

# **Methodology for field inventory of habitats in Montenegro**

## ***Introduction***

The aim of this methodology is to prepare methodological framework, which should help in the inventory of NATURA 2000 habitats (Habitats Directive 92/43/EC Annex I habitat types) in Montenegro. However the methodology is set up broadly, so it can be used for mapping of any valuable natural, semi-natural and even artificial habitats.

## ***Definition of mapped objects***

The methodology is set up for the mapping of all habitats which are valuable from a nature conservation point of view. Objects of the interests are valuable Natura 2000 habitat types or other natural habitat types (in the case of habitat complexes).

## ***Mapping units***

Mapping units are habitat types according to the draft Catalogue of Habitats for Montenegro. In the cases when mapped habitats are not listed in the Catalogue of Habitats for Montenegro (other natural habitats not included in the Natura 2000 classification or non-natural habitats as urban areas, planted shrub areas, intensively used grasslands and agricultural areas, artificial water bodies, etc.) the EUNIS classification of habitats 2004 – 3<sup>rd</sup> level (e.g. B2.5: Shingle and gravel beaches with scrub) should be used.

## ***Mapping***

Every area larger than minimum area for mapping (see part [Minimum area for mapping](#)) is being mapped. The objects can be mapped as polygons, lines or points. The localities smaller than minimum area for mapping are mapped only if these are isolated, but unique from a national or regional point of view and sustainable!

Each mapper can use during the field work the topographic map 1: 25 000 or satellite images or aerial photos according the agreement with the co-ordinator of mapping.

The mapper has to delineate the mapping objects first if the pre-selected mapping areas are too big (more than 100 ha, pre-selected mapping areas from Emerald network or interesting sites identified by the desktop inventory) or if the mapping area doesn't have pre-selected mapping areas. Delineation of the borders of mapping objects has to respect the natural borders in the landscape (as ridges, valleys, streams, rivers etc.) or any homogenous parts of the landscape with natural habitats, or natural complexes of habitats. Artificial habitats (in EUNIS coding I and J and possible others habitat types as plantations of woods, intensively used grasslands, etc.) with area more than 1 ha have to be drawn to the working map as independent objects. The mapper does not have to describe these objects in the mapping forms, just mark them in the working map with the respective EUNIS code.

If the pre-selected mapping area is not accessible due to unexpected circumstances (as for example due to presence of thorny thick shrubs or as it is fenced) the mapper has to map an accessible sample from each mapping unit. In such case the mapper may use the best season in the year from the accessibility point of view (later autumn or early spring) for the mapping even if the season is not the best from viewpoint of the vegetation development.

Detailed steps of mapping:

- 1) Identify borders of homogenous areas of habitats according to the physiognomy of plant communities (description of habitat types is provided in the draft Catalogue of Habitats for Montenegro - PETROVIC, D., VUKSANOVIC, S. HADZIABLAHOVIC, S., MACIC, V., 2010)
- 2) Fill in the mapping form for every mapped homogenous area larger than 1 ha (except artificial objects covering more than 1 ha)
- 3) The homogenous areas smaller than 1 ha are mapped as complex of mapping units, the mapping form is filled for dominant mapping units and minor mapping units are only listed in the list of habitat types mapped
- 4) All mapping units in the complex and their coverage in % should be recognised and recorded. Sum coverage of all mapping units should give 100 %.
- 5) All species of higher plants determined on the transect made through the polygon (mapped object) are recorded in the form with their coverage on the mapped object indicated in the Tansley`s scale. Bryophytes, lichens or fungi may be recorded, if they are determined by mapper, but it is not an obligation. For the minor units recorded in the complex of mapping units only characteristic species with their coverage related to the entire area of the complex are recorded.
- 6) Representativity of the habitats (according to explanatory notes of the Standard data form – SDF – Official Journal of the European Communities No L 107/1 - 1997):  
Degree of representativity of the natural habitat types (mapping units) on the site. The degree of representativity gives a measure of “how typical” is the habitat type present on the site.
  - A - excellent representativity
  - B - good representativity
  - C - significant representativity
  - D - non-significant presence

Use the expert judgement to estimate the representativity of the habitat type.

- 7) Conservation status of the habitats (according to explanatory notes of SDF – Official Journal of the European Communities No L 107/1 - 1997):  
Degree of conservation of the structure and functions of the natural habitat type and restoration possibilities.
  - A: excellent conservation = excellent structure well conserved and excellent future prospects
  - B: good conservation = one or two of the indicators are not in the perfect stage (f.e. structure is excellent, but the conservation is not excellent and future prospects also)
  - C: average or reduced conservation = bad structure with insufficient conservation and unfavourable future prospect

Habitat structure and habitat function varies widely between different habitats but it is clear that the various ecological processes essential for a habitat have to be present and functioning for the habitat to be considered to be at excellent conservation status. Thus for a woodland habitat such processes would include regeneration and nutrient cycling and structure would include elements such as the age class structure and presence of dead wood. It may not be necessary for all elements to be present on all sites. Similarly for mires the eco-hydrological regime can be essential, so that disruptions to it by e.g. drainage can be C – average or reduce conservation status. Although fragmentation is not mentioned in the directive it is clear that fragmentation can disrupt habitat function and is a factor that should be taken into account when assessing structure & function (according to EC 2007 - Assessment, monitoring and reporting under Article 17 of the Habitats Directive).

Use the expert judgement to estimate the conservation status of the habitat type.

- 8) Only for forest habitats other characteristics related to naturalness and representativity should be recorded:
- a. Large Deadwood – estimated amount of large deadwood per ha (Large deadwood - more than 2 m long and more than 50 cm wide in diameter). Mapper should also recognize if the deadwood is proportionally distributed on the polygon (yes/no) and if the structure of deadwood is diverse (marked in the mapping form as “**D**”), or if only fresh (recent, hard) deadwood is present (marked as “**H**”) or only decomposed (old, soft) deadwood (marked “**S**”) is present.
  - b. Large diameter trees on the polygon – estimated amount of large diameter trees per ha (Large diameter trees, i.e. diameter in 1,3 m height (d1,3m) is more than 50 cm in diameter). Mapper should also recognize if the large diameter trees are proportionally distributed on the polygon (yes/no).
  - c. “Origin” of the forest – estimate the origin of the forests in four categories (estimation to be made for entire mapped polygon in general – prevail “origin”)
    - i. Original – primary high forests (with insignificant signs of human caused influence)
    - ii. Secondary high forests (forests evidently influenced by human activities, but with relatively natural structure and components)
    - iii. Coppice forests – with relatively natural components of forests
    - iv. Plantation – artificial forest with unsuitable structureAll categories of forest origin have to cover 100% of the total area of forest polygon.

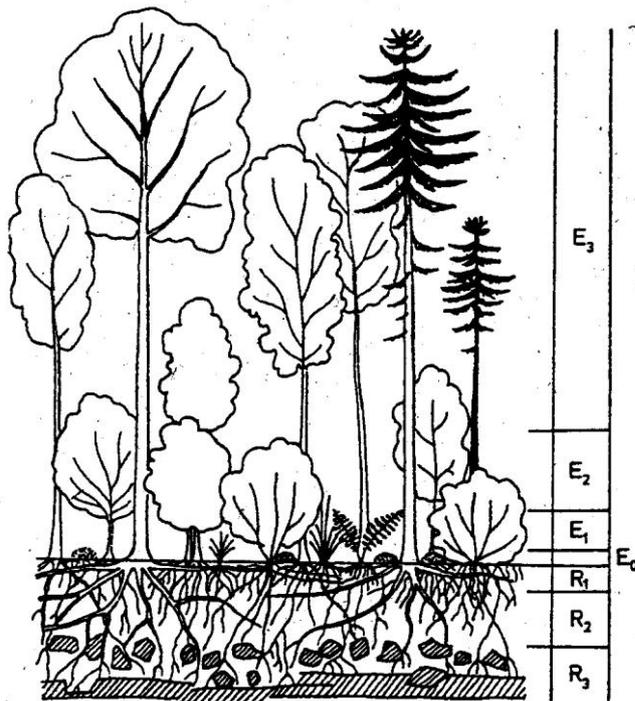
**Name and the code of the mapper:** the name of the person responsible for the data in the form and his code

**Date:** date of mapping (in particular the date of data sampling)

**Code of the object:** the code relating the form to the object (polygon, line or point) drawn on the map. This number of the form has to be the same as the number of the polygon drawn on the map. **Each polygon has to have unique number on one map sheet.**

**Map code:** the code of the map used for mapping where the polygon related to the form has been drawn (code of the map sheet, unique number of satellite image or an aerial photo)

**Vegetation coverage in vertical structure:** coverage layers in vertical structure in % of the mapped area (E0 – bryophytes layer – mosses and lichens; E1 – herbs layer – include all herbs and shrubs and trees, height of which does not exceed the height of the herbs present on the mapped object; E2 – shrub layer – includes all shrubs and trees, height of which does not exceed 3 m or the tallest shrubs (if their height is larger than 3 m) present on the mapped object; E3 – tree layer – all trees above the shrub layer).



*Ground and underground layers in the habitats according to JENÍK 1995 (underground biomass -R1, R2, R3 are the rhizom layers and mapper do not have to estimate these layers)*

**Name of mapping units:** the name of each mapping unit (including 'unmapped areas' category) recorded on the mapped polygon (object) with appropriate percentage of coverage. The sum of the percents of all mapping units on the mapped object has to be 100 %.

**Note:** All the additional important information about the mapping object or mapping units or some other statements or opinions of the mapper related to the mapping object can be recorded here.

**List of species:** all species determined on the mapped object (polygon, line, point) are written here. The species names used have to correspond with the national checklist of higher plant species.

**Tansley's scale** is used for estimation of coverage:

- 1** cover less than 1 %
- 2** cover between 1 – 25 %
- 3** cover more than 25 %

### **Minimum area for mapping**

Polygon	1 hectar
Line	at least 25 metres wide
Point	0.01 ha

**Grasslands and forests may be mapped only as polygons!!!**

### **Drawing to the working map:**

Borders of mapped objects (polygons, lines and points of habitats and their complexes) are delineated in the working map. Each object has to be marked by the code same as used for the related mapping form.

### **Digitalization of data from field mapping:**

Each mapper is requested to fill in the information from the field mapping forms into a special (client) database prepared by Daphne. The input form of the database has similar structure as the working field mapping form, but it uses combo-boxes with list of habitat types

(compilation of habitat types from habitat classification system of Montenegro with all EUNIS habitat types of the third level) and the checklist of higher plant species.

Mappers have to deliver the client database to the habitat mapping coordinator after input information from all field mapping forms into the database. If the mapper would like to amend the records in the database or to add some other mapping forms after he/she had delivered the client database to project coordinators, he can make amendments to the same database and informs coordinator about such case and submits the updated version of the database to the coordinator.

Geographical location of mapped localities (points, lines or polygons) from the field maps needs to be digitalised into GIS by mapper. The client database will be equipped with integrated GIS module which will allow mapper to digitalise the localities from the hard copy maps into the GIS directly in the database environment.