index
Area of the habitat			FV/U1/U2
Specific structure and function	Index 1		FV/U1/U2/XX
	Index 2		FV/U1/U2/XX
	Index ...		FV/U1/U2/XX
Conservation prospects			FV/U1/U2
Overall assessment			FV/U1/U2
Proportion of the habitat area with different conservation status		FV	x%
		U1	x%
		U2	x%
			FV/U1/U2

The list of the most important impacts on a natural habitat in the studied area (including its use). The coding of impacts should follow the one given in Annex E to the Standard Data Form for Natura 2000 areas.

Current impacts				
Code	Name of activity	Intensity	Impact	Synthetic description
		A/B/C	+/0/-	
		A/B/C	+/0/-	

The list of factors which – in a longer perspective – may constitute a threat to the species and its habitat: (future foreseeable impacts such as, for example, planned capital projects, changes in management and use, and increasing pressure from urban development). The codes of threats according to Annex E of the Standard Data Form for Natura 2000 areas should be used.

Threats (future, foreseeable impacts)				
Code	Name	Intensity	Impact	Synthetic description
		A/B/C	+/0/-	
		A/B/C	+/0/-	

Other information	
Other natural values	Other observed species of animals and plants listed in Annexes to the Habitats and Birds Directives: endangered species (Red book) and other rare species (give their numbers in the following scale: numerous, moderately numerous, rare); other unique values in the area.
Other observations	Any information helpful for the interpretation of results, e.g. weather anomalies.
Management of the area	List the institutions, organisations, legal entities responsible for the management of the area (e.g. national park, forest directorate and forest districts, Regional Water Management Authority and the like).
Existing plans of conservation /management/ land management	Protection plans for national parks and nature reserves, forest management plans, nature conservation plans in the State Forests, re-naturalisation plans (e.g. LIFE, EcoFund). Any documents which can be of significance to the conservation of the described natural habitat in the area.
Protection measures carried out and assessment of their effectiveness	E.g. strict protection, mowing, increasing water level, grazing, other restoration measures.
Methodological remarks	Any other remarks associated with the work carried out, including, above all, information essential to further planning of monitoring (methodology of work; indices to be studied in monitoring, regionally optimal timing of studies and the like).

Monitoring and the protection of natural habitats at a local level

The results of monitoring for nature should be used in planning activities on the protection of natural habitats, both at a local and national level. Hence, based on own monitoring observations, the experts present their proposals for the protection of the natural habitat in a given location. General recommendations are provided in this guide in the chapter "Habitat Protection", where the authors discuss, among others, the degree of threat to the natural habitat, existing and potential impacts, as well as thus far nature conservation experiences.

The purpose of protecting a given habitat within the country is to achieve the best possible conservation status of this habitat through, among others, adequate planning of its protection within the whole area of occurrence. As planning should take into account specifics of the area, i.e. - on the one hand, its importance for preservation of a given natural habitat at a national level, the obligation to protect other elements of biological diversity, as well as current protective measures, whereas, and on the other hand - social and economic conditions - then local conservation objectives do not necessarily mean the achievement of the parameters and indices of the habitat favorable status in each area. In fact, it is necessary to prioritize management of a given area.

Consequently, when planning protective measures for a given area, it is important to keep in mind that the proposals in the chapter "Habitat Protection" are designed only in terms of general requirements for the protection of a given habitat, and their use in practice depends on local conditions. For this reason, as well as due to competency issues, these are not recommendations of a decision-making nature. They allow managers to gain knowledge on the effects of their decisions as to whether or not to take specific actions, on the the habitat conservation status. Suggestions of the monitoring experts as regards the need for protective actions on the monitoring locations of the State Monitoring for Environment should be perceived in a similar way.

Layout of guides

The guides for particular habitats were prepared in accordance with the following pattern:

I. Information on the natural habitat

1. Phytosociological indicators (alliances, associations, communities)
2. Description of the natural habitat
3. Ecological conditions
4. Typical plant species
5. Distribution in Poland

II. Methodology

1. Methodology of monitoring studies

- Selection of monitoring locations
- Ways of carrying out the studies
- Time and frequency of studies
- Research equipment

2. Assessment of parameters of the conservation state of the natural habitat, and the indices of specific structure and functions (with distinguished cardinal indices)
3. Example of a filled-in habitat observation sheet for a monitored location
4. Natural habitats of similar ecological characteristics (*for which the described methodology can be adapted*)
5. Conservation of the natural habitat
6. References

Additionally, in the Annex at the end of the guide here is an example of a form filled in for each particular habitat containing crude data from field studies carried out in 2006-2008. Thus, the reader can see how the results of observations are reported in practice.

The names of plants were adopted from Mirek *et al.* (2002) while phytosociological nomenclature generally followed Matuszkiewicz (2006). In some instances other syntaxonomic approaches were suggested. All publications used were cited in the References section of the description of a given natural habitat.

When describing natural habitats, extensive use was made of the texts *Poradniki ochrony siedlisk i gatunków Natura 2000 podręcznik metodyczny* [The guides of the Natura 2000 habitats and species conservation – A methodological textbook] (2004) edited by Professor Jacek Herbich, vols 1-5, published by the Ministry of the Environment in Warsaw, at times quoting directly from them.

Data gathering (database)

The system for gathering data for the needs of monitoring has been organised in a way which enables the full utilisation of the organisational structure within which the central system of information gathering has been set up. Direct supervision of the system, both substantive and technical, is exercised by the coordinating institution. Information technology solutions, developed to meet the needs of gathering monitoring data, ensure continuous, recorded, and limited access to data via the Internet. The relevant application software has been installed on the central computer in the coordinating institution.

Legislative Acts

- Dyrektywa Rady 92/43/EWG z dnia 21 maja 1992 r. w sprawie ochrony siedlisk przyrodniczych oraz dzikiej fauny i flory (Dz.U. L 206 z 22.7.1992, str. 7) z późn. zm. Załącznik II: Fauna i flora. Gatunki roślin i zwierząt będące przedmiotem zainteresowania Wspólnoty, których ochrona wymaga wyznaczenia specjalnych obszarów ochrony.
- Załącznik IV: Gatunki roślin i zwierząt będące przedmiotem zainteresowania Wspólnoty, które wymagają ścisłej ochrony.
- Załącznik V: Gatunki roślin i zwierząt będących przedmiotem zainteresowania Wspólnoty, których pozyskiwanie ze stanu dzikiego i eksploatacja mogą podlegać działaniom w zakresie zarządzania.
- Konwencja Berneńska z 19 września 1979 r. - o ochronie gatunków dzikiej flory i fauny europejskiej oraz ich siedlisk naturalnych. Ostatnie modyfikacje: dekret 99-615 z 7 lipca 1999 r. wnoszący poprawki do załączników I, II, III i IV.
- Załącznik II: Ścisłe chronione gatunki fauny.
- Załącznik III: Chronione gatunki fauny.
- Konwencja Waszyngtońska z 3 marca 1973 r. dotycząca międzynarodowego handlu zagrożonymi gatunkami dzikich zwierząt i roślin (CITES).
- Załącznik I: obejmujący wszystkie gatunki roślin i zwierząt zagrożone wyginięciem, które są lub mogą być przedmiotem handlu.
- Załącznik II: obejmujący wszystkie gatunki roślin i zwierząt, które mogą stać się zagrożone wyginięciem oraz niektóre gatunki, które powinny być przedmiotem reglamentacji w celu skutecznej kontroli handlu.
- Załącznik III: obejmujący wszystkie gatunki, co do których jedna ze Stron uzna swoją właściwość do objęcia ich reglamentacją mającą na celu zapobieżenie lub ograniczenie eksploatacji tych gatunków i wymagającą współpracy innych Stron w zakresie kontroli handlu.
- Rozporządzenie Ministra Środowiska z dnia 6 października 2014 r. w sprawie ochrony gatunkowej zwierząt (Dz.U. 2014, poz. 1348).
- Rozporządzenie Ministra Środowiska z dnia 17 lutego 2010 r. z dnia 30 marca 2010 r. w sprawie sporządzania projektu planu ochrony dla obszaru Natura 2000. Dz. U. Nr 64, poz. 401 z późn. zm.
- Rozporządzenie Ministra Środowiska z dnia 17 lutego 2010 r. w sprawie sporządzania projektu planu zadań ochronnych dla obszaru Natura 2000. Dz. U. Nr 34, poz. 186 z późn. zm.
- Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody (Dz.U. z 2013 r., poz. 627).

General references

- Assessment and reporting under Article 17 of the Habitats Directive. Explanatory Notes & Guidelines for the period 2007-2012. Final draft July 2011 (http://circa.europa.eu/Public/irc/env/monnat/library?l=/habitats_reporting/reporting_2007-2012&vm=detailed&sb=Title).
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Glossary of selected terms

Abiotic – describes a non-living component of the environment (e.g. water, sediments).

Abrasion – the destruction of coastal cliffs and the removal of its contents caused by the mechanical scraping and friction of rock material carried by waves and sea currents. This destructive process is aided by wind and ice.

Aeolian (process) – occurring as an effect of wind action causing deflation (i.e. blowing away) of fine mineral and organic material or its build-up i.e. accumulation. As the result of the aeolian process, in dune habitats dunes and depressions between sand dunes are formed by either the blowing away of sand or being buried by sand.

Alien species – a species occurring outside its natural range of distribution in the form of individuals or viable gametes, spores, seeds, eggs or parts of individuals by which they can proliferate (definition follows the Nature Conservation Act, Dz.U. (J. of Laws) of 2004, No. 92, item 880, Article 5.1 c, with later amendments). The current list of alien species occurring in Poland is available on the following website: <http://www.iop.krakow.pl/ias>.

Anthropogenic pressure – all direct and indirect human activities leading to various (negative or positive) changes in the natural environment.

Ascension – the upward movement of underground water in rocks, resulting from differences in hydrostatic pressures.

Breast-height diameter – the diameter of a tree, measured traditionally at height of 130 cm from the ground.

Brushwood – lower layer of forest community, composed of shrub species and trees with heights from 50 cm to 4 m.

Characteristic species - a species (or a taxon of lower rank) which occurs chiefly in a specific syntaxon i.e. in a certain territory, it has a 'gravity point' of occurrence in a given syntaxon (Matuszkiewicz 2008). It means that: (1) in other syntaxa it is not found or very rarely, (2) occurs with a significantly higher degree of constancy in the given syntaxon, and (3) in this syntaxon it achieves a higher degree of viability.

Class of associations – the highest unit in the systematics of plant communities, often corresponding to principal ecological groups of plant communities, such as coniferous forests, alder woods, or grasslands.

Clear cutting – a forest management and regeneration technique, involving the simultaneous felling of all trees on a relatively large area called a clear cut area, where a new generation of trees is often planted.

Conservation status (favourable conservation status) – the conservation status of a natural habitat will be taken as "favourable" when: 1. the features of the natural habitat have the prospect of being maintained over a long time perspective; 2. the natural range and areas it covers within that range are stable or increasing and are likely to continue to exist for the foreseeable future; and 3. its specific structure and functions are maintained.

Cutting, tree cutting – a way of forest management (wood harvesting from a forest) and simultaneous forest regeneration.

Differential species – a species (or a lower-rank taxon) which occurs in a given syntaxon but does not occur in other syntaxa. These are usually taxa with wide amplitude. As a rule, these taxa are not classified in the group of characteristic taxa, nevertheless they can sometimes, at the same time, be characteristic taxa for the syntaxa of higher rank (Matuszkiewicz 2008).

Dominant species – this term was applied in the definitions of some of the indicators of the specific structure and functions of a natural habitat, in the following meaning: species (one or more) occurring most frequently (occurring in highest numbers) on a monitored location or transect; generally these were 1-2 of the most frequent species of vascular plants.

Ecosystem – a system encompassing all living organisms in a specific area (biocoenosis), organic matter and the abiotic environment (biotope). The biocoenosis and biotope are linked functionally through matter circulation and energy flow.

Erosion – mechanical destruction of Earth surface (rocks, soils) coupled with the removal of eroded material effected chiefly by water (e.g. river erosion, abrasion), and by wind (e.g. deflation).

Eutrophication – increase in fertility, a process of accumulation of nutrients, chiefly nitrogen and phosphorus.

Expansive plant species – rapidly spreading, usually common plant species, which – as a result of secondary succession – constitute a threat to rare plant communities, by its abundant occurrence reducing the biodiversity of natural habitats.

Fen, mire – a type of peat-generating community, whose physiognomy is defined by prevailing proportion of brown mosses which form compact sods or tufts.

Glacitectonic faults – deformations of the substrate below a glacier as well as sediments deposited by it, resulting from ice pressure or friction against the substrate.

Group cutting – a way of forest management and regeneration, which involves cutting a group of trees resulting in creating so-called nests where new regeneration emerges, or is introduced.

Habitats Directive – international legal act defining the setting up and functioning of the Natura 2000 ecological network, and – more generally – the principles of the conservation of natural habitats in the European Union. Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

Impoverished plant communities – plant communities of poorer floristic composition, most often resulting from strong, one-sided anthropogenic pressure, devoid of characteristic species, and – because of it – often impossible to classify into a defined association, but only to units of higher rank (alliance or even order).

Indices of the natural habitat conservation status – partial assessments of the 'specific structure and functions' parameter; these are the most important features of the studied habitats or the phenomena affecting the key ecological processes for the conservation of a given habitat.

Introduction – aided by the direct or indirect human actions, the purposeful or accidental transfer or translocation of an alien species into a natural habitat, outside the range in which the species occurs, or has occurred naturally in the past.

Invasive alien species – alien species whose introduction and spreading threatens biological diversity.

Littoral zone – a transitional zone between land and water. It also includes the shallow sea bottom, coast and the portion of land periodically inundated with water.

Lithosols – initial rocky soils, skeleton soils formed out of solid rock; generally occurring in mountains.

Macrophytes – large macroscopic (visible to a naked eye) aquatic plants.

Mire – See **Fen**.

Monitoring/monitored location – a relatively uniform area of the examined natural habitat, easily distinguished in the field. The surface areas of such locations may range from several hundred square meters to over ten hectares, depending on the spatial structure of the studied natural habitat.

Natural habitats – within the meaning of the Habitats Directive (and the Polish Nature Conservation Act following it): *terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural*. The list of natural habitats of European importance was given in Annex I of the Habitats Directive, and also in one of the regulations to the Polish Nature Conservation Act. It should be emphasised that in this expression, the concept approximates the definition of 'ecosystem' as it includes both abiotic biotope, and biotic biocoenosis. On the other hand, the best component helping to identify a natural habitat is vegetation – and more precisely – plant communities which are phytosociological identifiers of a given natural habitat.

Natural seeding – young seedlings and young trees occurring in high numbers on a forest floor or other grounds, developing spontaneously from seeds until the time they grow above the layer of herbaceous plants.

Natural succession – succession occurring spontaneously i.e. without human interference.

Neophytes, neophytisation – plant species of alien origin, arriving after the 15th century, permanently settled in primary habitats, entering natural communities. Neophytisation is one of the forms of degeneration of plant communities involving alien species entering and settling in natural communities.

Nitrophilous – a concept in the field of plant ecology – plant species that require great quantity of nitrogen in the soil for their development.

Nutrients (bioelements) – chemical elements indispensable to life, which constitute organisms and participate in life processes. They are divided into macroelements (nitrogen, phosphorus, potassium, calcium, iron, and magnesium), and microelements (e.g. zinc, copper, sodium, selenium, and silicon).

Oligotrophic – poor in terms of nutrient content.

Parameters of the conservation status of a natural habitat – surface area of a habitat, structure and functions, and conservation prospects. On the basis of these, an overall assessment is made of the status of the habitat within a biogeographical region, in a Natura 2000 area, or on a monitoring location. The names of parameters were borrowed from forms drafted by the European Commission for reports on the conservation statuses of habitats and species in biogeographical regions in particular Member States. It may be generally stated that a parameter of a habitat status describes, in a synthetic way, a group of features of a natural habitat as well as the factors affecting them.

Phytocoenosis – really existing plant community constituting a part of a given ecosystem.

Piezometer – a device (usually a pipe with a small diameter) for measuring the level of underground waters.

Primary succession – the process of colonising previously uninhabited places, leading to developing complex ecosystems.

Raised bog – a bog supplied exclusively by water from atmospheric precipitation, extremely poor in terms of nutrient components.

Relict, relict species – a plant or animal species preserved in a given region, on limited, usually small area; more widely distributed in the past; this term is usually used in referring to populations which have survived during glaciation periods; most often in highly elevated mountain areas.

Ruderal communities – communities occurring in secondary habitats, relatively deeply modified by humans, often on polluted soils, vulnerable to rapid changes.

Sea ingression – a process involving the inundation of low-elevation land areas by sea resulting from either increasing water levels or the lowering of the land. Sea water ingression also means that salt water penetrates inland fresh water areas.

Secondary succession – succession occurring in places where the previously growing vegetation was destroyed.

Selection cutting (continuous) – a forest management and regeneration technique, which involves the continuous cutting of single trees or tree groups and the incessant regeneration of the forest, with the young generation of trees having permanent shelter under the canopy of the stand.

Seminatural – a term denoting plant communities or natural habitats which have developed owing to human activities, but on the basis of native vegetation cover.

Shelterwood cutting – a way of forest management and regeneration, involving thinning the forest stand, repeated several times over a relatively short period, up to the complete removal of trees. Most often, the gradual thinning serves the purpose of emergence of natural regeneration which will replace the old forest stand.

Shrublet – a perennial plant with lignified stems lower than 0.5 m in height, often with many branchings and stolons.

Sphagnum bog – community of peat bog vegetation, with the characteristic outlook given by turf made of peatmosses.

Stepwise cutting – a forest management and regeneration technique, involving various kinds of regenerative cutting, leading to the balanced thinning of the forest, well spaced in time, which results in mixed forest stands being diversified in terms of age and spatial structure.

Subassociation – syntaxon, hierarchically lower than association, distinguished on the basis of the presence of certain species (differential species) as reflecting the differences among local habitats or regions.

Succession – directional changes in vegetation, which consist of subsequent plant communities (ecosystems) following one after another, differing in terms of structure and species composition. The succession starts from an initial stage, followed by transitional stages, and ends with the most sustainable stage, suitable for the given habitat, called climax.

Syntaxon – a general name of any unit within the systematics of plant communities (subassociation, association, alliance, order, class).

Syntaxonomy – science of systematics of plant communities.

Taxon – a general name of any taxonomic unit within the systematics of living things (subspecies, species, genus, family, order etc.).

Thinning – a silvicultural measure, removing a certain number of trees from a stand in order to improve the condition of development for the remaining trees, the objective of thinning is also aimed at improving the species composition of a tree stand by eliminating undesired trees (so-called converting thinning).

Transect – a line along which observations are made, an elongated study area serving most often to record the variability of the studied feature in an environmental gradient. In the monitoring of natural habitats, the transect is marked in order to ensure standardisation and repetitiveness in fieldwork methods in a patch of natural habitat, being as homogenous as possible.

Typical species – a plant or animal species whose occurrence is particularly associated with a given natural habitat. Both characteristic and differential plant species are included as well as species whose finding may facilitate identification or assessment of the conservation status of natural habitat.

Underwood – young generation of trees more than 50 cm high, which has grown under the forest canopy, when fully grown they later constitute the higher layer of a forest stand.

Variant – in phytosociological systematics: a unit lower than a subassociation, differentiated on the basis of the presence of certain species (differential species) as an effect of local-habitat diversification.