RED LIST OF THE CARPATHIAN NON FOREST HABITATS METHODOLOGY

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In 2008 the International Union for the Conservation of Nature (IUCN) initiated development of a global Red List of ecosystems (Resolution 4.020, IV World Conservation Congress in Barcelona, Spain, 2008). The IUCN Red List of Ecosystems is planned to be a global standard for how to assess the status of ecosystems, applicable at local, national, regional and global levels.

The first global consultation paper on the development of categories and criteria for a red list of ecosystems was published in 2011 (Rodríguez et al. 2011 – **Annex II**). More recently, a manuscript (Keith et al. – **Annex III**) on the scientific foundations for an IUCN Red List for Ecosystems has been submitted to a peer-review for a scientific journal. This document is based on the manuscript of Keith et al., which summarizes the scientific advances of the consultation process, presents a portfolio of case studies, and introduces the next version of the Red List categories and criteria for threatened ecosystems. It is expected that this version will not change considerably in the peer-review process, and that it will be proposed to IUCN Council for formal adoption of categories and criteria in 2013 (Rodríguez et al. 2012).

The term "ecosystem types" is used by Rodríguez et al. (2011) and by Keith et al. (unpublished) for units of assessments that represent complexes of organisms and their associated physical environment within an area (Tansley, 1935). The authors regard other terms applied in conservation assessments, such as "biotopes" and "habitats", as operational synonyms of "ecosystems".

The publication "Red List Assessment of European Habitat Types" (Rodwell et al., 2013), presents the survey of recent projects aimed at elaboration of red list of habitats in Europe and brings information dealing with trends, methodological approaches and outcomes of them.

Categories, criteria and classification of threatened non-forest biotopes (habitats) in the Carpathians

Objectives of the assessment

The objectives of regional assessments can be defined:
- to contribute to regional conservation planning through the provision of a baseline dataset describing the conservation status of the regions biotopes (habitats);
- to identify those geographic areas and ecosystems that need conservation measures to prevent degradation or collapse and ensure that biotopes (habitats) reach and maintain a favourable conservation status;
- to identify the major threats and propose mitigating measures and conservation actions to address them;

- to strengthen the network of experts focused on conservation of biotopes (habitats) in the region, so that the assessments can be kept up-to-date, and expertise be targeted to address the highest conservation priorities.

Based on common consultations of the project partners, the aim of the methodology is to create the Red List of threatened non-forest biotopes (habitats) of the Carpathians. The Red List would be based on IUCN categories used in version 3.1 (IUCN 2001, 2003, 2005) and the criteria used for categorisation of the species shall be listed. These IUCN categories and criteria were modified for the assessment of biotopes (habitats). To gain the results that would be comparable with global evaluation, other regional evaluations and that would be internationally accepted, the use of internationally agreed and valued criteria is crucial.

Assessment methodology

In order to create the Carpathian Red List of threatened biotopes (habitats) there is a need to first of all create national red lists of biotopes (habitats) in individual Carpathian countries. These will be done by each country itself. The structure of national lists should be kept consistent and each country should provide information needed for editing of the final whole – Carpathian Red List. For this reason also, the proposal is to use the Guidelines for Application of IUCN Red List Criteria at Regional Levels (IUCN 2003).

To categorise the biotopes (habitats) on whole – Carpathian scale, relevant information on biotopes (habitats) from all the Carpathian countries are needed. National lists of these biotopes (habitats) from each country should be sent to the coordinator. Once the categorisation of the biotopes (habitats) on national level is complete, biotopes (habitats) in categories CO, RC, CR, EN, VU, NT, LC, ES and DD will be selected as a basis for creation of draft Carpathian Red List. Final categorisation of the biotopes (habitats) on Carpathian level will be done by common consultations and workshops.

Basic methodological principles are given in the paper "Red List Assessment of European Habitat Types" (Rodwell et al., 2013). In this study are listed almost all previous works in this field, it evaluates the principles, methodological approaches and provides some conclusions for further work. For the purposes of our work the study is cited as full text version in the *Annex I*.

It is necessary to define basic terms we are using – biotope and habitat.

Habitat: topographically defined area of abiotic environment or biotope which provide or support the existence of particular living organism.

Biotope: complex of abiotic and biotic components and their interaction, which provide living environment for individual, population or community (defined also as site, the smallest natural living space where plants, animals and their communities exist).

Biotope is an area of uniform environmental conditions providing a living place for a specific assemblage of plants and animals. Biotope is almost synonymous with the term habitat, which is more commonly used in English-speaking countries. However, in some countries these two terms are distinguished: the subject of a habitat is a species or a population, the subject of a biotope is a biological community.

Geographic scope

The boundaries of the Carpathians as proposed for the purpose of this assessment are shown in Fig. 1. This map was used in previous projects for development of the Carpathian

Biodiversity Information System (CBIS), this includes borders of 309 orographic units and the organisation of data collection can be compatible with previous Carpathian projects. This can serve as a basis for data gathering and display the species distribution, and is available on www.carpates.org/cbis/orogs.html. The details and GIS layers will be provided by the specialists for data processing.
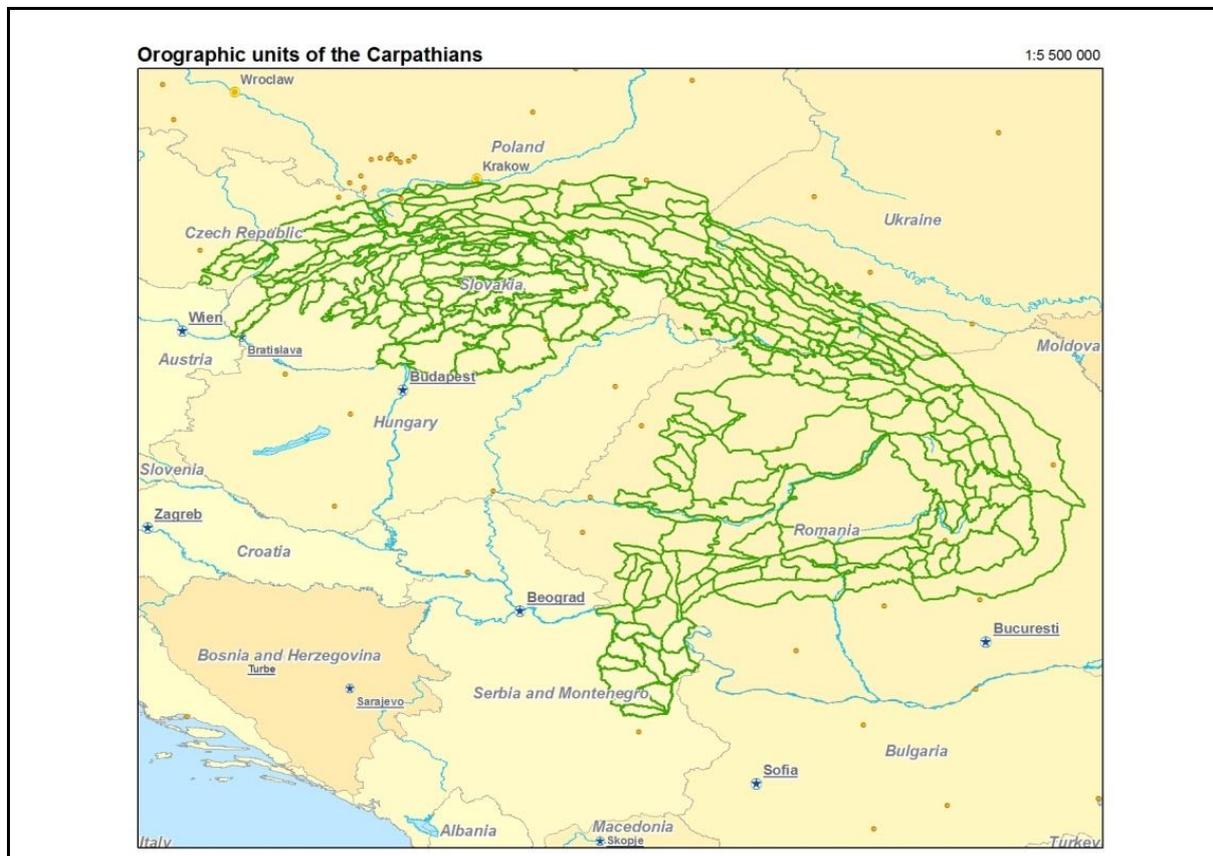

Fig. 1   Map of the Carpathian eco-region as used in the CBIS

Categories for red listing of biotopes (habitats) – regional assessment

Assessment of non-forest biotopes (habitats) has been methodologically based on works published in several European countries e.g. the Czech Republic (Kučera, 2005) Germany (Riecken et al., 2006,), Finland (Biodiversity FI, 2009) or Norway (Lindgaard, Henriksen, 2011).

Publications focused on classification, characteristic and evaluation of biotopes (habitats) in the Carpathian region and its surroundings as (Ružičková, et al., 1996, Chytrý et al., 2001, Stanová, Valachovič, 2002, Háková et al., 2004, Dančák, 2006) and also the red lists of species in the Carpatian region (e.g. Witkowski et al., 2003) have been used as well.

IUCN methods of the assessment of threatened species and IUCN criteria used for red list of threatened ecosystems (Rodríguez et al., 2011) were adjusted in the process of classification and evaluation of threatened non-forest biotopes (habitats).

The proposed IUCN Red List categories for non-forest biotopes (habitats) are almost the same as are used by the IUCN for the assessment of species (IUCN, 2001). A schematic of the categories and their relation can be found in Fig. 2. The threatened biotopes (habitats) are categorized either as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU).

Biotopes (habitats) that just fail to meet the criteria of the threatened categories are classified Near Threatened (NT) and ecosystems that unambiguously meet none of the criteria are Least Concern (LC). Biotopes (habitats) that are in a state of their ecological optima and are without endangering, are classified as Ecologically Satisfactory (ES). Analogous to the species categories, an additional category Data Deficient (DD) is given to biotopes (habitats) for which too few data exist to apply any criterion.
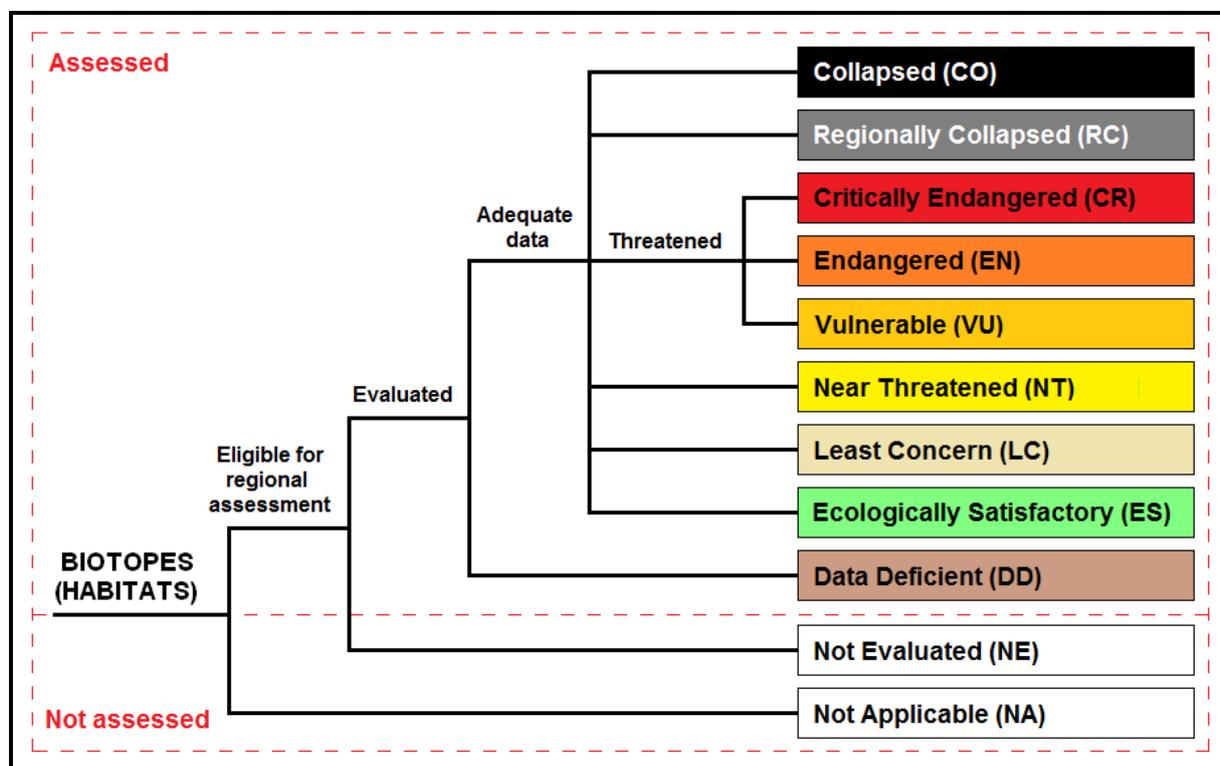

Fig. 2   Structure of the proposed IUCN Red List categories for non-forest biotopes (habitats) in the Carpathians by Barančok et al. (unpublished)

Biotopes (habitats) that have collapsed throughout their distribution are categorized Collapsed (CO), which corresponds to the category Extinct in species assessments. For biotopes (habitats), which would have collapsed only in the region, we allocated category Regionally Collapsed (RC). Biotopes (habitats) in the territory of the Carpathians that have not been evaluated at all belong to the category Not Evaluated (NE). Biotopes (habitats), which are not included in the territory of the Carpathians, are classified Not Applicable (NA).

Table 1   Definitions of Red List categories

	CATEGORY	DEFINITION
CO	Collapsed	Biotope (habitat) world-widely disappeared or natural conditions, biotic interactions and species composition have been changed as much that it is not possible to classify this "new" ecosystem as original biotopes (habitats) any more.
		CO – Collapsed – A habitat/biotope that, throughout its distribution, no longer sustains most of its characteristic biota or the abundance of biota that have a key role in the organization of the habitat/biotope. (HC)
		EX – Disappeared globally – A habitat type is deemed to have disappeared globally when there is very little doubt that this is the case. (NO)
RC	Regionally Collapsed	Biotope (habitat) not observed longer time in the Carpathians (or particular country) on regional level does not exist. The natural

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		recovering is not possible on regional level, crucial species of the biotope (habitat) disappeared in the region and there is low probability of their comeback and/or changes of natural conditions do not allow the existence of the biotope (habitat) in the region. RE – Disappeared – These habitat types are no longer found in Norway. They no longer exist regionally and will not be able to return naturally, and/or the key species in the habitat type are regionally extinct and there is little likelihood of them becoming re-established. (NO)
CR	Critically Endangered	Biotope (habitat) is critically endangered if available data meets any criteria of this category from A to G. Extremely high probability of serious endangerment in following 50 to 100 years in the Carpathian region. CR – A habitat is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing a very severe risk of collapse throughout its distribution. (HC) CR – A habitat type is critically endangered when the best available information indicates that at least one of the criteria 1, 2 or 4 for endangered is met. The risk that the habitat type will disappear from Norway during the coming 50 years is extremely high. (NO)
EN	Endangered	Biotope (habitat) is endangered if available data meets any criteria of this category from A to G. Biotope (habitat) is facing to high risk of endangerment in the period from 50 to 100 years. EN – A habitat or biotope is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a severe risk of collapse throughout its distribution. (HC) EN – A habitat type is endangered when the best available information indicates that at least one of the criteria 1, 2 or 4 for endangered is met. The risk that the habitat type will disappear from Norway during the coming 50 years is high. (NO)
VU	Vulnerable	Biotope (habitat) is vulnerable if available data meet any criteria from A to G of category of vulnerability. Biotope (habitat) is facing to moderately high risk of vulnerability in the period from 50 to 100 years. VU – A habitat or biotope is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a moderately severe risk of collapse throughout its distribution. (HC) VU – A habitat type is vulnerable when the best available information indicates that at least one of the criteria 1-4 for vulnerability is met. The risk that the habitat type will disappear from Norway during the coming 50 years is high. (NO)
NT	Near Threatened	Biotope (habitat) is near threatened when the available data meet at least one of the criteria A to G of Near Threatened. Recently it does not meet any of the criteria for CR, EN or VU, but in the future may do. NT – A habitat or biotope is Near Threatened when it has been evaluated against the criteria and it just fails to the criteria for the three threatened categories. (HC) NT – A habitat type is near threatened when the best available information indicates that at least one of the criteria 1-4 for near threatened is met. The habitat type meets none of the criteria 1-4 for CR, EN or VU, but is close to meeting some of these criteria now or in the near future. (NO)
LC	Least Concern	Biotope (habitat) is least concerned when it unambiguously meets none of the criteria for the threatened categories CR, EN, VU or NT. A habitat or biotope is Least Concern when it unambiguously meets none of the criteria for the three threatened categories. (HC)
ES	Ecologically Satisfactory	Biotope (habitat) belongs to the ecologically satisfactory category when it fails to meet any of the criteria for CR, EN, VU or NT, and is not placed in the DD, NA or NE categories. Ecologically satisfactory means that a substantial proportion of the biotope (habitat) objects are in a very good or good ecological state and the biotope (habitat) is sufficiently large (total surface area), occurs in enough areas and has a large enough breadth of occurrence to resist any external impacts without the risk of significant changes in its natural occurrence and character (or

		long-term, human-induced occurrence and character in the case of semi-natural sites).
DD	Data Deficient	Biotope (habitat) is placed in the data deficient category when it is very uncertain which category is correct and the appropriate category clearly includes the entire range from CR to ES, inclusive. Biotope (habitat) is DD when there is inadequate information to make a direct, or indirect, assessment according to the Red List criteria. Data Deficient is therefore not a category of threat. Listing of biotope (habitat) in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
		A habitat or biotope is Data Deficient when there is inadequate information to make a direct, or indirect, assessment according to the Red List criteria. Data Deficient is therefore not a category of threat. Listing of habitats/biotopes in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. (HC)
		A habitat type is placed in the data deficient category when it is very uncertain which category is correct and the appropriate category clearly includes the entire range from CR to LC, inclusive. (NO)
NE	Not Evaluated	This category includes biotopes (habitats) occurred in the area of the Carpathian region but they are not evaluated in terms of their vulnerability and rareness for the needs of the Red List. It includes particularly artificial biotopes (habitats), e.g. biotopes of ruderal and segetal vegetation, agricultural cultures, biotopes of urban environment etc. Also biotopes (habitats) with no relevant data concerning their character can be included here.
		A habitat or biotope is Not Evaluated when it is has not yet been evaluated against the criteria. (HC)
		A habitat type belongs to the not evaluated category when no Red List assessment has been performed for it. This may, for example, be due to poorly investigated classification, very little existing knowledge or a lack of available expertise. This category is also used for assessment units when types overlap at different levels in the NiN system and a choice has been made as to which level the Red List assessment will be performed on. Those which will not be evaluated are placed in NE. (NO)
NA	Not Applicable	Biotope (habitat) belongs to the not applicable category when it is deemed irrelevant for evaluation at the national or regional level. These biotopes (habitats) do not occur in a given area.
		A habitat type belongs to the not applicable category when it is deemed irrelevant for evaluation at the national level. This mainly concerns habitat types on artificial and constructed sites. (NO)

Abbreviations:
 NO – Norwegian Red List for Ecosystems and Habitat Types 2011
 HC – HELCOM Red List Biotopes 8/2012, Document 5/1

Categories for regional assessment are shown in Fig. 2. Final version of the Carpathian Red List will be the result of a scientific consensus reached by chosen experts. It will be publicised on BIOREGIO and Carpathian Convention website for following discussion and updating.

Criteria for red listing of biotopes (habitats) – the Carpathian region

We proposed seven types of criteria for the assessment of non-forest Carpathian biotopes (habitats) on the base of: recently published works (above mentioned and commented), knowledge about character and distribution of assessed non-forest biotopes (habitats) and knowledge of recent partial assessment used in several studies focused on biotopes (habitats) classification, evaluation of its favourable condition or human impacts appraisal.

Criterion A. Reduction in area (Decline in distribution)
Criterion B. Restricted distribution
Criterion C. Very rare occurrence
Criterion D. Disruption of natural conditions (Environmental degradation)
Criterion E. Disruption of biotic interactions
Criterion F. Disruption of biotope favourable status
Criterion G. Quantitative estimates of risk of biotope collapse

Criterion A. Reduction in area (Decline in distribution)

In the assessment according to criteria of Reduction in area (Decline in distribution) we propose take to consideration size of evaluated biotopes (habitats) (rare habitats are not included) as well as time horizon.

1. Common biotopes (habitats) covering large area (spread on several localities or occupy large area)

1.1. Reduction in area during last 50 (100) years or longer historical period

1.1.1. Observed, estimated or inferred long-term reduction in distribution of biotope (habitat) during the historical period of more than 100 (250) years of

100 % (in all cases the time period)		CO or RC
≥ 90 %	[90, 100) %	CR
≥ 70 %	[70, 90) %	EN
≥ 50 %	[50, 70) %	VU
≥ 20 %	[20, 50) %	NT
≥ 5 %	[5, 20) %	LC
< 5 %	[0, 5) %	ES

1.1.2. Observed, estimated or inferred reduction in distribution of biotope (habitat) over the last 50 (100) years of

100 % (in all cases the time period)		CO or RC
≥ 80 %	[80, 100) %	CR
≥ 50 %	[50, 80) %	EN
≥ 30 %	[30, 50) %	VU
≥ 15 %	[15, 30) %	NT
≥ 5 %	[5, 15) %	LC
< 5 %	[0, 5) %	ES

1.1.3. Projected or suspected reduction in distribution of biotope (habitat) within the next 50 years or over any 50-year period including the present and future of

≥ 80 %	[80, 100) %	CR

≥ 50 %	[50, 80) %	EN
≥ 30 %	[30, 50) %	VU
≥ 15 %	[15, 30) %	NT
≥ 5 %	[5, 15) %	LC
< 5 %	[0, 5) %	ES

1.2. Reduction in area during last 25 (10) years

1.2.1. Observed, estimated or inferred reduction in distribution of biotope (habitat) over the last 25 (10) years of

100 % (in all cases the time period)		CO or RC
≥ 75 %	[75, 100) %	CR
≥ 50 %	[50, 75) %	EN
≥ 20 %	[20, 50) %	VU
≥ 5 %	[5, 20) %	NT
< 5 %	(0, 5) %	LC
0 %	0 %	ES

1.2.2. Projected or suspected reduction in distribution within the next 25 years or over any 25-year period including the present and future of

≥ 75 %	[75, 100) %	CR
≥ 50 %	[50, 75) %	EN
≥ 20 %	[20, 50) %	VU
≥ 5 %	[5, 20) %	NT
< 5 %	(0, 5) %	LC
0 %	0 %	ES

2. Less spread biotopes (habitats) covering small area (spread on less or more number of localities with small area)

2.1. Reduction in area during last 50 (100) years or longer historical period

2.1.1. Observed, estimated or inferred long-term reduction in distribution of biotope (habitat) during the historical period of more than 100 (250) years of

100 % (in all cases the time period)		CO or RC
≥ 80 %	[80, 100) %	CR
≥ 60 %	[60, 80) %	EN
≥ 40 %	[40, 60) %	VU
≥ 15 %	[15, 40) %	NT
≥ 5 %	[5, 15) %	LC
< 5 %	[0, 5) %	ES

2.1.2. Observed, estimated or inferred reduction in distribution of biotope (habitat) over the last 50 (100) years of

100 % (in all cases the time period)		CO or RC
≥ 75 %	[75, 100) %	CR
≥ 50 %	[50, 75) %	EN
≥ 25 %	[25, 50) %	VU
≥ 10 %	[10, 25) %	NT
≥ 5 %	[5, 10) %	LC
< 5 %	[0, 5) %	ES

2.1.3. Projected or suspected reduction in distribution of biotope (habitat) within the next 50 years or over any 50-year period including the present and future of

≥ 75 %	[75, 100) %	CR

≥ 50 %	[50, 75) %	EN
≥ 25 %	[25, 50) %	VU
≥ 10 %	[10, 25) %	NT
≥ 5 %	[5, 10) %	LC
< 5 %	[0, 5) %	ES

2.2. Reduction in area during last 25 (10) years

2.2.1. Observed, estimated or inferred reduction in distribution of biotope (habitat) over the last 25 (10) years of

100 % (in all cases the time period)		CO or RC
≥ 70 %	[70, 100) %	CR
≥ 40 %	[40, 70) %	EN
≥ 15 %	[15, 40) %	VU
≥ 5 %	[5, 15) %	NT
< 5 %	[0, 5) %	LC
0 %	0 %	ES

2.2.2. Projected or suspected reduction in distribution within the next 25 years or over any 25-year period including the present and future of

≥ 70 %	[70, 100) %	CR
≥ 40 %	[40, 70) %	EN
≥ 15 %	[15, 40) %	VU
≥ 5 %	[5, 15) %	NT
< 5 %	[0, 5) %	LC
0 %	0 %	ES

Criterion B.   Restricted distribution

In this case we actually used similar scheme as Rodríguez et al. (2011) in criteria C: Small current distribution and decline and D: Very small current distribution or Keith et al. (2012, unpublished) in criteria B: Geographic distribution is restricted. For Carpathian it is necessary to adjust values of the habitats distribution – Extent of occurrence EOO or Area of occupancy AOO. In the proposal we have currently provided several values, which is necessary to specify after consultation with experts from other involved countries.

1. Small current distribution and decline (in distribution or ecological function)

1.1. Extent of occurrence (EOO) estimated to be

0 km^2		CO or RC
≤ 1 (3) km^2	(0, 1] km^2 or (0, 3] km^2	CR
≤ 5 (15) km^2	(1, 5] km^2 or (3, 15] km^2	EN
≤ 20 (50) km^2	(5, 20] km^2 or (15, 50] km^2	VU
≤ 50 (100) km^2	(20, 50] km^2 or (50, 100] km^2	NT

with an area of > 50 (100) km^2 evaluate according to criterion A

and at least one of the following:

    a) an observed or inferred continuing decline in:
       aa) a measure of spatial extent appropriate to the biotope (habitat); or
       ab) a measure of environmental quality appropriate to the characteristic biota of the biotope (habitat); or
       ac) a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat);

b) observed or inferred threatening processes that are likely to cause continuing declines in either geographic distribution, environmental quality or biotic interactions within the next 20 years;

c) biotope (habitat) exists at
   ca) only a single location if EOO ≤ 1 (3) km^2,
   cb) 5 or fewer locations if EOO ≤ 5 (15) km^2,
   cc) 10 or fewer locations if EOO ≤ 20 (50) km^2;

1.2. <u>**Area of occupancy (AOO)**</u> (the number of 1 × 1 or 3 × 3 (or 5 × 5) km grid cells occupied) estimated to be

0		CO or RC
≤ 2	(0, 2]	CR
≤ 5	(2, 5]	EN
≤ 20	(5, 20]	VU
≤ 50	(20, 50]	NT

with the presence of a larger number of grid cells of 50 evaluate according to criterion A

and least one of the following:

a) an observed or inferred continuing decline in:
   aa) a measure of spatial extent appropriate to the biotope (habitat); or
   ab) a measure of environmental quality appropriate to the characteristic biota of the biotope (habitat); or
   ac) a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat);

b) observed or inferred threatening processes that are likely to cause continuing declines in either geographic distribution, environmental quality or biotic interactions within the next 20 years;

c) biotope (habitat) exists at
   ca) only a single location if AOO ≤ 2 grid cells (1 × 1 or 3 × 3 km),
   cb) 5 or fewer locations if AOO ≤ 5 grid cells (1 × 1 or 3 × 3 km),
   cc) 10 or fewer locations if AOO ≤ 20 grid cells (1 × 1 or 3 × 3 km);

2. <u>**Small current distribution (occurrence) in orographic units (OOU)**</u> estimated to be

0		CO or RC
≤ 2	(0, 2]	CR
≤ 5	(2, 5]	EN
≤ 20	(5, 20]	VU
≤ 50	(20, 50]	NT

with occurrence in larger number of orographic units as 25 evaluate according to criterion A

and at least one of the following:

a) an observed or inferred continuing decline in:
   aa) a measure of spatial extent appropriate to the biotope (habitat); or
   ab) a measure of environmental quality appropriate to the characteristic biota of the biotope (habitat); or
   ac) a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat);

b) observed or inferred threatening processes that are likely to cause continuing declines in either geographic distribution, environmental quality or biotic interactions within the next 20 years;

c) biotope (habitat) exists at
   ca) only a single location in given orographic unit,
   cb) 5 or fewer locations in given orographic unit,

cc) 10 or fewer locations in given orographic unit;

Criterion C.   Very rare occurrence

A very small number of locations and prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of collapse or becoming CR within a very short time period.

Very small current distribution estimated to be

0		CO or RC
≤ 5	(0, 5]	CR
≤ 10	(5, 10]	EN
≤ 25	(10, 25]	VU

with occurrence on several localities evaluate according to criterion B or A

Area of particular habitat in whole territory of the occurrence is no more than 1 km^2 eventually in case of category VU the area can slightly exceed 1 km^2.

Criterion D.   Disruption of natural conditions (Environmental degradation)

Similar scheme to Keith et al. (2012, unpublished) in C criteria: Change in an abiotic component that degrades the environment for characteristic biota of the ecosystem (Environmental degradation) was used in the assessment of natural conditions disturbances. Some values were modified and data were completed for other criteria of threat.

In this case we propose possibility to divide evaluation of natural environment disturbances caused by natural changes (on global as well as regional and local level) and evaluation of natural environment disturbances caused by anthropogenous activities (mainly direct impacts, various human activities, changes after realization of particular activities etc.).

This two level evaluation is reasonable due to the fact that natural development of the environment and its changes last longer time period but actually these are more significant and often irreversible. Throughout this time biotopes (habitats, ecosystems) and its elements (plants, animals and its communities) can adapt itself, change sites, change to different natural biotope of this region etc.. Changes can be significant, unfavourable for particular biotope (habitat) but overall for natural conditions not negative.

Disturbance of natural condition by direct or indirect anthropogenous activities is visible in short term period and it is more intensive but often only on local level. Biotopes (habitats, ecosystems) and its elements (plants, animals and its communities) moreover cannot adequately react on these changes and getting liquidated. On the other hand when anthropogenous disturbances are over and global conditions are preserved, there is possibility of biotopes (habitats) revitalizations. All in all these changes and disturbances are significant and negative for particular biotope (habitat) as well as natural environment at all.

1. **Changes of abiotic components which cause degradation of the environment for characteristic biota of the biotope (habitat) – natural changes of the environment**

   1.1. **Changes of natural environment within 50 (100) years or longer historical period**

      1.1.1. **Observed, estimated or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the last 100** (250) **years** (historically confirmed changes of natural environment):

      100 % area with 100 % degradation   CO or RC

≥ 90 % area with ≥ 90 % relative degradation	CR
≥ 70 % area with ≥ 90 % relative degradation	EN
≥ 90 % area with ≥ 70 % relative degradation	EN
≥ 70 % area with ≥ 70 % relative degradation	VU
≥ 50 % area with ≥ 80 % relative degradation	VU
≥ 80 % area with ≥ 50 % relative degradation	VU
≥ 40 % area with ≥ 40 % relative degradation	NT
≥ 20 % area with ≥ 50 % relative degradation	NT
≥ 50 % area with ≥ 20 % relative degradation	NT
≥ 10 % area with ≥ 10 % relative degradation	LC
> 0 % area with ≥ 20 % relative degradation	LC
≥ 20 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

1.1.2. Observed, estimated or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the last 50 years:

100 % area with 100 % degradation	CO or RC
≥ 80 % area with ≥ 80 % relative degradation	CR
≥ 50 % area with ≥ 80 % relative degradation	EN
≥ 80 % area with ≥ 50 % relative degradation	EN
≥ 50 % area with ≥ 50 % relative degradation	VU
≥ 25 % area with ≥ 75 % relative degradation	VU
≥ 75 % area with ≥ 25 % relative degradation	VU
≥ 25 % area with ≥ 25 % relative degradation	NT
≥ 5 % area with ≥ 50 % relative degradation	NT
≥ 50 % area with ≥ 5 % relative degradation	NT
≥ 5 % area with ≥ 5 % relative degradation	LC
> 0 % area with ≥ 10 % relative degradation	LC
≥ 10 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

1.1.3. Projected or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the next 50 years or any 50-year period including the present and future:

≥ 80 % area with ≥ 80 % relative degradation	CR
≥ 50 % area with ≥ 80 % relative degradation	EN
≥ 80 % area with ≥ 50 % relative degradation	EN
≥ 50 % area with ≥ 50 % relative degradation	VU
≥ 25 % area with ≥ 75 % relative degradation	VU
≥ 75 % area with ≥ 25 % relative degradation	VU
≥ 25 % area with ≥ 25 % relative degradation	NT
≥ 5 % area with ≥ 50 % relative degradation	NT
≥ 50 % area with ≥ 5 % relative degradation	NT
≥ 5 % area with ≥ 5 % relative degradation	LC
> 0 % area with ≥ 10 % relative degradation	LC
≥ 10 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

1.2. Changes of natural environment within 25 (10) years (it is necessary to consider reasonability of defining criteria with shorter time period as 50 years)

1.2.1. Observed, estimated or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the last 25 (10) years

A value probably as it is in 1.1.2. criterion, depend on concrete cases.

1.2.2. Projected or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the next 25 years or over any 25-year period including the present and future

A value probably as it is in 1.1.3. criterion, depend on concrete cases.

2. Changes of abiotic components which cause degradation of the environment for characteristic biota of the biotope (habitat) – anthropogenous changes of the environment

2.1. Changes of natural environment within 50 years or longer historical period

2.1.1. Observed, estimated or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the last 50 years (historically confirmed changes of natural environment):

100 % area with 100 % degradation	CO or RC
≥ 80 % area with ≥ 80 % relative degradation	CR
≥ 50 % area with ≥ 80 % relative degradation	EN
≥ 80 % area with ≥ 50 % relative degradation	EN
≥ 50 % area with ≥ 50 % relative degradation	VU
≥ 25 % area with ≥ 75 % relative degradation	VU
≥ 75 % area with ≥ 25 % relative degradation	VU
≥ 25 % area with ≥ 25 % relative degradation	NT
≥ 5 % area with ≥ 50 % relative degradation	NT
≥ 50 % area with ≥ 5 % relative degradation	NT
≥ 5 % area with ≥ 5 % relative degradation	LC
> 0 % area with ≥ 10 % relative degradation	LC
≥ 10 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

2.2. Changes of natural environment within 25 years or shorter period

2.2.1. Observed, estimated or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the last 25 years:

100 % area with 100 % degradation	CO or RC
≥ 75 % area with ≥ 75 % relative degradation	CR
≥ 50 % area with ≥ 75 % relative degradation	EN
≥ 75 % area with ≥ 50 % relative degradation	EN
≥ 40 % area with ≥ 40 % relative degradation	VU
≥ 20 % area with ≥ 50 % relative degradation	VU
≥ 50 % area with ≥ 20 % relative degradation	VU
≥ 15 % area with ≥ 15 % relative degradation	NT
≥ 5 % area with ≥ 25 % relative degradation	NT
≥ 25 % area with ≥ 5 % relative degradation	NT
≥ 3 % area with ≥ 3 % relative degradation	LC
> 0 % area with ≥ 5 % relative degradation	LC
≥ 5 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

2.2.2. Projected or inferred changes in an environmental variable appropriate to the characteristic biota of the biotope (habitat) over the next 25 years or any 25-year period including the present and future:

≥ 75 % area with ≥ 75 % relative degradation	CR
≥ 50 % area with ≥ 75 % relative degradation	EN
≥ 75 % area with ≥ 50 % relative degradation	EN
≥ 40 % area with ≥ 40 % relative degradation	VU

≥ 20 % area with ≥ 50 % relative degradation	VU
≥ 50 % area with ≥ 20 % relative degradation	VU
≥ 15 % area with ≥ 15 % relative degradation	NT
≥ 5 % area with ≥ 25 % relative degradation	NT
≥ 25 % area with ≥ 5 % relative degradation	NT
≥ 3 % area with ≥ 3 % relative degradation	LC
> 0 % area with ≥ 5 % relative degradation	LC
≥ 5 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

Criterion E.   Disruption of biotic interactions

In the process of the assessment of disruption of biotic processes and interactions, we used similar scheme as Keith et al. (2012, unpublished) in criteria D: Disruption of biotic processes or interactions that sustain the characteristic biota of the ecosystem). We adjusted some values and completed data for others categories of threat. We used same criteria for classification as in the case of changes of natural environment.

1. Disruption of biotic processes or interactions that sustain the characteristic biota of the biotope (habitat) – natural changes of the environment

1.1. Changes of natural environment within 50 (100) years or longer historical period

1.1.1. Observed, estimated or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the last 100 (250) **years** (historically confirmed changes of natural environment):

100 % area with 100 % degradation	CO or RC
≥ 90 % area with ≥ 90 % relative degradation	CR
≥ 70 % area with ≥ 90 % relative degradation	EN
≥ 90 % area with ≥ 70 % relative degradation	EN
≥ 70 % area with ≥ 70 % relative degradation	VU
≥ 50 % area with ≥ 80 % relative degradation	VU
≥ 80 % area with ≥ 50 % relative degradation	VU
≥ 40 % area with ≥ 40 % relative degradation	NT
≥ 20 % area with ≥ 50 % relative degradation	NT
≥ 50 % area with ≥ 20 % relative degradation	NT
≥ 10 % area with ≥ 10 % relative degradation	LC
> 0 % area with ≥ 20 % relative degradation	LC
≥ 20 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

1.1.2. Observed, estimated or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the last 50 years:

100 % area with 100 % degradation	CO or RC
≥ 80 % area with ≥ 80 % relative degradation	CR
≥ 50 % area with ≥ 80 % relative degradation	EN
≥ 80 % area with ≥ 50 % relative degradation	EN
≥ 50 % area with ≥ 50 % relative degradation	VU
≥ 25 % area with ≥ 75 % relative degradation	VU
≥ 75 % area with ≥ 25 % relative degradation	VU
≥ 25 % area with ≥ 25 % relative degradation	NT
≥ 5 % area with ≥ 50 % relative degradation	NT

≥ 50 % area with ≥ 5 % relative degradation	NT
≥ 5 % area with ≥ 5 % relative degradation	LC
> 0 % area with ≥ 10 % relative degradation	LC
≥ 10 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

1.1.3. Projected or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the next 50 years or any 50-year period including the present and future:

≥ 80 % area with ≥ 80 % relative degradation	CR
≥ 50 % area with ≥ 80 % relative degradation	EN
≥ 80 % area with ≥ 50 % relative degradation	EN
≥ 50 % area with ≥ 50 % relative degradation	VU
≥ 25 % area with ≥ 75 % relative degradation	VU
≥ 75 % area with ≥ 25 % relative degradation	VU
≥ 25 % area with ≥ 25 % relative degradation	NT
≥ 5 % area with ≥ 50 % relative degradation	NT
≥ 50 % area with ≥ 5 % relative degradation	NT
≥ 5 % area with ≥ 5 % relative degradation	LC
> 0 % area with ≥ 10 % relative degradation	LC
≥ 10 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

1.2. Changes of natural environment within 25 (10) years (it is necessary to consider reasonability of defining criteria with shorter time period as 50 years)

1.2.1. Observed, estimated or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the last 25 (10) **years**

A value probably as it is in 1.1.2. criterion, depend on concrete cases.

1.2.2. Projected or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the next 25 years or over any 25-year period including the present and future

A value probably as it is in 1.1.3. criterion, depend on concrete cases.

2. Disruption of biotic processes or interactions that sustain the characteristic biota of the biotope (habitat) – anthropogenous changes of the environment

2.1. Changes of natural environment within 50 years or longer historical period

2.1.1. Observed, estimated or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the last 50 years (historically confirmed changes of natural environment):

100 % area with 100 % degradation	CO or RC
≥ 80 % area with ≥ 80 % relative degradation	CR
≥ 50 % area with ≥ 80 % relative degradation	EN
≥ 80 % area with ≥ 50 % relative degradation	EN
≥ 50 % area with ≥ 50 % relative degradation	VU
≥ 25 % area with ≥ 75 % relative degradation	VU
≥ 75 % area with ≥ 25 % relative degradation	VU
≥ 25 % area with ≥ 25 % relative degradation	NT
≥ 5 % area with ≥ 50 % relative degradation	NT

≥ 50 % area with ≥ 5 % relative degradation	NT
≥ 5 % area with ≥ 5 % relative degradation	LC
> 0 % area with ≥ 10 % relative degradation	LC
≥ 10 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

2.2. Changes of natural environment within 25 years or shorter period

2.2.1. Observed, estimated or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the last 25 years:

100 % area with 100 % degradation	CO or RC
≥ 75 % area with ≥ 75 % relative degradation	CR
≥ 50 % area with ≥ 75 % relative degradation	EN
≥ 75 % area with ≥ 50 % relative degradation	EN
≥ 40 % area with ≥ 40 % relative degradation	VU
≥ 20 % area with ≥ 50 % relative degradation	VU
≥ 50 % area with ≥ 20 % relative degradation	VU
≥ 15 % area with ≥ 15 % relative degradation	NT
≥ 5 % area with ≥ 25 % relative degradation	NT
≥ 25 % area with ≥ 5 % relative degradation	NT
≥ 3 % area with ≥ 3 % relative degradation	LC
> 0 % area with ≥ 5 % relative degradation	LC
≥ 5 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

2.2.2. Projected or inferred detrimental changes in a measure of disruption to biotic interactions appropriate to the characteristic biota of the biotope (habitat) over the next 25 years or any 25-year period including the present and future:

≥ 75 % area with ≥ 75 % relative degradation	CR
≥ 50 % area with ≥ 75 % relative degradation	EN
≥ 75 % area with ≥ 50 % relative degradation	EN
≥ 40 % area with ≥ 40 % relative degradation	VU
≥ 20 % area with ≥ 50 % relative degradation	VU
≥ 50 % area with ≥ 20 % relative degradation	VU
≥ 15 % area with ≥ 15 % relative degradation	NT
≥ 5 % area with ≥ 25 % relative degradation	NT
≥ 25 % area with ≥ 5 % relative degradation	NT
≥ 3 % area with ≥ 3 % relative degradation	LC
> 0 % area with ≥ 5 % relative degradation	LC
≥ 5 % area with > 0 % relative degradation	LC
≥ 0 % area with ≥ 0 % relative degradation	ES

Criterion F. Disruption of biotope favourable status

For evaluation of threats of non-forest biotopes (habitats) it could be used principles and methodical approaches of favourable status of biotopes and species of European importance (according to Polák, Saxa 2005).

Evaluation of the area, size of locality, changes of biotopes (habitats) occurrence etc. would be in this case partially the duplicity with criteria A, B and C, but other following parameters enter the evaluation: species composition of biotopes, occurrence of characteristic and

diagnostic species, status of ecosystem (partially involved within the criteria E). It is complex evaluation of particular biotopes (habitats).

Recent methodical approaches and evaluation of biotopes (Polák, Saxa, 2005) are defined only for biotopes of European importance. Criteria of evaluation of other categories of habitats do not exist. Work experiences have confirmed that there are some faults and inaccuracies which are necessary to remove and whole methodical approach of the evaluation of favourable habitat status is need to be revised.

Finalizing of the manual for evaluation of favourable habitat status seems to be realistic in short time period because there will be available a lot of data for its objective reviewing especially throughout the material processing for red list elaboration.

If this criterion (Criterion F. Disruption of biotope favourable status) is approved for evaluation of habitats threats, it will be finalized to useful version for this work.

Currently we established following classification for habitats threats evaluation:

Unfavourable status of biotope (habitat) – inappropriate	CR
Unfavourable status of biotope (habitat) – very disturbed	EN
Unfavourable status of biotope (habitat) – disturbed	VU
Unfavourable status of biotope (habitat) – moderately disturbed	NT
Favourable status of biotope (habitat) – good	LC
Favourable status of biotope (habitat) – excellent	ES

Criterion G.   Quantitative estimates of risk of ecosystem collapse

This criterion was also used by Keith et al. (2012, unpublished) as criterion E Quantitative analysis that estimates the probability of biotope collapse. We assigned following proposals:

≥ 75 % within 50 years	CR
≥ 50 % within 50 years	EN
≥ 25 % within 50 years	VU
≥ 10 % within 50 years	NT
≥ 5 % within 50 years	LC
< 5 % within 50 years	ES

Evaluation of biotopes (habitats) threats according to assigned criteria

It will be impossible to use particular criteria for some biotopes (habitats), because for the evaluation there won't be available sufficient data. In such case criterion will be evaluated as DD (Data Deficient).

The biotope (habitat) can be classified to following threats categories (in compliance to A – G criteria):

- if biotope (habitat) is evaluated according to any criteria as CR (Critically Endangered) all in all it will be classified as CR (Critically Endangered);
- if biotope (habitat) is evaluated according to any criteria as EN (Endangered) all in all it will be classified as EN (Endangered);
- if biotope (habitat) is evaluated according to any criteria as VU (Vulnerable) all in all it will be classified as VU (Vulnerable);
- if biotope (habitat) is evaluated according to any criteria as NT (Near Threatened) all in all it will be classified as NT (Near Threatened);

- the biotope (habitat) can be classified into categories LC (Least Concern) or ES (Ecologically Satisfactory), only if it is not classified within NT, VU, EN or CR other category.

The biotopes (habitats), not occurred in the Carpathian region due to the character of natural conditions, are classified in category NA (Not Applicable). The biotopes (habitats) occurred in the region but not included within the frame of threats evaluation are classified as NE (Not Evaluated).

Database structure of biotopes (habitats) – the Carpathian region

Name of biotope (habitat)
Red List Category

Syntaxonomy
Characteristics
Basic species composition
Protected, rare, endangered and endemic plant species
Significance for fauna – protected, rare, endangered and endemic animal species

Distribution
Important localities (areas) of occurrence
Map of distribution

Current conservation
Threats, risk factors
Draft (project) of protection / management

Assessment procedure and criteria for red listing

Photodocumentation

References
Comments

Date of assessment
Person of data processing

Data sheet of biotopes (habitats) – the Carpathian region

Name of biotope (habitat)

Code and name according to EUNIS (Davies, Moss, 2001, Davies, Moss, Hill, 2004)
Code and name according to NATURA 2000 (EUR27)
Code and name SK (Stanová, Valachovič, 2002; Ružičková et al., 1996)
Code and name xxx – other countries – CZ, PL, UA, HU, RO, SR (national publications)

- codes and names of biotopes (habitats) according to EUNIS: *rolling list according to cited references*;
- codes and names of biotopes (habitats) according to NATURA 2000: *rolling list according to cited references*;
- codes and names of biotopes (habitats) according to national lists: *common text field, where particular countries will put the names separately*.

In case we decide, that it is important, we can write also other names of biotopes (habitats), e.g. in compliance with CORINE (Wyatt, 1991), Emerald/Smaragd or Pal. Hab (Devillers, Devillers-Terschuren, 1996, 1999).

Red List Category

CO   Collapsed
RC   Regionally Collapsed
CR   Critically Endangered
EN   Endangered
VU   Vulnerable
NT   Near Threatened
LC   Least Concern
ES   Ecologically Satisfactory
DD   Data Deficient
NE   Not Evaluated
NA   Not Applicable

- Threats: *rolling system with above mentioned values.*

Syntaxonomy

Syntaxonomy   valid names of particular phytocoenosis (complete references)

Affinity of particular syntaxonomical units (together with their hierarchical classification: class – order – suborder – alliance – suballiance – association – subassociation) to particular biotope – in compliance with valid classification of particular country.

Afterwards (in case of differences in communities' classification) we will try to unify the classification to use it in whole Carpathian region.

- Syntaxonomy: *currently it will be common text field*, where particular countries will write the syntaxons in compliance with national valid classification. After completing and processing of the data material from whole Carpathian region it is possible to elaborate

rolling list in hierarchical classification, where each syntaxon will have its own code and name.

Characteristics

Basic characteristic of biotope (habitat) – structure, ecology, important features.

- Characteristic: *common text field*.

Basic species composition

Basic species composition (plant species) – diagnostic species composition (Diagnostic Taxa Combination = characteristic species (characteristic taxa - CH), differential species (differential taxa – D) and constant accompanying species (constant taxa – C), or in hierarchy: diagnostic species (diagnostic taxa - Dg), constant species (constant taxa - C) and dominant species (dominant taxa - Dm).

In case that particular biotope (habitat) includes several vegetation units (e.g. associations, alliances etc.) species composition will be processed for particular units separately.

- Basic species composition: *common text field*.
- For taxa nomenclature unification it would be convenient to use of any taxa database e.g. Marhold, Hindák, 1998 in Slovakia – available on Institute of Botany of SAS web site (would the connection be possible?) or Flora Europaea (some Western Carpathian species miss here).

Protected, rare, endangered and endemic plant species

Data of important flora species occurrence within particular biotope (habitat).

- Important species: *common text field* – just for the beginning because it would be necessary to include species mentioned in particular lists of all concerned countries.
- Protected species: *rolling list which will contain valid list of protected species in the terms of valid legislation* – necessary for each country separately, or common list with possible state mark where it is protected (if it is not everywhere).
- Endangered and rare species: *rolling system which can follow the Red list of species processed within this project* (currently Baláž et al., 2001, Feráková et al., 2001, Kubinská et al., 2001, Pišút et al., 2001).
- Endemic species: *rolling list* – necessary to process endemic list of whole Carpathians (in Slovakia: Kliment, 1999).
- It would be convenient to use any of databases (e.g. Marhold, Hindák, 1998 in Slovakia – available on Institute of Botany of SAS web site) for species names unification (would the connection and link be possible?) or Flora Europaea (some Western Carpathian species miss here).

Significance for fauna – protected, rare, endangered and endemic animal species

Data of important fauna species occurrence within particular biotope (habitat).

- Important fauna species: *common text field* – it would be good to do the link to Red list of fauna species (processed within the framework of this project).

Distribution

Distribution of biotopes (habitats) depending on ecological factors.
Occurrence of particular biotopes (habitats) regarding to geomorphology.

- Distribution: *text field*;
- Distribution regarding to geomorphology: *rolling system with geomorphologic units*;
- Link to map output.

Important localities (areas) of occurrence – Map of distribution

Data dealing with the most important localities.

- Important localities: *text field*;
- To consider possibilities of map of occurrence elaboration.

Current conservation

Presentation of current state of biotopes (habitats) protection – affinity to protection area, area of European importance etc.

- Protection: *text field* – if we want to preserve wider definition of biotopes (habitats) occurrence and protection areas;
- Protection: *rolling system* – if we are able to process list of all protection areas in particular categories, eventually in terms of Degrees of Protection etc.

Threats, risk factors

Defining of basic threats factors, risk threats factors.
Description of specific threatening elements.

- Threats: *rolling list* – basic factors.
- Risk factors: *rolling list*.
- Threats: *text field* - specification.

Draft (project) of protection / management

Description of possible protection proposals – legislation, management etc.

- Protection and management: *text field*.

Assessment procedure and criteria for red listing

All the criteria of biotopes (habitats) evaluation and threat categories classification will be included in this section. Of that it would be clear which approach and which criteria were chosen for particular threat category classification.

- Criteria: *rolling system with values mentioned in criteria from A to G.*

Photodocumentation

Photo-documentation of particular biotope (habitat) from different localities.

- Photo-documentation: *figure field* – possibility of figures inserting.

References

The survey of references dealing with particular biotope (habitat).

- References: *text fields.*

Comments

- Comments: *text fields.*

Other information

Date of assessment
Person of data processing

Preliminary list of non-forest biotopes (habitats) – Slovakia

List of biotopes (habitats) according to EUNIS:

> Davies et. al., 2004: EUNIS habitat classification, Revised 2004, ANNEX 1 – Index numbers and names of all EUNIS Habitats 2004

Some of biotopes (habitats) not occurred in Carpathians are included in category of NA (Not Applicable), e.g.:

A Marine habitats	NA
B Coastal habitats	NA
D3 Aapa, palsa and polygon mires	NA
E7 Sparsely wooded grasslands	NA
F1 Tundra	NA
F5 Maquis, arborescent matorral and thermo-Mediterranean brushes	NA
F6 Garrigue	NA
F7 Spiny Mediterranean heaths	NA
F8 Thermo-Atlantic xerophytic scrub	NA
H4 Snow or ice-dominated habitats	NA
H5 Miscellaneous inland habitats with very sparse or no vegetation	NA
H6 Recent volcanic features	NA

Some of biotopes (habitats) occurred in Carpathians but not included in the framework of non-forest habitats evaluation are classified within the category NE (Not Evaluated), e.g.:

G Woodland, forest and other wooded land	NE
I Regularly or recently cultivated agricultural, horticultural and domestic habitats	NE
J Constructed, industrial and other artificial habitats	NE

On the base of preliminary list of biotopes (habitats) occurred in Slovakia, which will be evaluated within the Red List elaboration, we identified 115 biotopes (habitats). Below we provide the list of biotopes (habitats):

C Inland surface waters
C1 Surface standing waters

C1.1 Permanent oligotrophic lakes, ponds and pools		BEI
C1.14 Charophyte submerged carpets in oligotrophic waterbodies		BEI
C1.2 Permanent mesotrophic lakes, ponds and pools		BEI
C1.3 Permanent eutrophic lakes, ponds and pools		BEI
C1.32 Free-floating vegetation of eutrophic waterbodies		BEI
C1.33 Rooted submerged vegetation of eutrophic waterbodies		BEI
C1.34 Rooted floating vegetation of eutrophic waterbodies		BEI
C1.4 Permanent dystrophic lakes, ponds and pools		BEI
C1.45 Peatmoss and *Utricularia* communities of dystrophic waterbodies		BEI

C2 Surface running waters

C2.11 Soft water springs		BNI
C2.121 Petrifying springs with tufa or travertine formations		BEI
C2.2 Permanent, non-tidal, fast, turbulent watercourses		BEI
C2.3 Permanent, non-tidal, smooth-flowing watercourses		BEI
C2.6 Beds of rivers and streams	?	BNI
C2.7 Riverine islets	?	BNI

C3 Littoral zone of inland surface waterbodies

C3.1 Species-rich helophyte beds		oB

C3.2 Water-fringing reedbeds and tall helophytes other than canes	oB	BNI
C3.26 *Phalaris arundinacea* beds		BNI
C3.4 Species-poor beds of low-growing water-fringing or amphibious vegetation		oB
C3.41 Euro-Siberian perennial amphibious communities		BEI
C3.5 Pioneer and ephemeral vegetation of periodically inundated shores	R-NE	oB
C3.51 Euro-Siberian dwarf annual amphibious swards		BEI
C3.52 Euro-Siberian dwarf annual amphibious swards		oB
C3.53 Euro-Siberian annual river mud communities		BEI
C3.55 Sparsely vegetated river gravel banks		BEI

D Mires, bogs and fens
D1 Raised and blanket bogs

D1.11 Active, relatively undamaged raised bogs	BEI
D1.111 Raised bog hummocks, ridges and lawns	BEI
D1.112 Raised bog hollows (schlenken)	BEI
D1.12 Damaged, inactive bogs	BEI
D1.122 Drained raised bogs	BEI
D1.123 Ditched raised bogs	BEI

D2 Valley mires, poor fens and transition mires

D2.2 Poor fens and soft-water spring mires	BEI
D2.3 Transition mires and quaking bogs	BEI
D2.3H Wet, open, acid, peat and sand with *Rhynchospora alba* and *Drosera*	BEI
D2.3H1 Nemoral bare peat communities	BEI
D2.3H2 Boreal mud-bottom communities	BEI

D4 Base-rich fens and calcareous spring mires

D4.1 Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks	BEI

D5 Sedge and reedbeds, normally without free-standing water

D5.21 Beds of large *Carex* spp.	BNI
D5.24 Fen *Cladium mariscus* beds	BEI

D6 Inland saline and brackish marshes and reedbeds

D6.11 Interior European *Puccinelia distans* meadows	OCA	BEI
D6.14 Swards of Carpathian travertine concretions		BEI

E Grasslands and lands dominated by forbs, mosses or lichens
E1 Dry grasslands

E1.11 Euro-Siberian rock debris swards		BEI
E1.12 Euro-Siberian pioneer calcareous sand swards	OCA	BEI
E1.2 Perennial calcareous grassland and basic steppes		BEI
E1.22 Arid subcontinental steppic grassland (*Festucion valesiacae*)		BEI
E1.23 Meso-xerophile subcontinental meadow-steppes (*Cirsio-Brachypodion*)		BEI
E1.28 Central European calcaro-siliceous grassland		BEI
E1.29 *Festuca pallens* grassland		BEI
E1.2C Pannonic loess stepic grassland		BEI
E1.2F Pannonic sand steppes	OCA	BEI
E1.71 *Nardus stricta* swards		BEI
E1.9 Non-Mediterranean dry acid and neutral open grassland, including inland dune grassland		BNI
E1.91 Dwarf annual siliceous grasslands		BNI
E1.94 Inland dune pioneer grassland	OCA	BEI
E1.95 Inland dune siliceous grassland	OCA	BEI
E1.9B Pannonic inland dunes	OCA	BEI

E2 Mesic grasslands

E2.1 Permanent mesotrophic pastures and aftermath-grazed meadow	BNI
E2.22 Sub-Atlantic lowland hay meadows	BEI
E2.3 Mountain hay meadows	BEI

E3 Seasonally wet and wet grasslands

E3.4 Moist or wet eutrophic and mesotrophic grassland — BNI
  E3.41 Atlantic and sub-Atlantic humid meadows — BNI
  E3.43 Subcontinental riverine meadows — BEI
  E3.44 Flood swards and related communities — BNI
  E3.46 Transitional tall herb humid meadows — oB
  E3.51 *Molinia caerulea* meadows and related communities — BEI

E4 Alpine and subalpine grasslands
E4.1 Snow-patch grassland (Vegetated snow-patch) — BEI
E4.2 Moss and lichen dominated mountain summits, ridges and exposed slopes — BEI
  E4.31 Alpic *Nardus stricta* swards and related communities — BEI
  E4.34 Alpigenous acidophilous grasslands — BEI
E4.4 Calciphilous alpine and subalpine grassland — BEI
  E4.41 Closed calciphile alpine grasslands — BEI
  E4.43 Calciphilous stepped and garland grassland — BEI
E4.5 Alpine and subalpine enriched grassland — BEI

E5 Woodland fringes and clearings and tall forb stands
E5.2 Termophile woodland fringes — BNI
E5.4 Moist or wet tall-herb and fern fringes and meadows — BEI
  E5.411 Watercourse veils (other than of *Filipendula*) — BEI
  E5.414 Continental river bank tall-herb communities dominated by *Filipendula* — BEI
  E5.423 Continental tall-herb communities of humide meadows — BEI
E5.5 Subalpine moist or wet tall-herb and fern habitats — BEI
  E5.52 Alpigene tall grass communities — BNI
  E5.58 Alpine *Rumex* communities — BEI
  E5.5B Alpine and subalpine fern stands — BEI

E6 Inland salt steppes
E6.2 Continental inland saline grass and herb-dominated habitats — OCA — BEI
  E6.21 Pannonic salt steppes and saltmarshes — OCA — BEI
  E6.23 Central Eurasian solonchak grassland dominated by *Crypsis* — OCA — BEI

F Heathland, scrub and tundra
F2 Arctic, alpine and subalpine scrub
F2.1 Subarctic and alpine dwarf willow scrub — BEI
F2.2 Evergreen alpine and subalpine heath and scrub — BEI
  F2.21 Alpine dwarf ericoid wind heaths — BEI
  F2.24 Alpigenic high mountain *Empetrum - Vaccinium* heaths — BEI
  F2.2A Alpine high mountain dwarf *Vaccinium* heaths — BEI
  F2.32 Subalpine and oroboreal *Salix* brush — BEI
  F2.33 Subalpine mixed brushes — BEI
  F2.46 Carpathian *Pinus mugo* scrub — BEI

F3 Temperate and mediterranean-montane scrub
F3.1 Temperate thickets and scrub — oB
  F3.16 *Juniperus communis* scrub — BEI
  F3.18 Inland dune thickets — BEI
  F3.24 Subcontinental and continental deciduous thickets — BEI

F4 Temperate shrub heathland
  F4.21 Submontane *Vaccinium - Calluna* heaths — BEI
  F4.22 Sub-Atlantic *Calluna - Genista* heaths — BEI
  F4.262 Dry sandy heaths with *Calluna* and *Genista* — BEI

F9 Riverine and fen scrubs
F9.1 Riverine scrub — BNI
  F9.11 Orogenous riverine brush — BEI
  F9.13 Montane river gravel low brush — BEI
F9.2 *Salix* carr and fen scrub — BNI

H Inland unvegetated or sparsely vegetated habitats

H1 Terrestrial underground caves, cave systems, passages and waterbodies

    H1 Terrestrial underground caves, cave systems and waterbodies   BEI

H2 Screes

    H2.31 Alpine siliceous screes   BEI

    H2.32 Medio-European upland siliceous screes   BEI

    H2.44 Carpathian calcareous screes   BEI

  H2.5 Acid siliceous screes of warm exposures   BEI

  H2.6 Calcareous and ultra-basic screes of warm exposures   BEI

    H2.61 Peri-Alpine thermophilous screes   BEI

H3 Inland cliffs, rock pavements and outcrops

    H3.11 Middle European montane siliceous cliffs   BEI

    H3.25 Alpine and sub-Mediterranean calcareous cliffs   BEI

  H3.4 Wet inland cliffs   BEI

  H3.6 Weathered rocks and outcrop habitats   BEI

Abbreviations:

Biotope (habitat) of EU importance	*BEI*
Biotope (habitat) of national importance	*BNI*
Other biotope (habitat)	*oB*
Biotope (habitat) with occurrence outside the Carpathian area	*OCA*
Biotope (habitat) of ruderal vegetation – not evaluated	*R-NE*
Need to be verified	*?*

Occurrence of any other biotopes (habitats) will be investigated within the database processing.

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