Assessment and mapping of the Great Prespa Lake wetland habitat types in Albania

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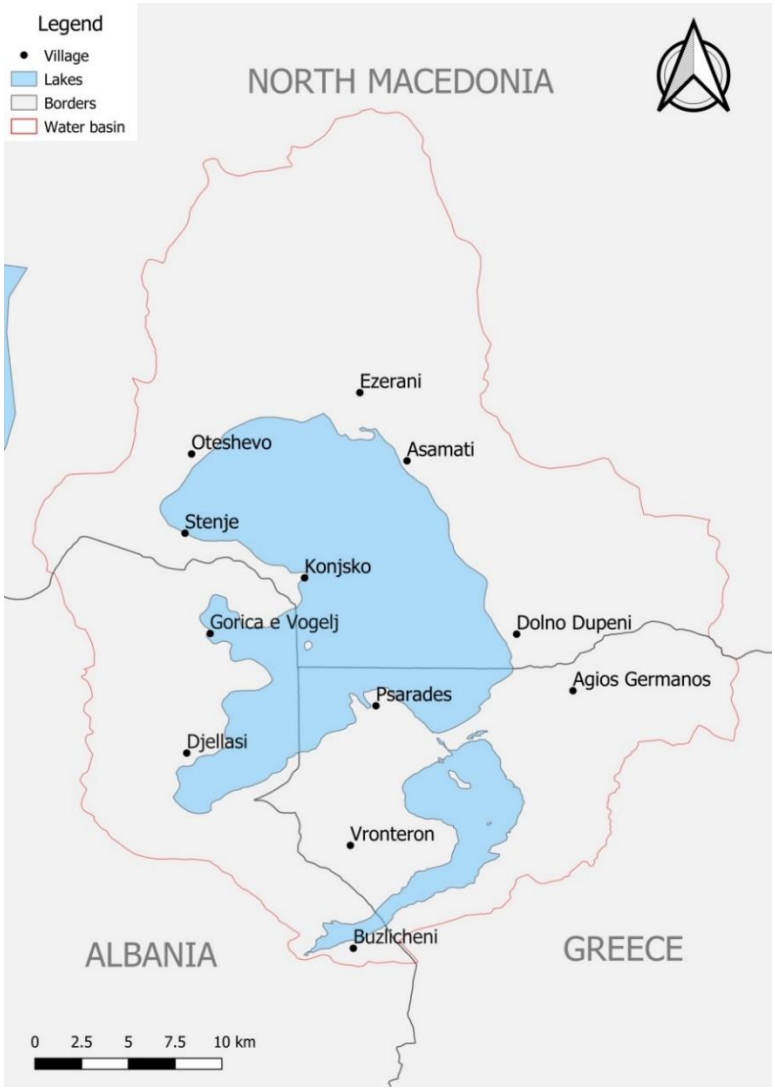
1. INTRODUCTION

The Prespa lakes watershed is located in the central-western part of Balkan Peninsula and is shared between three countries - Albania, North Macedonia and Greece (Map 1). Geographically, it is divided into two sub-watersheds: Great Prespa Lake (synonyms: Macro Prespa Lake, Liqeni i Prespes, Prespa e Madhe, Limni Megali Prespa, Golemo Prespansko Ezero) and the Lesser Prespa Lake (synonyms: Micro Prespa Lake, Liqeni i Prespes, Prespa e Vogël, Limni Mikri Prespa or Malo Prespansko Ezero). The largest part of the Great Prespa Lake watershed is situated in the North Macedonia, while Albania and Greece share smaller parts. The Lesser Prespa Lake watershed is shared between Greece (approx. 80% of the watershed) and Albania. The total area of the combined sub-watersheds and lakes is 1,218.1 km^2 (Perennou et al. 2009). According to Chavkalovski (1997) the total area of the hydrological basin is 1,349.2 km^2, out of which 1,095.3 km^2 belongs to Great Prespa Lake and 254.0 km^2 to Lesser Prespa Lake. It can be considered a true Mediterranean biodiversity hotspot (Myers et al. 2000), as it is characterized by a great variety of floristic elements (Pavlides 1985, Strid *et al.* 2017) and vegetation types (Micevski, 1963, 1964, 1969, Pavlides 1985, Matevski *et al*. 2011, Vrachnakis *et al.* 2011, Fotiadis *et al.* 2018).



Map 1. Location of the Prespa lakes watershed in the Balkan Peninsula.

The flora and vegetation of the Great and Lesser Prespa lakes in Albania remain poorly studied. The new conditions associated with the establishment of the Prespa Transboundary Park and the International Agreement for the Protection and Sustainable Development of the Prespa Park have highlighted the necessity for a more complete and reliable recording of the existing situation, including the distinction of the different habitat types and the identification of their territorial boundaries, as well as the identification of their important values, and, lastly, the assessment of the current threats affecting their long-term sustainability and conservation.

For these reasons, it is important to distinguish, evaluate and map the habitat types in the area of the Great and Lesser Prespa lakes that are directly affected by the water level of the lakes, which will serve as a baseline for further management and protection actions.

2. METHODOLOGY

2.1. Selection and characteristics of the sampling plots

In order to study the vegetation ecology and to distinguish the different vegetation types and units, 62 phytosociological samples (relevés) were conducted using the Braun-Blanquet method (Braun-Blanquet 1951, 1964, Dengler et al. 2008). All relevés were carried out from May to September 2019 in the littoral and open water zones of the Great and Lesser Prespa lakes (Map 2).

Map 2. Study area (Satellite image: Bing).

Vegetation sampling was performed at locations with distinct physiognomic characteristics. Sampling localities were selected based on the following criteria: a) to be large enough to include all the species that are part of the specific vegetation unit, and b) to be homogenous, both floristically and ecologically. Relevé positions were mapped on the WGS84 projection system based on their G.P.S. (Global Positional System) co-ordinates.

The plot size of every relevé was according to European standards (Chytrý & Otýpková 2003):

- 16 m^2 for grasslands and reedbed communities
- 4 m^2 for aquatic plant communities

In each relevé the following data were recorded in a specially designed form (Figure 1):

- General data: Number of relevé, date of assessment, locality and plot size, elevation, water depth, relief, exposition, inclination, cover of vegetation for each layer (tree, shrub, herb), height of each layer, geological substratum and soil type.
- Data for the evaluation of conservation degree: structure and functions, positive impacts, pressures and threats, and restoration possibility.
- Data for the species: Every taxon that participated in the vegetation community was recorded and its cover-abundance was evaluated according to the modified Braun-

Blanquet nine-part scale (Dengler *et al.* 2008) where: (1) r = 1 individual with 0-5% cover, (2) + = 2-5 individuals with 0-5% cover, (3) 1 = 6-50 individuals with 0-5% cover, (4) 2m = more than 50 individuals with 0-5% cover, (5) 2a = any amount of individuals with 5-12.5% cover, (6) 2b = any amount of individuals with 15-25% cover, (7) 3 = any amount of individuals with 26-50% cover, (8) 4 = any amount of individuals with 50-75% cover, (9) 5 = any amount of individuals with 75-100% cover.

2.2. Identification and nomenclature of spermatophytes and pteridophytes

Plant specimens were collected when necessary. For their identification, the "Flora Europaea" (Tutin *et al.* 1968-1980, 1993), "Illustrated Flora of Albania" (Pils 2016), "Flora of Albania" (Paparisto *et al.* 1988; Qosja *et al.* 1992 & 1996), "Excursionist Flora of Albania" (Demiri 1983) and "Flora and Vegetation of the Prespa National Park" (Strid *et al.* 2020) were used. In addition, "Flora of the Turkey and the East Aegean Islands" (Davis 1965-1985), "Flora R.P. Bulgaricae" (Jordanov *et al*. 1963-1989), "Flora Hellenica" (Strid & Tan 1997, 2000) and "Mountain Flora of Greece" (Strid 1986, Strid & Tan 1991) were used as auxiliary sources. Where necessary, part of the collected material was also compared with specimens kept in the "Pavlidis Herbarium" (material collected from the Greek Prespa National Park), which is maintained by the Society for the Protection of Prespa.

For the nomenclature of plant taxa, the online Euro-Med database (2006-) was followed. The number of identified taxa was 124.

All plant specimens were deposited in the Herbarium of the Department of Forestry and N.E.M., Karpenissi, Greece (Agricultural University of Athens).

2.3. Data analyses

After the collection of the field data and the identification of plant samples, the data were compiled in Microsoft Excel 2010 and were exported to JUICE 7.0 software (Tichý 2002) for further analysis. The TWINSPAN (Two-Way Indicator Specification Analysis) method (Hill 1979a) was used for the numerical classification of relevés, with three pseudospecies cut levels (0%, 5%, 25%) and six levels of division, and with a minimum of two relevés for each cluster. In addition, plots were classified using Ward's method of clustering with relative Euclidean distance. All species recorded in different layers were merged into one layer. For the hierarchical clustering the cover values of all taxa were square-root transformed prior the analysis. Hierarchical clustering was carried out using PAST 3.0 software (Hammer *et al.,* 2001).

2.4. Syntaxonomy

For the inclusion of taxa[1], as syntaxa[2] diagnostic species, the articles and research papers of Micevski (1963, 1964, 1969), Horvat *et al.* (1974), Oberdorfer (1990), Papastegiadou (1990), Golub *et al.* (1991), Mucina (1997), Tzonev (2009), Fotiadis *et al.* (2014), Fotiadis *et al*. (2018) and Mucina *et al.* (2016) were used.

[1]Species and subspecies (singular: taxon)

[2] Associations, alliances and higher vegetation units (singular: syntaxon)

Evaluator:					
Plot code (ddmmyy#nbr):					
Date of assessment:					
coords	**centre**	**LON:**		**bottom right**	**LON:**
		LAT:			**LAT:**
Locality:					
Plot size (m^2):			**Area assessed (m^2):**		
Exposition (°):			**Altitude (m):**		
Inclination (°):			**Relief:** cliff/ slope /plain /depression/ravine		
Geological substratum:			**Soil type:** sandy - silt - loam		
Adjacent vegetation (habitat) type(s):			Substratum with significant disturbances (e.g. erosion, trampling)		YES NO
Invasive/Ruderal species (incl. abundance):					
Other:					

	Cover (%)							
	0-5	5-25	25-50	50-75	>75	Layer	Cover %	Height (m)
boulders (>20 cm)						Tree (>2m)		
stones (2-20 cm)						Shrub (0.5-2 m)		
gravel (2mm – 2cm)						Herb (<0.5m)		
fine soil								
litter								
moss								

Typical species							
Species	Cover		Vit.	Species	Cover		Vit.
	plot	area			plot	area	

Pressures (P) and Threats (T) for the habitat type			
Code	Description	P, T, T or PT	Importance

Figure 1. Fieldwork protocol for vegetation sampling.

For the determination of the differential species (positive, positive-negative, negative and non-differentiated) amongst the groups derived from the TWINSPAN method, the algorithm used was that proposed by Tsiripidis *et al.* (2009a), as amended by Tsiripidis *et al.* (2009b).

Vegetation units were classified according to the Braun-Blanquet method (1951, 1964) into: class (suffix: -etea), order (suffix: -etalia), union (suffix: -ion) and sub-union (suffix: -etum). Wherever it was not possible to reclassify the vegetation unit to an association it was ranked as a community in the next highest syntaxon that could be distinguished.

The nomenclature of the vegetation units was determined, where possible, according to the codes of Barkman et al. (1976, 1986) and Weber et al. (2000). Where there was no possibility of denomination, due to lack of a definitive conclusion on the systematic classification of a vegetation unit, the nomenclature provided by Micevski (1963, 1964, 1969), Quezel (1964, 1967, 1969), Horvat *et al*. (1974), Raus (1980), Mucina (1997), Fotiadis (2004), Tzonev (2009), Fotiadis *et al*. (2014) and Mucina *et al.* (2016) was used.

2.5. Mapping

Mapping of the different vegetation types in the study area was performed by applying standard digitisation techniques. As a basemap, BING satellite images were used. The process utilised all the vegetation sampling plots, as well as several other ground validation station co-ordinates. Maps were produced in ArcMap 10.4 and the QGIS 3.03 environment.

Habitat types were classified according to the available codes derived from The Interpretation Manual of European Union Habitats (2013). When it was not possible to include the vegetation units in any of the proposed Annex I habitat types, EUNIS coding was adopted (Schaminée *et al.,* 2013), viz.:

- C3.21 & C3.23 / D5.11 & D5.13 for reedbeds
- C3.2 for *Butomus umbellatus* communities (Flowering rush communities)
- D5.21 for communities dominated by tall sedges
- D5.12 for communities dominated by *Scirpus lacustris*
- E3.3 for hay meadows

2.6. Evaluation of habitat types conservation degree

The conservation degree per relevé and grid cell (10 x 10 km)[3] was estimated using three categories of criteria (European Commission 2011; Kotzageorgis *et al.* 2015; Chrysopolitou *et al*. 2015):

- Conservation degree of structure: The current state of habitat type structures and functions, including the completeness of typical species.
- Conservation degree of functions: An assessment of the prospects for maintaining the structures and functions of the habitat type.
- Restoration possibility: The possibility of the restoration of structures and functions and typical species of the habitat type, from a scientific and technocratic point of view.

The conservation degree was calculated by combining the methodology proposed by Evans & Arvela (2011) and that followed for completing the SDF (European Commission 2011), based on the following eight criteria in particular:

Criterion 1. Conservation degree of typical species
Criterion 2. Conservation degree of specific structure and functions
Criterion 3. Future trend of structure and functions
Criterion 4. Future status of structure and functions
Criterion 5. Area cover by the habitat type compared to reference value
Criterion 6. Future trend of area cover by the habitat type
Criterion 7. Future trend of area cover by the habitat type compared to reference value
Criterion 8. Restoration possibility

[3] For the purpose of the conservation degree assessment for the habitat types, as well as for the species of European concern, the National Grid (10 X 10 Km) created by the EEA was used.

For each of these criterion the degree of conservation (based on field protocols, see header data in Annex I) was calculated to be:

A: Excellent conservation degree (A)

B: Good conservation degree (B)

C: Moderate or limited conservation degree, (C) = all other combinations.

Based on the combination of the above criteria, three main groups of criteria result:

1. (Group A) 'Existing conservation degree of structures and functions' (Final evaluation of structures and functions), resulting from the combination of criteria 1, 2 and 5:

Excellent Conservation Degree (A): when both the Typical Types parameter and the Structure and Functions parameter are at Extremely Good Conservation degree
Good Conservation Degree (B): when at least one of the two parameters (Typical Species or Structure and Functions) are of Good Conservation Degree and no parameters are at Moderate Conservation Level,
Moderate or Limited Conservation Degree (C): when at least one of the two parameters (Typical Species or Structure and Functions) are at Moderate Conservation Level, or
Unknown Conservation Degree (X): when one of the two parameters (Typical Species or Structure and Functions) are of Good Conservation Degree and the other is at an unknown Preservation Degree, or both are at an unknown Conservation Degree.

2. (Group B) 'Prospects for maintaining structures-functions and extent' (Final evaluation of structure and functions perspectives), resulting from the combination of the existing conservation degree calculated above, and criteria 3 and 4, as well as criteria 6 and 7:

Area cover (Criterion 6, 7)	Future trend (Criterion 3)	Future status (Criterion 4)	Conservation prospects
A	A	A	**A**
A	B	A	**A**
A	B	B	**B**
A	B	X	**B**
A	C	B	**C**
A	C	C	**C**
A	C	X	**C**
A	X	A	**A**
A	X	B	**B**
A	X	C	**C**
A	X	X	**X**
B	A	A	**A**
B	A	B	**B**
B	A	X	**B**
B	B	B	**B**
B	B	C	**C**
B	B	X	**B**
B	C	B	**B**
B	C	C	**C**
B	C	X	**C**
B	X	B	**B**
B	X	C	**C**
B	X	X	**X**
C	A	A	**A**
C	A	B	**B**
C	A	C	**C**
C	A	X	**C**
C	B	B	**B**
C	B	C	**C**
C	B	X	**C**
C	C	C	**C**
C	C	X	**C**
C	X	A	**B**
C	X	B	**B**
C	X	C	**C**
C	X	X	**X**
X	A	A	**A**
X	A	B	**B**

Area cover (Criterion 6, 7)	Future trend (Criterion 3)	Future status (Criterion 4)	Conservation prospects
X	A	C	**C**
X	A	X	**X**
X	B	A	**B**
X	B	B	**B**
X	B	C	**C**
X	B	X	**X**
X	C	A	**B**
X	C	B	**B**
X	C	C	**C**
X	C	X	**X**
X	X	A	**X**
X	X	B	**X**
X	X	C	**X**
X	X	X	**X**

The above results give the following combination:

Excellent (A)
Good (B)
Moderate or limited (C)
Unknown (X)

3. (Group C) Possibility for rehabilitation, which was estimated per sampling plot by the person conducting the sampling (criterion 8).

The final calculation of the conservation degree per relevé is shown as follows:

Final degree of structure-function conservation (Group A)	Conservation prospects (Group B)	Restoration possibility (Group C)	Conservation degree
A	A	Easy	**A**
A	A	Possible with an average effort	**A**
A	A	Difficult or impossible	**A**
A	A	Unable to assess	**A**
A	B	Easy	**A**
A	B	Possible with an average effort	**A**
A	B	Difficult or impossible	**A**
A	B	Unable to assess	**A**
A	C	Easy	**A**
A	C	Possible with an average effort	**A**
A	C	Difficult or impossible	**A**
A	C	Unable to assess	**A**
A	X	Easy	**A**
A	X	Possible with an average effort	**A**
A	X	Difficult or impossible	**A**
A	X	Unable to assess	**A**
B	A	Easy	**A**
B	A	Possible with an average effort	**A**
B	A	Difficult or impossible	**A**
B	A	Unable to assess	**A**
B	B	Easy	**B**
B	B	Possible with an average effort	**B**
B	B	Difficult or impossible	**B**
B	B	Unable to assess	**B**
B	C	Easy	**B**
B	C	Possible with an average effort	**B**
B	C	Difficult or impossible	**C**
B	C	Unable to assess	**C**
B	X	Easy	**X**
B	X	Possible with an average effort	**X**
B	X	Difficult or impossible	**X**
B	X	Unable to assess	**X**
C	A	Easy	**B**

Final degree of structure-function conservation (Group A)	Conservation prospects (Group B)	Restoration possibility (Group C)	Conservation degree
C	A	Possible with an average effort	**B**
C	A	Difficult or impossible	**C**
C	A	Unable to assess	**X**
C	B	Easy	**B**
C	B	Possible with an average effort	**C**
C	B	Difficult or impossible	**C**
C	B	Unable to assess	**C**
C	C	Easy	**C**
C	C	Possible with an average effort	**C**
C	C	Difficult or impossible	**C**
C	C	Unable to assess	**C**
C	X	Easy	**X**
C	X	Possible with an average effort	**X**
C	X	Difficult or impossible	**C**
C	X	Unable to assess	**X**
X	A	Easy	**B**
X	A	Possible with an average effort	**B**
X	A	Difficult or impossible	**X**
X	A	Unable to assess	**X**
X	B	Easy	**B**
X	B	Possible with an average effort	**X**
X	B	Difficult or impossible	**X**
X	B	Unable to assess	**X**
X	C	Easy	**X**
X	C	Possible with an average effort	**X**
X	C	Difficult or impossible	**X**
X	C	Unable to assess	**X**
X	X	Easy	**X**
X	X	Possible with an average effort	**X**
X	X	Difficult or impossible	**X**
X	X	Unable to assess	**X**

Based on the conservation degree of the sampling plots falling in each cell, the conservation degree of the habitat type for each cell (as well as for the whole research area) was calculated as follows:

Conservation degree = A (excellent conservation)	Conservation degree = B (good conservation)	Conservation degree = C (moderate or limited conservation)
If a percentage greater than, or equal to, 75% of the sampling plot (SP) within a cell has an excellent conservation status	If the percentage of the SP in a cell having an excellent degree of conservation is less than 75% and the percentage of SP having a moderate conservation degree is less than 25%	If a percentage greater than, or equal to, 25% of the SP within a cell has moderate degree of conservation

For those cells which have not been sampled, the assessment of their conservation degree has been evaluated based on estimation and field work experience.

3. RESULTS – DISCUSSION

The analysis revealed that 24 different vegetation units can be distinguished in the area of the Great and Lesser Prespa lakes (excluding agricultural, rural, ruderal and sparsely, or non-, vegetated habitats) (see Annex A). These vegetation units and the habitat types have been distinguished both floristically (Table 1) and ecologically.

Table 1. Differential species of the Great Prespa Lake habitat types (dark grey positive differential species, light grey negative differential and white neutral species).

Habitat type	**3150**	**6420**	**D5.12**	**C3.2**	**E3.3**	**D5.21**	**C3.21 & C3.23 / D5.11 & D5.13**	**3270**
Ceratophyllum demersum	20	0	0	0	50	0	13,33333333	0
Myriophyllum spicatum	72	0	0	0	0	0	13,33333333	0
Urticularia australia & *communis*	12	100	0	0	0	0	6,666666667	0
Cardamine raphanifolia	0	100	0	0	0	0	0	0
Persicaria lapathifolia	0	100	0	0	0	0	0	0
Eleocharis uniglumis	0	100	0	0	0	0	0	0
Glyceria fluitans	0	100	0	0	0	0	0	0
Mentha pulegium	0	100	0	0	0	0	0	0
Paspalum paspalodes	0	100	0	0	0	0	0	0
Scutellaria galericulata	0	100	0	0	0	0	0	0
Typha latifolia	0	100	0	0	0	37,5	40	0
Schoenoplectus lacustris	0	100	100	0	0	37,5	0	0
Mentha longifolia	0	0	25	0	0	0	6,666666667	0
Trifolium micranthum	0	0	25	0	0	0	6,666666667	0
Urtica dioica	0	0	25	0	0	12,5	13,33333333	0
Epilobium hirsutum	0	0	25	0	0	0	33,33333333	0
Rumex palustris	0	0	25	0	0	0	20	0
Butomus umbellatus	0	0	0	100	0	0	0	0
Ranunculus repens	0	0	0	100	0	12,5	0	0
Plantago major	0	0	0	50	0	25	0	0
Junfus effusus	0	100	0	0	50	25	0	0
Carex hirta	0	100	0	0	100	62,5	0	0
Lycopus europaeus	0	100	0	0	0	62,5	13,33333333	0
Phragmites australis	8	100	0	0	50	62,5	80	0
Cerastium species	0	0	0	0	50	0	0	0
Eleocharis palustris	0	0	0	0	50	12,5	0	0
Mentha spicata	0	0	0	0	50	12,5	0	0
Poa compresa	0	0	0	0	50	0	0	0
Cynosurus cristatus	0	0	0	0	100	12,5	0	0
Trifolium campestre	0	0	0	0	100	12,5	0	0
Trifolium pratense	0	0	0	0	50	0	0	0
Zostera species	8	0	0	0	50	0	6,666666667	0
Trifolium tomentosum	0	0	0	0	100	25	0	0
Verbena oficinalis	0	0	0	0	100	25	0	0
Trifolium repens	0	0	0	0	100	75	0	0
Trifolium fragiferum	0	0	0	0	100	75	0	0
Agrostis stolonifera	0	0	0	0	100	87,5	13,33333333	0
Juncus articulatus & *acutiflorus*	0	0	0	0	100	87,5	6,666666667	0
Mentha aquatica	0	0	0	0	100	62,5	13,33333333	0
Plantago lanceolata	0	0	0	0	100	62,5	0	0
Potentilla reptans	0	0	0	0	100	62,5	0	0
Cirsium creticum	0	0	0	0	50	37,5	0	0
Cerastium fontanum	0	0	0	0	50	25	0	0
Crepis setosa	0	0	0	0	50	25	0	0
Lolium perenne	0	0	0	0	50	37,5	0	0

Habitat type	3150	6420	D5.12	C3.2	E3.3	D5.21	C3.21 & C3.23 / D5.11 & D5.13	3270
Lotus corniculatus	0	0	0	0	50	50	0	0
Medicago lupulina	0	0	0	0	50	25	0	0
Phleum species	0	0	0	0	50	25	0	0
Juncus inflexus	0	0	0	0	0	25	0	0
Alisma plantago-aquatica	0	0	0	0	0	50	0	0
Alopecurus species	0	0	0	0	0	37,5	0	0
Anthoxanthum odoratum	0	0	0	0	0	25	0	0
Epilobium species	0	0	0	0	0	25	0	0
Holcus lanatus	0	0	0	0	0	25	0	0
Juncus bufonius	0	0	0	0	0	25	0	0
Medicago species	0	0	0	0	0	25	0	0
Oenanthe aquatica	0	0	0	0	0	25	0	0
Paniculus species	0	0	0	0	0	37,5	0	0
Ranunculus steleratus	0	0	0	0	0	25	0	0
Rhinanthus species	0	0	0	0	0	25	0	0
Rorripa sylvatica	0	0	0	0	0	25	0	0
Rumex species	0	0	0	0	0	62,5	0	0
Rorippa amphibia	0	0	0	0	0	25	0	0
Stellaria aquatica	0	0	0	0	0	25	0	0
Veronica beccabunga	0	0	0	0	0	50	0	0
Vulpia myurus	0	0	0	0	0	25	0	0
Xanthium species	0	0	0	0	0	25	0	0
Persicaria amphibia	0	0	0	0	0	50	26,66666667	0
Carex species	0	0	0	0	0	0	20	0
Poa trivialis	0	0	0	0	0	0	20	0
Cyperus fuscus	0	0	0	0	0	37,5	0	100

The vegetation units of the study area have been included in the habitat types (Table 1), according to the European Commission Guide (2013) following the results of the hierarchical clustering analysis (Figure 2) as well.

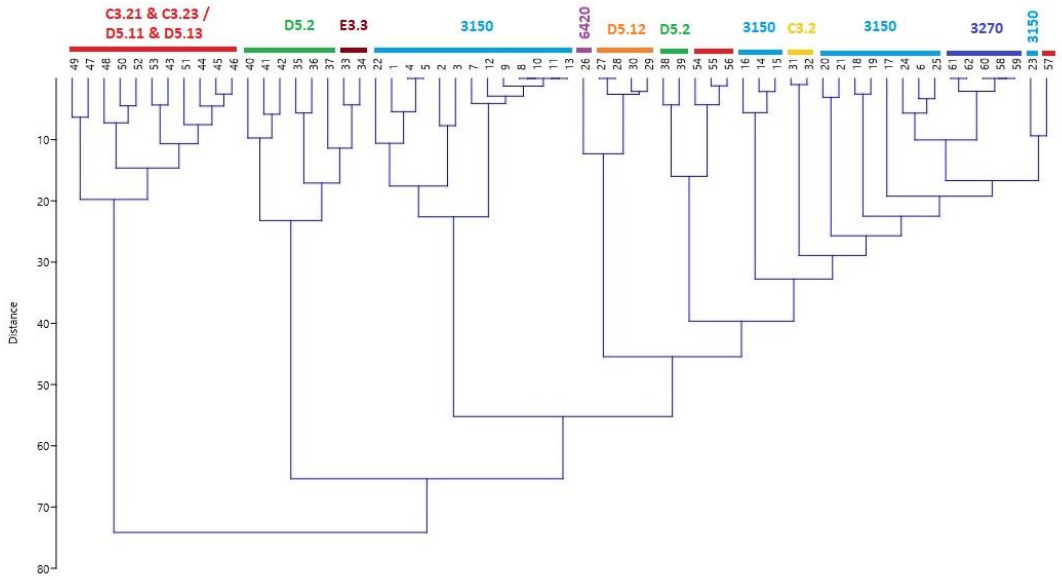


Figure 2. The resulted tree from the hierarchical clustering analysis (Ward method, Euclidian distance).

3150. + Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation

Description: This habitat type consists of plant communities that appear in the lakes and are composed of aquatic macrophytes or free-floating plant species. They are located principally in Lesser Prespa Lake and in small bays around Great Prespa Lake, in locations protected from wind and where the water is more eutrophic. It should be stressed that this type of habitat continues from and frequently coincides with the reedbeds.

Characteristics of the habitat type:

Altitude (m)	846-855	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain, ravine	
Geological substratum	Alluvial	
Soil type	Mainly loam	
Water depth (m)	0,05-1,5	
Cover area (ha)	277,2303	
% of the study area	5,28	
Structure and functions	Absence or not of significant presence of ruderal or invasive neophytes	92%
	Hydrological conditions adequate for the survival and persistence of typical species	100%
	No high fragmentation of cover by woody species	100%
	Absence or very low cover of high emergent helophytes (e.g. *Phragmites australis*, *Typha* spp.)	92%
	Evidence of use of the habitat(s) by fauna species, e.g. birds and amphibians in the case of Hydrocharition vegetation, and fish in the case of Magnopotamion vegetation	100%
	Evidence of no or low water level fluctuations (up to 50 cm) within the hydrological cycle	92%
	At least one of the typical species occurs abundantly and there is also at least one other typical species present	100%
	Absence of eutrophication	76%
	No impact of pesticides and pollutants	92%
	Hydrological regime natural – no significant hydrological impact (e.g. water extraction as indicated by pipes, dams, earthworks)	100%
	No rubbish and waste dumping	92%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Invasive non-native species (J01[4])	8%
	Discharges (E03)	8%
	Species composition change (succession) (K02.01)	8%

Importance - Significance: This habitat type hosts many important bird and fish species and contributes to the effective overall functioning of the lake ecosystem. Prespa should be considered as a very important area for this habitat type, since 12 different vegetation units have been recorded.

Pressures - Threats: Significant pressures were not associated with habitat type 3150. Generally, the typical species of this habitat type are strongly influenced by waves and wind, as they cannot adapt to waves and, therefore, they appear in sheltered locations. This habitat type is mainly threatened by: (a) accumulation of rubbish; (b) abandonment of low-impact, traditional activities that will lead to the encroachment of the reedbeds; and (c) high

[4] Code of pressure and threats by Evans & Arvela (2011)

eutrophication levels. In addition, invasive alien aquatic species constitute a significant threat for this habitat type. *Elodea canadensis*, which is included in the list of the most dangerous alien species (Larsson et al. 2007), was found during fieldwork and its population dynamics needs to be monitored from now on.

Management measures: Management actions need to focus on the collection of rubbish, which undermines the conservation degree of the habitat, as well as on the control of alien and highly invasive species, such as *Elodea canadensis*. The control of *E. canadensis* in order to prevent its spread to Lesser Prespa Lake is of high importance.

Vegetation Units / Syntaxonomy: In the area of Prespa Lakes, 25 relevés were classified as habitat type 3150. Amongst the main predominant species are *Myriophyllum spicatum*, *Nymphaea alba*, *Nymphoides peltata*, *Ceratophyllum demersum*, *Lemna minor, Hydrocharis morsus-ranae*, *Potamogeton lucens*, *Vallisneria spiralis*, *Potamogeton perfoliatus*, and others. This habitat type is very diverse concerning its vegetation types (Photo 1, 2, 3, 4), as a total of 12 different phytosociological associations and communities have been distinguished:

Class	Order	Alliance	Association/Community
Lemnetea	Lemnetalia minoris	Stratiotion	Ceratophylletum demersi
		Lemnion minoris	Lemno-Utricularietum vulgaris
Potamogetonetea	Potamogenetalia	Nymphaeion albae	Nymphoidetum peltatae
			Nymphaetum albae
			Nuphar lutea comm.
		Potamogetonion	Potameto-Vallisnerietum
			Potamogeton perfoliatus comm.
			Potamogetum lucentis
			Myriophylletum spicati
			Potamogeton natans comm.
			Potamogeton pectinatus comm.
			Elodea canadensis comm.

Photo 1. *Nuphar lutea* comm.

Photo 2. Nymphoidetum peltatae

Photo 3. Myriophylletum spicati

Photo 4. Nymphaetum albae

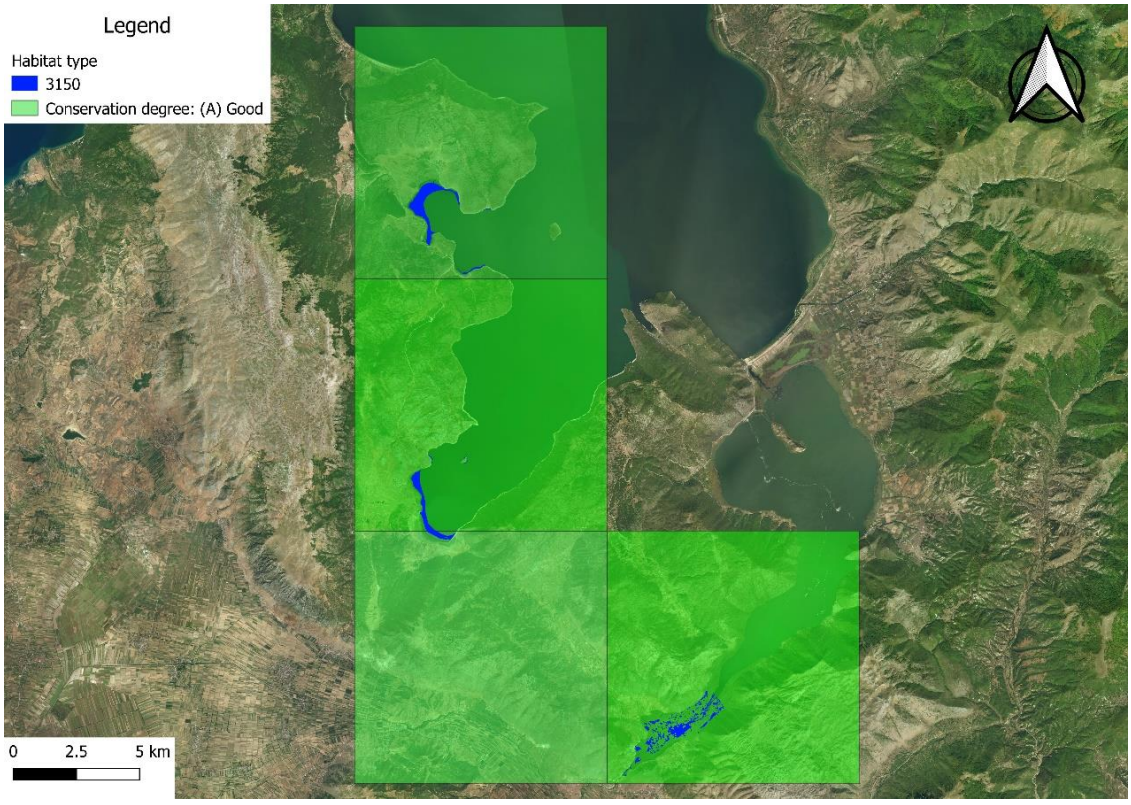
The conservation degree of the habitat type appears to be good, with the exception of few individual sites where the main threat is vegetation succession, discharges and the invasive species *Elodea canadensis*.

Conservation degree in relevés:

Number of relevé	100719#3	100719#05	030819#1	030819#2	030819#4	030819#6	030819#7	030819#8	030819#9	030819#10	030819#11	050819#1	050819#2	050819#3	050819#4	050819#5	050819#6	050819#7	040819#7	060819#9	060819#10	060819#11	060819#13	060819#6	060819#15
Typical species	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Specific structure and functions	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Structure and functions future trend	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Structure and functions future status	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cover area (compared to reference value)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cover area future trend	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cover area future trend (compared to reference value)	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Final evaluation of structures and functions	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Final evaluation of structure and functions perspectives	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Restoration possibility	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Conservation degree	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	**Conservation degree in the cell**	Total cover of habitat type in the study area	Data quality
050819#1	A	E524N204	1.032318	13.27891	0.078A	37.24A	G[5]
050819#2	A						
050819#3	A						
050819#4	A						
050819#5	A						
050819#6	A						
100719#3	B						
100719#5	B						
050819#7	A						
030819#10	A						
030819#9	A	E524N203	0.507124	33.65715	0.0151A	18.29A	G
030819#10	A						
030819#7	A						
030819#8	A						
030819#6	A						
030819#1	A						
040819#7	A	E524N202	0.165001	0.830383	0.199A	5.95A	G
030819#2	A						
030819#4	A						
060819#15	A	E525N202	1.06786	4.743034	0.225A	38.52A	G
060819#13	A						
060819#11	A						
060819#10	A						
060819#9	A						
060819#6	A						
					TOTAL	**100A**	



Map 2. Conservation degree and distribution of the habitat type 3150 in the study area.

[5] G: good (data based on relevés), O: observation (data based on observations by experts)

3270. Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation

Description: This habitat type consists of the muddy banks of Great Prespa Lake, where *Cyperus fuscus* creates almost monospecific communities. During the spring and at the beginning of the summer, sites look like muddy banks without any vegetation (this develops later in the year). If the conditions are not favourable (it depends mainly on the water level of Great Prespa Lake), this vegetation has a weak development or could be completely absent.

Characteristics of the habitat type:

Altitude (m)	846	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain	
Geological substratum	Alluvial	
Soil type	Loam	
Water depth (m)	0	
Cover area (ha)	5,9024	
% of the study area	0,957	
Structure and functions	Absence or not of significant presence of ruderal or invasive neophytes	100%
	Hydrological conditions adequate for the survival and persistence of typical species	100%
	No high fragmentation of cover by woody species	100%
	Absence or very low cover of high emergent helophytes (e.g. *Phragmites australis*, *Typha* spp.)	100%
	Evidence of use of the habitat(s) by fauna species, e.g. birds and amphibians in the case of Hydrocharition vegetation, and fish in the case of Magnopotamion vegetation	100%
	Evidence of no or low water level fluctuations (up to 50 cm) within the hydrological cycle	0%
	At least one of the typical species occurs abundantly and there is also at least one other typical species present	100%
	Absence of eutrophication	100%
	No impact of pesticides and pollutants	100%
	Hydrological regime natural – no significant hydrological impact (e.g. water extraction as indicated by pipes, dams, earthworks)	100%
	No rubbish and waste dumping	100%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Road, paths and railroads (D01)	100%
	Discharges (E03)	100%
	Trampling, overuse (G05.01)	100%
	Reduction or loss of specific habitat features (J03.01)	100%
	Species composition change (succession) (K02.01)	100%
	Flooding modifications (J02.04)	100%

Importance - Significance: This habitat type is very important for birds, mainly as a feeding site, as well as for amphibian species.

Pressures - Threats: The most important threat for this habitat type is correlated with the water level of Great Prespa Lake, since the high decrease of the water level that has been documented during the last 40 years undermines the conservation degree of the habitat.

Management measures: The main management actions need to focus on the collection of rubbish around the lake, as well as on the control of cattle grazing. Special monitoring actions needs to be planned for this habitat type, since the fluctuation of the water level from one year to the next does not allow a full understanding of the extent of the distribution and the ecology of the habitat within a single year. Maintenance of the habitat types that neighbour the habitat type 3270 (such as, for example, D5.2) is of high importance.

Vegetation Units / Syntaxonomy: 5 relevés were classified as habitat type 3270 in the study area, which are classified in *Cyperus fuscus* comm. (Photo 5) in the order Cyperetalia fusci:

Class	Order	Alliance	Association/Community
Isoëto-Nanojuncetea	Cyperetalia fusci		*Cyperus fuscus* comm.

The conservation degree of the habitat type appears to be moderate, mainly because the existence of the habitat type depends on the water level of Great Prespa Lake.

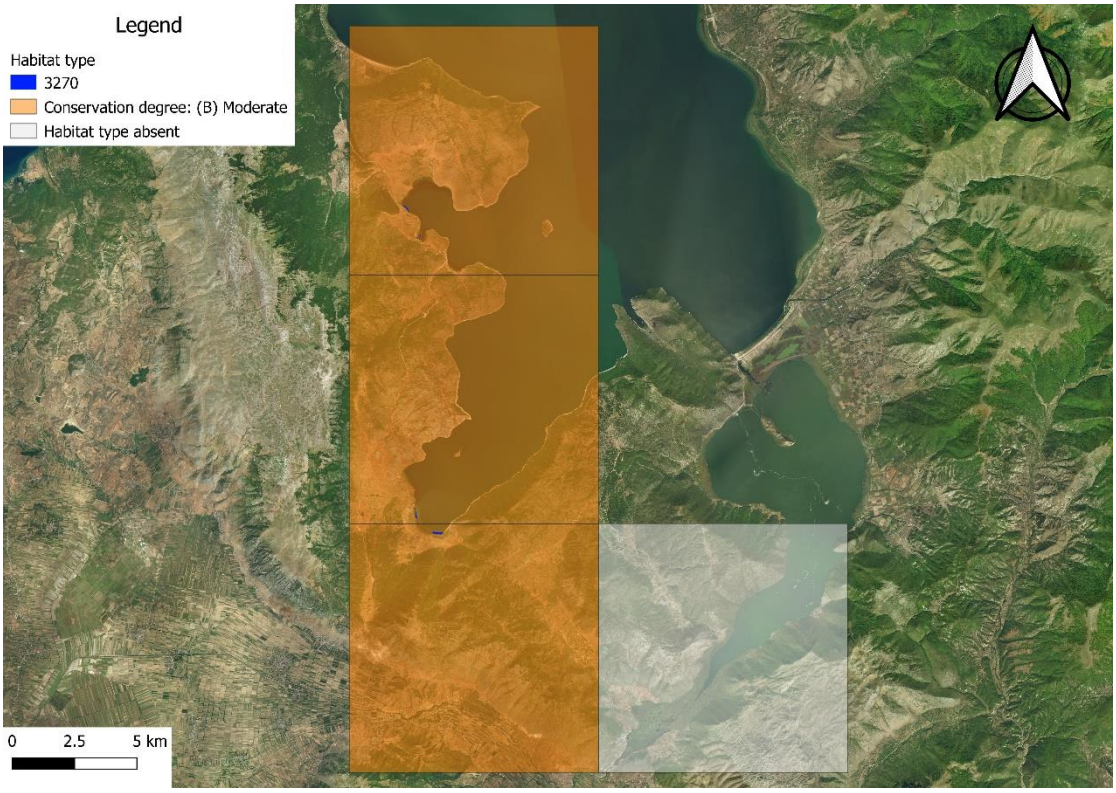
Photo 5. *Cyperus fuscus* comm.

Conservation degree in relevés:

Number of relevé	220819#1	220819#2	220819#3	220819#4	220819#5
Typical species	A	A	A	A	A
Specific Structure and functions	A	A	A	A	A
Structure and Functions future trend	A	A	A	A	A
Structure and Functions future status	B	B	B	B	B
Cover area (compare to reference value)	A	A	A	A	A
Cover area future trend	B	B	B	B	B
Cover area future trend (compare to reference value)	B	B	B	B	B
Final evaluation of Structures and Functions	A	A	A	A	A
Final evaluation of Structure and Functions perspectives	B	B	B	B	B
Restoration possibility	B	B	B	B	B
Conservation degree	B	B	B	B	B

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
220819#1	B	E524N204	0.018474	13.27891	0.0014B	31.3B	G
220819#2	B						
220819#4	B	E524N203	0.013446	33.65715	0.00003995B	22.8B	
220819#5	B						
220819#3	B	E524N202	0.027104	0.830383	0.033B	45.9B	
					TOTAL	**100B**	



Map 3. Conservation degree and distribution of the habitat type 3270 in the study area.

6420. + Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion

Description: Habitat type 6420 represents humid to wet meadows, which can be seen in small ponds on the perimeter of the reeds.

Characteristics of the habitat type:

Altitude (m)	845	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain	
Geological substratum	Alluvial	
Soil type	Loam	
Water depth (m)	0-0,1	
Cover area (ha)	2,6316	
% of the study area	0,05012	
Structure and functions	Abundance of tall perennial grasses (except *Phragmites*, *Typha* and *Arundo*)	100%
	Absence of rubbish or of high levels of eutrophication	100%
	Stabilised shores	100%
	Non-disturbed hydrological cycle	100%
	Absence of evidence of primary or secondary succession	0%
	Rich in bird communities	100%
	Presence/practice of normal (regular) grazing	0%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Discharges (E03)	100%
	Trampling, overuse (G05.01)	100%
	Species composition change (succession) (K02.01)	100%

Importance - Significance: According to Dafis *et al*. (2001) the ecological significance of this habitat type is linked to maintaining the biodiversity of the wetland systems where it develops. Furthermore, this habitat is an important habitat for bird and amphibian species.

Pressures - Threats: Habitat type 6420 is mainly threatened by vegetation succession. To a lesser extent, vehicular traffic and rubbish dumping are also threats and pressures.

Management measures: It is essential to protect the habitat type from the expansion of human activities with management measures to ensure that the vegetation does not evolve (e.g. cutting of reedbeds).

Vegetation Units / Syntaxonomy: 1 relevé was classified as being under this habitat type. Amongst the most predominant species were *Cardamine raphanifolia*, *Lycopus europaeus, Paspalum paspalodes* etc. A single vegetation unit was distinguished for the analysis:

A/A	Class	Order	Alliance	Association/Community
1	Phragmito-Magnocaricetea	Phragmitetalia	Phragmition communis	*Cardamine raphanifolia* comm.

The conservation degree of this habitat type appears to be moderate.

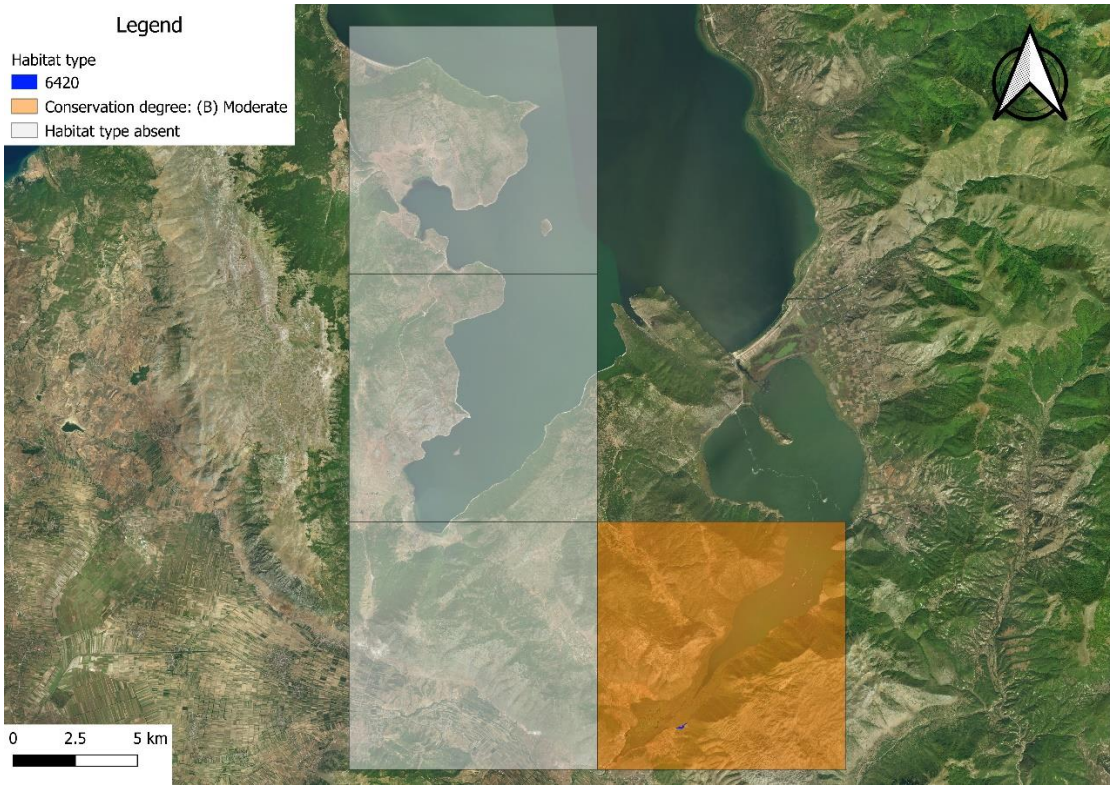
Conservation degree in relevés:

Number of relevé	190619#1
Typical species	A
Specific structure and functions	B

Structure and functions future trend	B
Structure and functions future status	B
Cover area (compared to reference value)	B
Cover area future trend	B
Cover area future trend (compared to reference value)	B
Final evaluation of structures and functions	B
Final evaluation of structure and functions perspectives	B
Restoration possibility	B
Conservation degree	B

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
060819#2	B	E525N202	0.026316	4.743034	0.0056B	100B	G
					TOTAL	**100B**	



Map 4. Conservation degree of the habitat type 6420 in the study area.

91E0. * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)

This priority habitat type includes riverine forests dominated by *Alnus glutinosa*. In the study area it can be found in Lesser Prespa Lake where the River Devoll used to flow. Access to the one stand that can be found is not possible, but the conservation degree of the habitat seems to be moderate, since the size of the stand is very small (not having the typical structure of an alder forest). The improvement of this conservation degree is directly correlated with the expansion of their cover, on which fluctuations in the water levels have a major impact, as well as vegetation succession.

92A0. + *Salix alba* and *Populus alba* galleries

This habitat type includes forests dominated by *Salix alba*. In the study area it can be found in Lesser Prespa Lake where the River Devoll used to flow (sites similar to the ones of the habitat type 91E0*). Access to the site where it occurs is not possible, but the conservation degree of the habitat is considered moderate, since the size of the stand is quite small (not having the proper structure and functions). The improvement of the conservation degree is directly correlated with the expansion of their cover, on which fluctuations in the water levels have a major impact, as well as vegetation succession.

C3.2 Flowering rush communities

Description: This habitat type consists of a small stand of *Butomus umbellatus* in Great Prespa Lake.

Characteristics of the habitat type:

Altitude (m)	848	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Depression	
Geological substratum	Alluvial	
Soil type	loam	
Water depth (m)	0,05	
Cover area (ha)	0,0195	
% of the study area	0,0003714	
Structure and functions	Soils wet at least for 9 months	100%
	Non-disturbed hydrological cycle	100%
	Absence of evidence of primary or secondary succession	100%
	Non-significant presence of ruderal and/or invasive species (e.g. *Arundo donax*)	0%
	Absence of rubbish	0%
	Absence or very low cover of *Phragmites australis*	100%
	Absence of high levels of eutrophication	0%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Urbanized areas, human habitation (E01)	100%
	Discharges (E03)	100%
	Trampling, overuse (G05.01)	100%

Importance - Significance: The area covered by this habitat is very small, however, it contributes to the landscape diversity of the study area.

Pressures - Threats: The main pressures on the habitat are correlated with human activities, such as rubbish dumping and trampling by cattle.

Management measures: Removal of rubbish, as well as control of trampling by cattle. The expansion of the reedbeds might also be considered a threat in the near future.

Vegetation Units / Syntaxonomy:

A/A	Class	Order	Alliance	Association/Community
1	Phragmito-Magnocaricetea	Phragmitetalia	Phragmition communis	Butometum umbellati

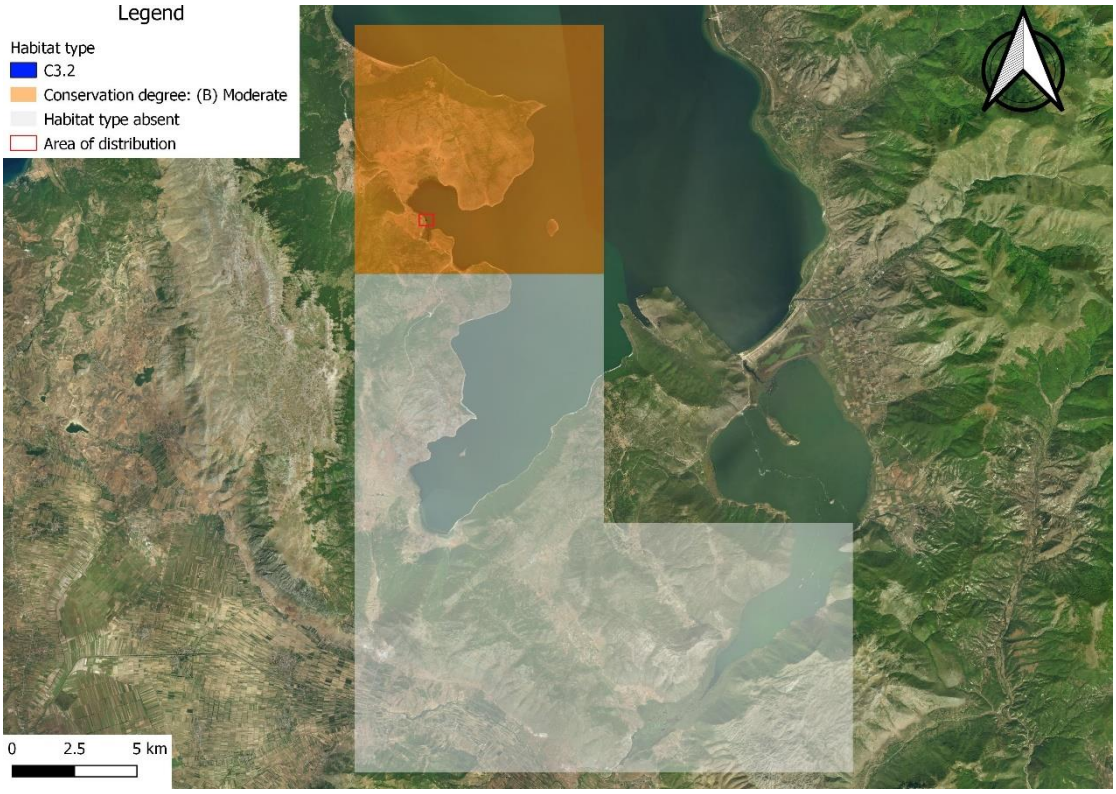
The conservation degree of this habitat type appears to be moderate.

Conservation degree in relevés:

Number of relevé	100719#04	100719#06
Typical species	A	A
Specific structure and functions	B	B
Structure and functions future trend	B	B
Structure and functions future status	B	B
Cover area (compared to reference value)	B	B
Cover area future trend	B	B
Cover area future trend (compared to reference value)	B	B
Final evaluation of structures and functions	B	B
Final evaluation of structure and functions perspectives	B	B
Restoration possibility	B	B
Conservation degree	B	B

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
100719#4	B	E524N204	0.000195	13.27891	0.0000147B	100B	G
100719#6	B						
					TOTAL	**100B**	



Map 5. Conservation degree and distribution of the habitat type C3.2 in the study area.

C3.21 & C3.23 / D5.11 & D5.13 – Reedbeds

Description: The reedbeds habitat type includes, amongst others, monotypic communities of *Phragmites australis* and *Typha angustifolia*, as well as mixed formations of these two species. They are located principally in Lesser Prespa Lake and in small bays around Great Prespa Lake. This habitat type appears around Great Prespa Lake in locations with stagnant or slowly flowing waters (C3.21 & C3.23), with variations in the water level and sometimes in water-saturated soils (D5.11 & D5.13), while in Lesser Prespa Lake it occurs exclusively in locations with stagnant or slowly flowing waters (C3.21 & C3.23).

Characteristics of the habitat type:

Altitude (m)	846-857	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain	
Geological substratum	Alluvial	
Soil type	Mainly loam	
Water depth (m)	0-1	
Cover area (ha)	410,3796	
% of the study area	0,07815	
Structure and functions	Species-poor *Phragmites australis* stands of high vegetation cover (> 70%)	100%
	Non-significant presence of ruderal and/or invasive species (e.g. *Arundo donax*)	86,7%
	Adjacent vegetation semi-natural or natural	100%
	Evidence of vigorous reed rhizomes (or rhizome formations) in wetland soils (or near water surface in case of floating reedbeds)	73,3%
	Constant high water table, i.e. habitat inundated during high water level season, and soils saturated with water during dry season	73,3%
	Pure (monospecific) stands of *Phragmites australis* of single age and structure present within total area of the habitat type	100%
	Bird species and/or reed-dwelling insects present	100%
	Fresh reed stems growing amongst dry (standing or laying) stems of previous year(s)	73,3%
	Absence of rubbish	66,7%
	Absence of high levels of eutrophication	26,7%
	Evidence of fluctuating water level (e.g. by differentiating colour on reed stems)	80%
	Flowering fresh reed stems exceed 50% of total standing fresh stems (note to be taken into account after flowering season, i.e. after mid-July)	100%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Discharges (E03)	66,7%
	Trampling, overuse (G05.01)	46,7%

Importance - Significance: Reedbeds are a very important habitat type because: (a) they filter the water entering the lake from agricultural fields and settlements; (b) they provide suitable nesting habitat for rare bird species; and (c) they protect habitats sensitive to waves and wind, such as free-floating communities of nuphars and other free-floating communities.

Pressures - Threats: The main pressures on the habitat are directly correlated with human activities. Locally the presence of large quantities of waste undermines the conservation degree, while in selected areas (mainly in the northern part of the study area) overgrazing by cattle negatively affects the habitat.

Management measures: No management measures are required for this habitat type as it appears to be in very good conservation status.

Vegetation Units / Syntaxonomy: 15 relevés were attributed to this habitat type. Amongst the main predominant species are *Phragmites australis, Typha latifolia* (Photo 6) and others. A total of 2 associations were distinguished from the analysis:

A/A	Class	Order	Alliance	Association/Community
1	Phragmito-Magnocaricetea	Phragmitetalia	Phragmition communis	Phragmitetum australis
2				Typhetum latifoliae

Photo 6. Typhetum latifoliae

The degree of conservation of this habitat type appears to be very good.

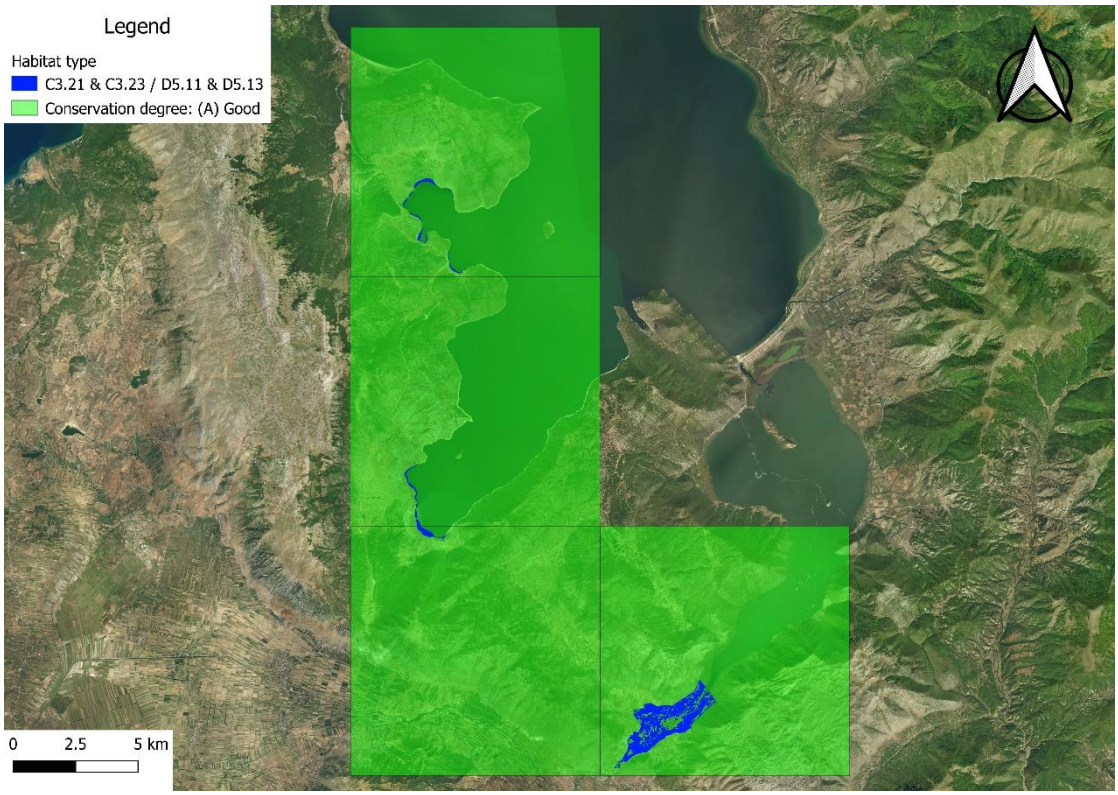
Conservation degree in relevés:

Number of relevé	040819#1	040819#3	040819#4	040819#5	040819#6	040819#8	040819#10	060819#3	060819#4	060819#5	060819#7	060819#8	060819#12	060819#14	060819#16
Typical species	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Specific Structure and functions	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Structure and Functions future trend	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Structure and Functions future status	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cover area (compare to reference value)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cover area future trend	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Cover area future trend (compare to reference value)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Final evaluation of Structures and Functions	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Final evaluation of Structure and Functions perspectives	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Restoration possibility	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Conservation degree	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km²)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
040819#1	A	E524N204	0.277922	13.27891	0.0209A	6.55A	G
040819#4	A						
040819#3	A						
040819#5	A						
040819#6	A	E524N203	0.174562	33.65715	0.0052A	4.25A	
040819#8	A	E524N202	0.161359	0.830383	0.194A	3.93A	
040819#10	A						
060819#3	A	E525N202	3.489953	4.743034	0.736A	85.04A	
060819#5	A						
060819#4	A						
060819#7	A						
060819#8	A						
060819#12	A						
060819#14	A						
060819#16	A						
					TOTAL	**100A**	



Map 6. Conservation degree of habitat type C3.21 & C3.23 / D5.11 & D5.13 in the study area

D5.12 *Scirpus lacustris* beds normally without free-standing water

Description: These are plant communities dominated by *Schoenoplectus lacustris*, which occur in places saturated with water.

Characteristics of the habitat type:

Altitude (m)	846	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain	
Geological substratum	Alluvial	
Soil type	mainly loam	
Water depth (m)	0-0,1	
Cover area (ha)	6,7195	
% of the study area	0,13	
Structure and functions	Abundance of tall perennial grasses (except *Phragmites*, *Typha* and *Arundo*)	0%
	Absence of rubbish or of high levels of eutrophication	100%
	Stabilised shores	100%
	Non-disturbed hydrological cycle	0%
	Absence of evidence of primary or secondary succession	100%
	Rich in bird communities	100%
	Presence/practice of normal (regular) grazing	100%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	100%
Pressures and Threats	Water flow changes (limnic, tidal and oceanic) (M01.05)	100%
	Flooding modifications (J02.04)	100%

Importance - Significance: This plant community filters water entering the lake from agricultural fields and settlements.

Pressures - Threats: No serious threats were detected for this habitat type.

Management measures: No management measures are required for this habitat type as it appears to be in very good conservation status.

Vegetation Units / Syntaxonomy: This habitat type represents stands where *Schoenoplectus lacustris* is the dominant species (Photo 7).

A/A	Class	Order	Alliance	Association/Community
1	Phragmito-Magnocaricetea	Phragmitetalia	Phragmition communis	Schoenoplectetum lacustris

The conservation degree of this habitat type appears to be very good.

Conservation degree in relevés:

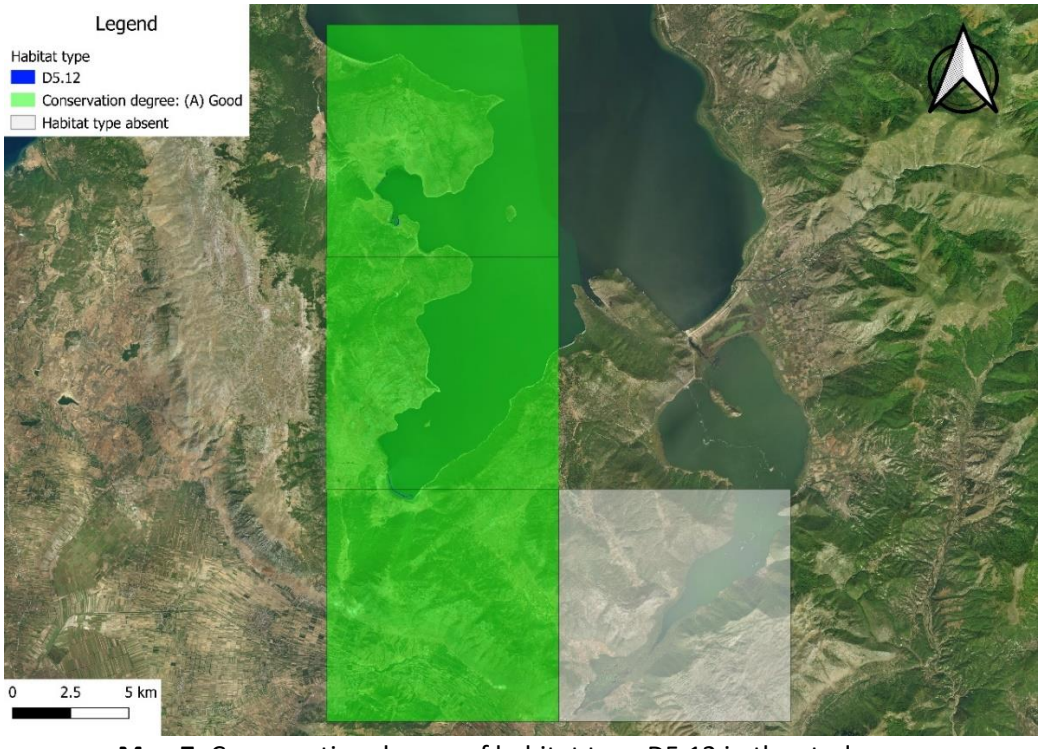
Number of relevé	030819#3	040819#9	040819#2	030819#5
Typical species	A	A	A	A
Specific structure and functions	A	A	A	A
Structure and functions future trend	A	A	A	A
Structure and functions future status	A	A	A	A
Cover area (compared to reference value)	A	A	A	A
Cover area future trend	B	B	B	B

Cover area future trend (compared to reference value)	B	B	B	B
Final evaluation of structures and functions	A	A	A	A
Final evaluation of structure and functions perspectives	B	B	B	B
Restoration possibility	A	A	A	A
Conservation degree	A	A	A	A

Photo 7. Schoenoplectetum lacustris

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
040819#2	A	E524N204	0.029297	13.27891	0.0022A	43.6A	G
	A	E524N203	0.011259	33.65715	0.0003345A	16.8A	O
040819#9	A	E524N202	0.026639	0.830383	0.0321A	39.6A	G
030819#3	A						
030819#5	A						
					TOTAL	**100A**	



Map 7. Conservation degree of habitat type D5.12 in the study area

D5.21 Beds of large *Carex* spp.

Description: This habitat represents the formations where *Carex* spp. and *Juncus* spp. are the dominant species.

Characteristics of the habitat type:

Altitude (m)	845-855	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain	
Geological substratum	Alluvial	
Soil type	Loam	
Water depth (m)	0	
Cover area (ha)	16,8214	
% of the study area	0,32	
Structure and functions	Abundance of tall perennial grasses (except *Phragmites*, *Typha* and *Arundo*)	37,5%
	Absence of rubbish or of high levels of eutrophication	25%
	Stabilised shores	100%
	Non-disturbed hydrological cycle	100%
	Absence of evidence of primary or secondary succession	50%
	Rich in bird communities	100%
	Presence/practice of normal (regular) grazing	37,5%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Agriculture intensification (A02.01)	25%
	Discharges (E03)	100%
	Intensive grazing (A04.01)	100%
	Trampling, overuse (G05.01)	75%
	Species composition change (succession) (K02.01)	37,5%
	Wildfires	25%

Importance - Significance: This plant community filters water entering the lake from agricultural fields and settlements.

Pressures - Threats: The main pressures on the habitat are directly correlated with cattle overgrazing and trampling, which alters the structure and the species composition of the habitat.

Management measures: There is a great need for a grazing management plan for the study area. Cattle grazing is the main pressure on this habitat, since the number of grazing animals, as well as the annul rotation of grazing, seems to be above the capacity of the habitat and the sustainability of the present management regime is therefore brought into question.

Vegetation Units / Syntaxonomy: In the area of the Prespa lakes, 8 relevés were classified as habitat type D5.21. Amongst the main predominant species are *Agrostis stolonifera, Juncus articulatus, Juncus inflexus, Carex hirta, Cirsium creticum, Cyperus fuscus* and others. In this habitat type 3 different phytosociological communities have been distinguished:

A/A	Class	Order	Alliance	Association/Community
Phragmito-Magnocaricetea	Phragmitetalia			*Agrostis stolonifera* comm.
				Juncus articulatus comm.
				Carex hirta comm.

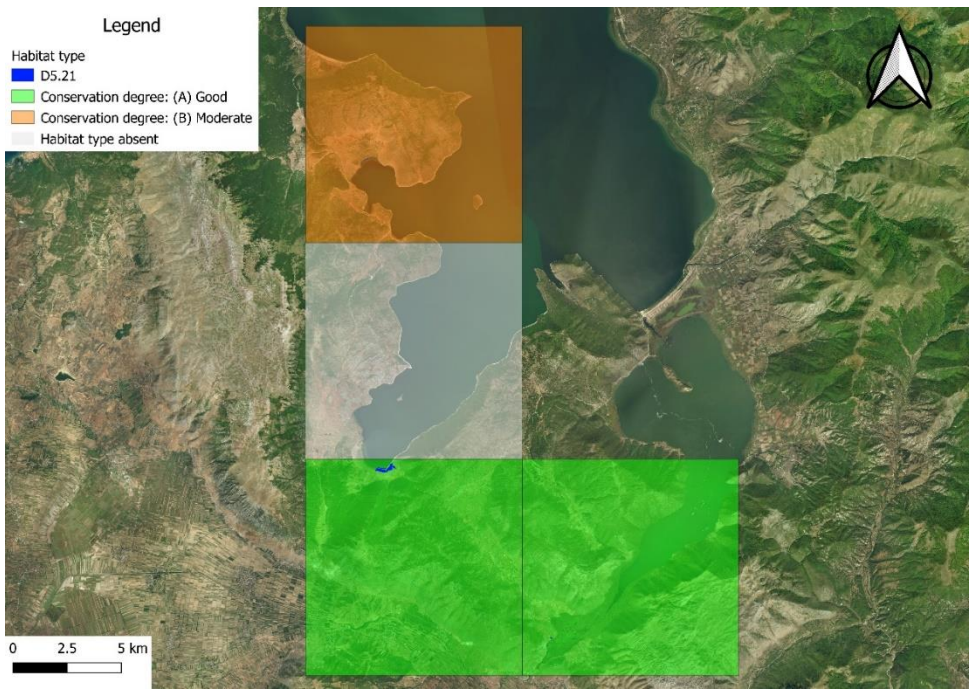
The conservation degree of the habitat type appears to be very good in general, though it is locally threatened by intensive grazing.

Conservation degree in relevés:

Number of relevé	100719#01	100719#02	100719#07	100719#08	100719#11	100719#12	100719#13	110719#1
Typical species	A	A	B	B	A	B	A	A
Specific structure and functions	B	B	B	B	A	B	A	A
Structure and functions future trend	B	B	B	B	B	B	B	B
Structure and functions future status	B	B	B	B	B	B	B	B
Cover area (compared to reference value)	B	B	B	B	B	B	B	B
Cover area future trend	B	B	B	B	B	B	B	B
Cover area future trend (compared to reference value)	B	B	B	B	B	B	B	B
Final evaluation of structures and functions	B	B	B	B	A	B	A	A
Final evaluation of structure and functions perspectives	B	B	B	B	B	B	B	B
Restoration possibility	A	A	B	B	A	B	A	A
Conservation degree	B	B	B	B	A	B	A	A

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
100719#2	B	E524N204	0.010899	13.27891	0.000821B	6.48B	G
100719#1	B						
100719#8	B						
100719#7	B						
100719#11	A	E524N202	0.149703	0.830383	0.18A	88.99A	
100719#13	A						
100719#12	B						
110719#1	A	E525N202	0.007077	4.743034	0.0015A	0.042A	
					TOTAL	**100A**	



Map 8. Conservation degree and distribution of the habitat type D5.21 in the study area

E3.31 Hay meadows (Helleno-Moesian riverine and humid *Trifolium* meadows)

Description: This habitat type represents the humid meadows, which appear on relatively flat soils that have occasionally been, or can be, used for agricultural crops during drought years.

Characteristics of the habitat type:

Altitude (m)	860	
Exposition (^{0})	0	
Inclination (^{0})	0	
Relief	Plain	
Geological substratum	Alluvial	
Soil type	Loam	
Water depth (m)	0	
Cover area (ha)	56,9241	
% of the study area	1,08	
Structure and functions	Abundance of tall perennial grasses and herbs	0%
	Absence of rubbish or of high levels of eutrophication	0%
	Stabilised shores	100%
	Non-disturbed hydrological cycle	50%
	Absence of evidence of primary or secondary succession	100%
	Rich in bird communities	100%
	Presence/practice of normal (regular) grazing/mowing	100%
Positive impacts	Existance of Transboundary Park	100%
	Existance of Management Authority	100%
	Project(s) for habitat research	100%
	Project(s) for habitat conservation/restoration	0%
Pressures and threats	Intensive grazing (A04.01)	100%
	Discharges (E03)	100%
	Trampling, overuse (G05.01)	100%

Importance - Importance: This habitat type contributes significantly to the diversity of the flora, fauna and landscape. It also has significant economic importance, as it provides large quantities of animal fodder.

Pressures-Threats: The E3.31 habitat type is mainly threatened by intensive cattle grazing Photo 8), and to a lesser extent by rubbish dumping.

Management measures: The most important management action for this habitat is the creation of a grazing management plan. Several sites across the study area are overgrazed, undermining the conservation degree, functions and structure of this habitat. The number of grazing animals needs to be controlled, as well as the rotation of grazing activity during the year at each site. In addition, the removal of rubbish is a priority.

Vegetation Units / Syntaxonomy: 2 relevés were carried out in the area. A total of 1 phytosociological community was distinguished (Photo 9):

A/A	Class	Order	Alliance	Association/Community
1	Molinio-Arrhenatheretea	Arrhenatheretalia		*Trifolium repens* comm.

The conservation degree of this habitat type appears to be moderate.

Photo 8. Patches of different vegetation units due to grazing

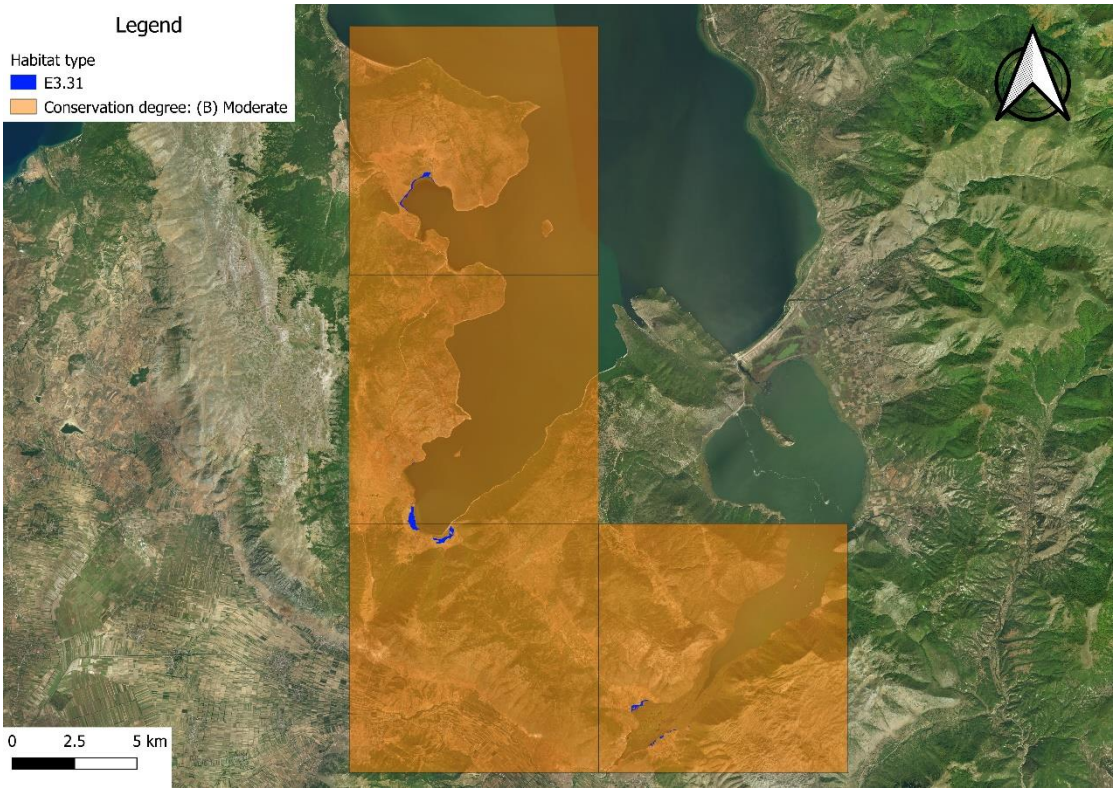
Photo 9. *Trifolium repens* comm.

Conservation degree in relevés:

Number of relevé	100719#9	100719#10
Typical species	A	A
Specific structure and functions	B	B
Structure and functions future trend	B	B
Structure and functions future status	B	B
Cover area (compared to reference value)	B	B
Cover area future trend	B	B
Cover area future trend (compared to reference value)	B	B
Final evaluation of structures and functions	B	B
Final evaluation of structure and functions perspectives	B	B
Restoration possibility	A	A
Conservation degree	B	B

Conservation degree in cells and in the study area:

Number of relevé	Conservation degree	Cell code	Area cover by habitat type in cell (Km^2)	Area of cell in the study area	Conservation degree in the cell	Total cover of habitat type in the study area	Data quality
	B	E524N204	0.131972	13.27891	0.00994B	23.18B	O
100719#9	A	E524N203	0.133937	33.65715	0.00398B	23.53B	G
100719#10	B						
	B	E524N202	0.200369	0.830383	0.2413B	35.2B	O
	B	E525N202	0.102963	4.743034	0.0217B	18.09B	O
					TOTAL	**100B**	



Map 9. Conservation degree of habitat type E3.31 in the study area

4. CONCLUSIONS

4.1. Habitat types

In total five habitat types in Annex I of the Habitats Directive were detected in the study area.

- 3150. + Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation
- 3270. + Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
- 6420. + Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion
- 91E0. * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)
- 92A0. + *Salix alba* and *Populus alba* galleries

It should be noted that one, 91E0*, is a priority habitat type.

In addition, for the vegetation communities that are not included in the Habitats Directive, and where the EUNIS coding was followed, a total of five more discrete "habitat types" were found, viz.:

- C3.2 for communities dominated by *Butomus umbellatus*
- C3.21 & C3.23 / D5.11 & D5.13 for reedbeds
- D5.12 for communities dominated by *Schoenoplectum lacustris*
- D5.21 for communities dominated by tall sedges
- E3.31 for hay meadows (Bern convention Resolution 4 habitat type)

4.2. Vegetation Types

A total of 24 different vegetation types were distinguished in the area, of which there were 11 associations and 13 communities. The great vegetation diversity at Great Prespa Lake is shown by the fact that the vegetation types are included in 5 Alliances, 5 Orders and 7 classes:

Lemnetea
- Lemnetalia minoris
  - Stratiotion
    - Ceratophylletum demersi
  - Lemnion minoris
    - Lemno-Utricularitum vulgaris

Potamogetonetea
- Potamogetonetalia
  - Nymphaeion albae
    - Nymphaeetum albae
    - Nymphoidetum peltatae
    - *Nuphar lutea* comm.
  - Potamogetonion
    - Potameto-Vallisnerietum spiralis
    - *Potamogeton perfoliatus* comm.
    - Potamogetum lucentis
    - Myriophylletum spicati
    - *Potamogeton natans* comm.
    - *Potamogeton pectinatus* comm.
    - *Elodea canadensis* comm.

Isoëto-Nanojuncetea

Cyperetalia fusci
Cyperus fuscus comm.

Phragmito-Magnocaricetea
Phragmitetalia
Phragmition communis
Schoenoplectetum lacustris
Phragmitetum australis
Typhetum latifoliae
Butometum umbellati
Juncus articulatus comm.
Carex hirta comm.
Agrostis stolonifera comm.
Cardamine raphanifolia comm.

Molinio-Arrhenatheretea
Arrhenatheretalia
Trifolium repens comm.

Alnetea glutinosae

Salicetea purpureae

4.3. Pressures – threats

The most important pressures and threats for almost all the habitat types are related to intense grazing at Great Prespa Lake. In addition, all habitat types are affected by rubbish dumping, while, to some extent, vegetation succession and invasive species can also be a threat to most of them.

4.4. Conservation Degree

The conservation degree is good for the study area, for all the cells (of the GRID) for the habitat types 3150, C3.21 & C3.23/ D5.11 & D5.13 and D5.12. The conservation degree is good for the study area, but moderate in some cells (of the GRID), for the habitat type D5.21, while the conservation degree is moderate for the habitat types 3270, 6420, C3.2, E3.31, mainly due to current pressures and threats.

4.5. Conservation measures

The main management actions for the habitat types of the study area are:
(a) Collection and removal of the rubbish that can be found in almost every habitat type of the study area (both aquatic and terrestrial communities). These actions can be part of a broader project that would include communication with the local community, as well as environmental education activities with the local school authorities.
(b) The main pressure in the habitat types that can be found in the Great Prespa Lake study area is overgrazing. In the majority of all grassland and sedges communities the effect is severe. There is a need for a grazing management plan in which the number of animals, as well as the annual rotation of grazing, at every site would be determined.
(c) In Lesser Prespa Lake, the encroachment of reedbeds on the habitat type 3150, as well as on open water surfaces, is a major threat that has developed during the last 40 years. Targeted management actions need to take place.

(d) Monitoring of the habitat type 3270, as well as of the “habitat type” C3.2, is of great importance, since in both cases their ecology and their distribution is not sufficiently known.

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