

## E6.3 Temperate inland salt marsh

### Summary

These are inland salt marshes and meadows in temperate and continental regions, characteristic of situations where fossil salt lies close to the surface or where relict sea water is present, resulting in brackish or saline ground and surface water. In more continental regions inland salt pans are more common, as in the Pannonian plain, Central Balkan and in the steppic areas of South-Eastern Europe where the habitat is found on solonetz and solonchak soils in depressions within a matrix of salt steppes and as subhalophytic meadows. Elsewhere in Europe, the habitat can be found in association with a variety of salty bedrocks and also on abandoned salt workings. The species composition is very varied according to the regional climate and particular site conditions and, in more extensive sites, there can be zonations of different plant communities related to microtopography or salinity level. These habitats are under pressure in most parts of the range because of modifications in hydrology with land reclamation and drainage, structures of inland water courses, changes in management type with the abandonment of traditional mowing and grazing or shift to intensive grazing and overuse, and urbanization. Natural succession may also form a threat. The habitat is declining in extent and quality throughout the range and large losses have occurred in recent historic time.

### Synthesis

Due to the large reduction in quantity the category Endangered is scored. Additionally, the relatively severe reduction in quality parameters results in the Red List category Near Threatened.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Endangered	A1	Endangered	A1

### Sub-habitat types that may require further examination

In the Annex I of the Habitat's Directive the habitat has been divided into a more oceanic type (1340) and a more continental type (1530). It is likely that both subhabitats are seriously threatened.

### Habitat Type

#### Code and name

E6.3 Temperate inland salt marsh



Inland salt marsh in Sülldorf, East Germany (Photo: Carsten Hobohm).



Inland salt marsh with *Salicornia europaea* near Boian, Romania (Photo: Carsten Hobohm).

## Habitat description

This habitat refers to inland salt marshes and meadows in temperate and continental regions, which are dominated by halophytic (salt-adapted) plants. In Western and Central Europe this habitat is found in places where fossil salt lies close to the surface or where relict sea water is present, resulting in brackish or saline ground and surface water. Such sites are extremely rare.

In Western and Central Europe the habitat occurs on several types of bedrock, like on marble in Lorraine, on travertine in the Auvergne, on so-called Zechstein in England, Germany and Poland, and on miocene salt rocks in Poland. This habitat is naturally found in places where fossil salt deposits have been uplifted to the surface in the form of domes or pillows or where salty water related to the salt stratum or relict seawater is present close to the surface. In the Atlantic regions plant communities belong to the (mainly coastal) classes *Thero-Salicornietea* and *Juncetea maritimi* and the alliance *Potentillion anserinae*. The species composition resembles that of coastal salt marshes (A2.5abc), but some coastal species are never found in inland sites and also the functioning of inland and coastal salt marshes is very different. A very specific case form the saline spring fens on travertine soils in the Slovakian Carpathians, with among others *Trichophorum pumilum*, *Pinguicula vulgaris*, *Parnassia palustris* and *Primula farinosa*, but these are considered as a subhabitat of D4.1a (Small-sedge base-rich fens and calcareous spring mires).

In more continental regions inland salt pans are more common, like in the Pannonian plain, Central Balkan and in the steppic areas of South-Eastern Europe. Here the habitat is found on hypersaline (solonetz and solonchak) soils, where it occurs as depressions within a matrix of alkaline steppes and as subhalophytic, mesic meadows. In these regions the habitat contains vegetation of the classes *Thero-Salicornietea* (alliance *Salicornion prostratae*) and *Festuco-Puccinellietea* (alliance *Juncion gerardii* and *Beckmannion eruciformis*).

Like in coastal salt marshes, within the habitat often a vegetation zonation is found, reflecting different levels of salinity, related with microtopography. Lower parts of the habitat in most cases are sparsely vegetated with *Salicornia europaea*, *S. emerici* var. *vicensis* (in Lorraine), *S. perennans* (= *S. prostrata*), *Suaeda maritima*, *Suaeda prostrata*, *Suaeda pannonica*, *Salsola soda*, *Spergularia salina* and *Spergularia maritima*, *Puccinellia distans* and sometimes *Puccinellia fasciculata*. In the Atlantic region on moist sites, the saline meadows and pastures resemble that of coastal salt marshes, with a combination of *Agrostis stolonifera*, *Juncus gerardi*, *Glaux maritima*, *Carex distans*, *Plantago maritima*, *Glaux maritima*, *Tetragonolobus maritimus*, *Triglochin maritima* and *Aster tripolium*, and on more brackish sites *Lotus tenuis*, *Trifolium fragiferum*, *Potentilla anserina*, *Alopecurus bulbosus*, *Alopecurus geniculatus*, *Festuca arundinacea*, *Blysmus rufus* and *Juncus compressus*.

Moist saline meadows in the continental region are characterised by *Juncus gerardi*, *Carex distans*, *Agrostis stolonifera*, *Aster tripolium* subsp. *pannonicus*, *Cirsium brachycephalum*, *Melilotus dentatus*, *Scorzonera parviflora*, *Mentha pulegium*, and *Lotus tenuis*. On drier edges communities with *Puccinellia distans* or *Puccinellia limosa* are found (alliance *Puccinellion limosae*), communities that are also found in (wetter parts of) salt steppes (E6.2). In South-Eastern Europe halophytic and sub-halophytic moist meadows that are dominated by *Elytrigia obtusiflorus* (*Elymus elongatus* subsp. *ponticus*), *Festuca arundinacea* and *Phacelurus digitatus* are included in this habitat.

Besides the dominance of halophytic and sub-halophytic plant communities, also part of the associated fauna is characteristic halophytic. Examples are the mott *Coleophora adjunctella* (living on *Juncus gerardi*), and the beetles *Hygrotus parallelogrammus*, *Enochrus bicolor* and *Bembidion minimum*.

Small stands of *Bolboschoenus maritimus*, *Schoenoplectus tabernaemontani* or *Phragmites australis* may be present, especially where the water table remains high during the year, but where these species form larger, brackish reedbeds, they are considered as a separate wetland habitat C5.4. In the continental regions in drier sites alkaline steppic grasslands are found, which are considered under habitat E6.2

(Continental inland salt steppes), and have some species in common. Mediterranean inland salt marshes and steppes are considered as a separate habitat under E6.1. Habitats with saline vegetation of the *Crypsietea aculeatae* are considered under habitat C3.5c.

The habitat can occur as a natural or semi-natural system. In the latter case sites are traditionally used as meadows or pastures. In natural sites succession is mainly limited or prevented by long-term inundation and high soil salinity. Desalinisation and abandonment of traditional management may lead to an increase of ruderal species and scrubs, and transitions towards other habitats.

In Western and Central Europe the habitat is naturally rare in Germany, Poland, Czech Republic, Slovakia, England, France and Italy. Also on the Balkan the habitat is relatively rare, and among others found in Macedonia and Bulgaria. Inland salt pans are more common in the Pannonian lowland and occur even more widespread further eastwards, in the steppe regions of the Ukraine, the Caspian Lowlands of Russia and the Central Asian (semi)deserts.

Although in some cases referred to as Annex 1-type 1340 and having similar vegetation, saline coastal sites that became relatively recently (approximately since the Middle Ages) isolated from the sea by natural dynamics or embankment are not included here, but are considered under coastal habitats (B-group).

Anthropogenic sites associated with salt industry or other present human activity are not considered under this habitat (like saline sites along roads resulting from salt deposition during winter). But abandoned salt mines or waste deposits, which now have a semi-natural character and harbour the characteristic species combination, may be included under the habitat.

Indicators of good quality:

- High water table during (at least) part of the season, resulting in regular disturbance
- Dominance of halophytic and sub-halophytic species
- Presence of rare, halophytic fauna
- High soil salinity ( $EC_e$  over 4 dS/m)
- Maintenance of traditional management (extensive grazing, mowing)
- Absence of ruderal species and shrubs
- Absence of disturbance by man

Characteristic species (\*= also in E6.2):

Flora: *Agrostis stolonifera*, *Alopecurus bulbosus*, *Aster tripolium* (incl. subsp. *pannicum* = *Tripolium pannicum*)\*, *Atriplex prostrata* (= *hastata*), *Bolboschoenus maritimus* (= *Scirpus maritimus*), *Beckmannia eruciformis*, *Blysmus rufus*, *Bupleurum tenuissimum*, *Carex cuprina*, *Carex distans*\*, *Carex divisa*, *Centaureum pulchellum*, *Cirsium brachycephalum*, *Frankenia hirsuta*, *Glaux maritima*, *Halimione pedunculata*, *Halocnemum strobilaceum*, *Hordeum hystris*, *Hordeum marinum*, *Hordeum jubatum*, *Juncus gerardi*, *Leontodon taraxacoides* (= *L. saxatilis*), *Limonium vulgare*, *Lotus glaber* (= *L. tenuis*), *Melilotus dentatus*, *Odontites vulgaris* (= *O. serotina*), *Plantago coronopus*, *Plantago maritima*, *Plantago tenuiflora*, *Potentilla anserina*, *Puccinellia distans*, *Puccinellia limosa*\*, *Pulegium vulgare*, *Ranunculus sardous*, *Salicornia emericii*, *Salicornia europaea* (incl. *S. ramosissima*), *Salicornia perennans* (= *S. prostrata*), *Salsola soda*, *Samolus valerandi*, *Schoenoplectus tabernaemontani* (= *Scirpus lacustris* ssp. *tabernaemontani*), *Scorzonera parviflora*, *Spergularia media* (= *S. maritima*)\*, *Spergularia marina* (= *S. salina*)\*, *Suaeda maritima*, *Suaeda prostrata*, *Taraxacum bessarabicum*, *Trifolium fragiferum*, *Triglochin maritima*.

Fauna (examples):

Birds: 1. included in Birds Directive - *Crex crex*, *Coturnix coturnix*, *Luscinia svecica*, *Botaurus stellaris*, *Ixobrychus minutus*, *Rallus aquaticus*, *Porzana porzana*, *Gallinula chloropus*, *Circus aeruginosus*, *Vanellus*

vanellus, *Limosa limosa*, *Gallinago gallinago*, *Tringa totanus*, 2. other: *Anas aquerquedula*, *Perdix perdix*, *Tachybaptus ruficollis*, *Charadrius dubius*, *Lanius excubitor*, *Riparia riparia*, *Acrocephalus schoenobaenus*, *A. arundinaceus*, *Saxicola rubetra*, *S. rubicola*, *Oenanthe oenanthe*, *Anthus pratensis*, *Motacilla flava*, *Emberiza calandra*.

Invertebrates: 1. aquatic Coleoptera – *Hygrotus parallelogrammus*, *H. nigrolineatus*, *Ochthebius auriculatus*, *O. marinus*, *Berosus spinosus*, *Heterocerus parallelus*, *H. flexuosus*, *H. obsoletus*, 2. Coleoptera: *Dyschirius chaldeus*, *D. salinus*, *Bembidion varium*, *B. fumigatum*, *B. aspericolle*, *B. minimum*, *Pogonus chaldeus*, *Anisodactylus poecilioides*, *Dicheirotichus obsoletus*, *Acupalpus elegans*, *Amara strandi*, *A. strenua*, *A. convexiuscula*, 3. Dolichopodidae – *Micromorphus albipes*, *Thinophilus flavipalpis*, *T. ruficornis*, *Schoenophilus versutus*, *Syntormon filiger*, *Campsicnemus magius*, *C. pictornis*, *Melanostolus nigricilius*, *Tachytrechus notatus*, *Dolichopus clavipes*, *D. diadema*, *D. latipennis*, *D. sabinus*, *Medetera truncorum*.

### Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

D6.1 Inland saltmarshes

EuroVegChecklist:

*Festucion maritimae* Christiansen 1927 (= *Puccinellion maritimae*)

*Armerion maritimae* Br.-Bl. et De Leeuw 1936

*Thero-Salicornion* Br.-Bl. 1933

*Puccinellio maritimae-Spergularion salinae* Beeftink 1965

*Scirpion maritimi* Dahl et Hadac 1941

*Loto tenuis-Trifolion fragiferi* Westhoff et Den Held ex de Foucault 2009 (= *Potentillion anserinae* Tx. 1947 p.p.)

*Saginion maritimae* Westhoff et al. 1962

Annex 1:

1340 Inland salt meadows

1530 Pannonic salt steppes and salt marshes

Emerald:

D6.1 Inland saltmarshes

MAES-2:

Grassland

IUCN:

5.16. Permanent Saline, Brackish or Alkaline Marshes/Pools

**Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?**

No

Justification

The habitat occurs widespread, but also localised, in the Atlantic, Continental, Pannonian and Steppic region.

### Geographic occurrence and trends

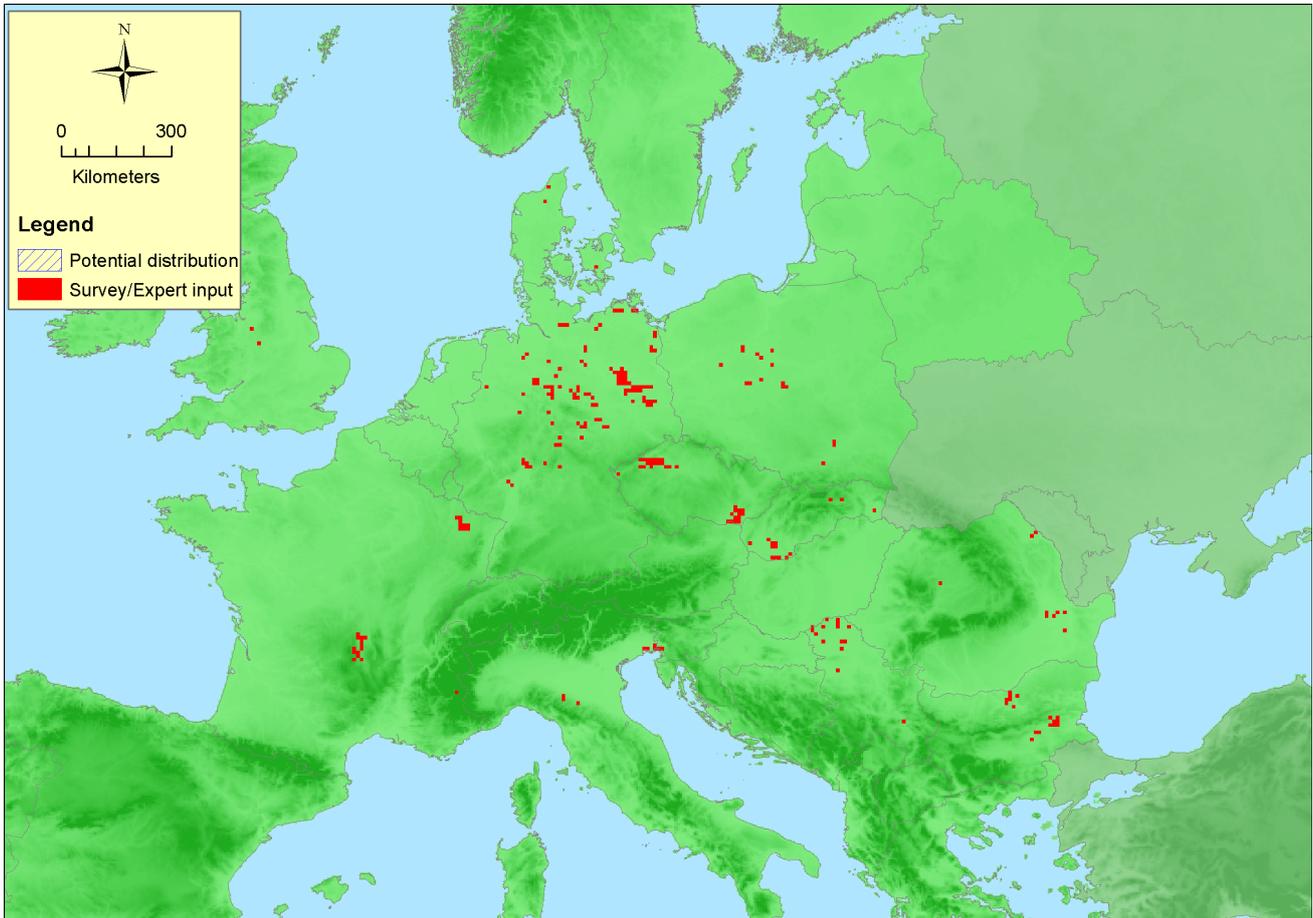
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Austria</i>	Present	4 Km <sup>2</sup>	Decreasing	Decreasing
<i>Bulgaria</i>	Present	3 Km <sup>2</sup>	Decreasing	Decreasing
<i>Czech Republic</i>	Present	1 Km <sup>2</sup>	Decreasing	Decreasing
<i>France</i>	France mainland: Present	7.7 Km <sup>2</sup>	Decreasing	Decreasing
<i>Germany</i>	Present	4 Km <sup>2</sup>	Decreasing	Decreasing
<i>Hungary</i>	Present	110 Km <sup>2</sup>	Decreasing	Decreasing
<i>Italy</i>	Italy mainland: Present	0.03 Km <sup>2</sup>	Decreasing	Unknown
<i>Poland</i>	Present	0.7 Km <sup>2</sup>	Decreasing	Decreasing
<i>Romania</i>	Present	1.3 Km <sup>2</sup>	Decreasing	Unknown
<i>Slovakia</i>	Present	2.75 Km <sup>2</sup>	Decreasing	Unknown
<i>Slovenia</i>	Uncertain	Unknown Km <sup>2</sup>	Unknown	Unknown
<i>UK</i>	United Kingdom: Present	0.005 Km <sup>2</sup>	Decreasing	Decreasing

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Serbia</i>	Present	Unknown Km <sup>2</sup>	Unknown	Unknown

### Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
<i>EU 28</i>	2194650 Km <sup>2</sup>	236	135 Km <sup>2</sup>	calculated
<i>EU 28+</i>	2194650 Km <sup>2</sup>	249	>135 Km <sup>2</sup>	not reported

### Distribution map



The map is rather complete but misses data from Hungary. Data sources: Art17, EVA.

### How much of the current distribution of the habitat type lies within the EU 28?

Data on the habitat are reported only by EU countries, but it is certain that it is present in EU28+ countries on the Balkan (Serbia). However, if the steppic regions of Ukraine and southern Russia, where *Salicornia* and other saline communities occur on a large scale are included, the EU28 hosts less than 50%.

### Trends in quantity

Based on territorial data from Austria, Bulgaria, Czech Republic, France, Germany, Hungary, Poland, Slovakia, UK, the decrease over a period of about 50 years in the countries of EU is about -53,5%. This leads to category endangered. Italy and Romania reported decrease unknown and were excluded from calculations. Habitat was not reported from non-EU countries. For assesment of historical trends, there is relatively little data, but this trend seems larger than over a period of about 50 years and probably leads to the same category. The decreasing trend of habitat quantity results mainly from lowering of the salty ground water by meliorations, cessation of grazing and mowing, and from natural processes like decreasing of salt spring activity. Furthermore, Bulgaria reported that intensive agricultural and livestock-breeding activities and also changes in the river streams are the reason for a decrease of the habitat.

- Average current trend in quantity (extent)  
EU 28: Decreasing  
EU 28+: Decreasing
- Does the habitat type have a small natural range following regression?

No

#### *Justification*

The EOO is larger than 50,000 km<sup>2</sup>. However, within the range the habitat is relatively rare in most

countries.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?

Yes

#### *Justification*

The habitat is limited to the natural saline areas, which are very rare and relatively small in the humid climate of Central and Western Europe. In drier climates saline inland marsh habitats occur often in larger patterns, but are also naturally rare, because of water deficits.

### **Trends in quality**

Calculated from the territorial data, within the EU on average 60% of the area of the habitat has suffered from degradation in quality. The average severity of the degradation in this affected area is 49%. These calculations are based on data from ca. 99% of the reported area. No data from EU28+ countries is available, but the occurrences on the Balkan (Serbia, Macedonia) contribute relatively little to the EU28+ total area.

- Average current trend in quality

EU 28: Decreasing

EU 28+: Decreasing

### **Pressures and threats**

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The most important pressures and threats reported by the countries of the EU are natural systems modifications as land reclamation and drying out, general modification of hydrographic functioning and structures of inland water courses. These modifications lead to changes in saline water supply for the habitat and result in decrease of its quantity and quality. A second group of factors reported are changes in management type. On the one hand abandonment of traditional mowing and grazing leads to habitat degradation in Germany, Poland and Hungary, on the other hand intensive grazing and overuse is a threat in the UK, Bulgaria, Romania and Italy. Another serious threat is also intensification of agriculture, reported by France, Slovakia, Bulgaria and Poland (in case of salt meadows - the use of fertilizers and supply by fodder species). Some countries report natural processes as succession and biocenotic evolution. Moreover, habitat destruction by urbanization and transportation and service corridors are stressed. Soil erosion is a problem in Romania, invasive species in Austria and climate change could be a problem for Hungary. UK reports pollution of surface waters.

### **List of pressures and threats**

#### **Agriculture**

Agricultural intensification

Intensive grazing

Abandonment of pastoral systems, lack of grazing

#### **Natural System modifications**

Human induced changes in hydraulic conditions

#### **Natural biotic and abiotic processes (without catastrophes)**

Species composition change (succession)

### **Conservation and management**

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For maintaining the diversity of inland salt marshes extensive grazing by cattle or sheep is known to be the optimum management leading to the highest diversity. However, traditional mowing could be also applied. In general no management (like abandonment) leads to relatively species-poor reedbeds with

dominance of *Phragmites australis*. Inland salt marshes, especially in humid climate, are dependent on the supply of saline springs or saline ground water. Therefore, the natural hydrological conditions should be protected. In places where the hydrological conditions already have been damaged their reconstruction (for example by damming drainage ditches) are recommended to provoke flooding of saline water. In case of inland salt marshes managed as hay meadows fertilization and supply by fodder species (eg. *Lolium perenne*) should be prohibited.

## List of conservation and management needs

### Measures related to agriculture and open habitats

Maintaining grasslands and other open habitats

### Measures related to wetland, freshwater and coastal habitats

Restoring/Improving the hydrological regime

### Measures related to spatial planning

Establish protected areas/sites

Legal protection of habitats and species

## Conservation status

Annex 1 types:

1340: ALP U2, ATL U1, CON U2, PAN U2

1530: BLS U1, CON U1, PAN U1, STE FV

## When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

Inland salt marshes in most cases are seminatural habitats and therefore, for conservation and restoration, they should be traditionally used as meadows or pastures. The use should be extensive: for example traditional mowing includes one treatment per year in June or two treatments in June and August, while pasturing for example should be carried out by about 1 livestock unit/ha. In places where habitat degradation has been caused by damage of natural hydrological conditions recovery needs restoration of former natural supply of salty water. The time needed for restoration depends on the severity of the caused damage.

## Effort required

10 years	20 years	50+ years	200+ years
Through intervention	Through intervention	Through intervention	Through intervention

## Red List Assessment

### Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-54 %	unknown %	unknown %	unknown %
EU 28+	-54 %	unknown %	unknown %	unknown %

The average negative trend in area in the EU countries is based on trend data over the last 50 years from nine countries, covering ca. 99% of the reported area. Quantitative data from Italy and Romania were lacking, and no data was reported from EU28+ countries. The decline leads to the category Endangered. No or insufficient data on long historical trends or future trends were available.

## Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km <sup>2</sup>	Yes	Yes	No	>50	Yes	Yes	No	No
EU 28+	>50000 Km <sup>2</sup>	Yes	Yes	No	>50	Yes	Yes	No	No

Both EOO and AOO are larger than the thresholds for criterion B, and the habitat is present in many locations.

## Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	60 %	49 %	unknown %	unknown %	unknown %	unknown %
EU 28+	60 %	49 %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

The affected extent and the severity of degradation over the last 50 years have been calculated based on nine EU countries (99% of reported area). For two countries, Italy and Romania, not sufficient data was available. Also from EU28+ countries no data were reported. Most countries report the degradation in quality to be caused from a combination of abiotic degradation (changes in hydrological condition, soil degradation) and biotic losses. No long historical data or future estimates were given. Therefore only the criterion C/D1 has been assessed, leading to the category Near Threatened.

## Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	unknown
EU 28+	unknown

There is no quantitative analysis available that estimates the probability of collapse of this habitat.

## Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	EN	DD	DD	DD	LC	LC	LC	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	EN	DD	DD	DD	LC	LC	LC	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Endangered	A1	Endangered	A1

### Confidence in the assessment

Medium (evenly split between quantitative data/literature and uncertain data sources and assured expert knowledge)

### Assessors

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### Contributors

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