C1.1b Permanent oligotrophic to mesotrophic waterbody with soft-water species

Summary

This habitat includes oligotrophic to mesotrophic soft water of sandy plains and rocky substrates, mainly in Scandinavia and the north-western Atlantic and subatlantic region. The water is weakly acid to circumneutral, mesotrophic to oligotrophic, clear or brown. The vegetation which extends from the shallows to the lower sub-littoral, is only moderately diverse, moreso in the Atlantic region, and dominated by isoetids, *Littorella* and soft-water pondweeds. It is affected by water movement, ice and wind. Eutrophication and modified hydrology are reported as the main continuing threats to quality, with climate change in the future. Restoration measures include restoring the hydrology, limiting the input of nutrients, removing organic layers and restoring the buffering capacity.

Synthesis

This habitat reaches the qualification of Least Concern (LC) for the whole of Europe, due to a widespread distribution and relatively small declines in quality and qauntity over the last 50 years. However, the overall assessment is strongly influenced by the countries having the largest area of this soft-water habitat, Finland and Sweden, where the habitat is in rather good condition. For the rest of Europe the habitat qualifies as Near Threatened (NT) because of a strong decline in quality, and also declines in area are much larger with some countries reporting 90% decline. Quantitative and qualitative data are missing for Norway and Iceland, but based on some assumptions a similar score is reached for the EU28+ as for EU28.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Least Concern	-	Least Concern	-

Sub-habitat types that may require further examination

The situation of this habitat is very different in the northern countries (Scandinavia, where the habitat occupies its largest area) compared to the countries in the north-western Atlantic region (The Netherlands, Belgium, Germany, United Kingdom, Ireland, probably Poland), where the type has the highest diversity of plant species. The soft waters are more shallow in this latter region and several pressures are or have been much severe here. Therefore an assessment of this north-western Atlantic sub-type would have resulted in a much more threatened habitat at the EU level, closely reaching or even meeting the thresholds for Vulnerable.

Habitat Type

Code and name

C1.1b Permanent oligotrophic to mesotrophic waterbody with soft-water species

Hypericum elodes vegetation in soft-water lake Leikeven in the southern province of Noord-Brabant, The Netherlands (Photo: Gertie Arts).

Oligotrophic to mesotrophic lake in Finnland (Photo: Heikki Toivonen).

Habitat description

Oligotrophic to mesotrophic waters of sandy plains and rocky substrates (granites, gravel, stones, till, moraine, clay) containing few minerals. Over large parts of the lake the sediment is covered by a thin layer of detritus and accumulation of mud is sparse. The water layer is carbon deficient and poorly buffered (low alkalinity). The water is weakly acid to circumneutral. Concentrations of nitrogen and phosphorous are low and in the oligotrophic to mesotrophic range. The water is clear, sometimes humic (brown) with a low concentration of chlorophyll. The vegetation is low to moderate in species diversity and is dominated by soft-water species. This soft-water vegetation consists mainly of communities dominated by the isoetid species *Plantago uniflora* and other soft-water species with other growth forms like *Myriophyllum alterniflorum*, *Potamogeton polygonifolius* and *P. gramineus*. Several soft-water species including *Baldellia ranunculoides* subsp. *ranunculoides*, *B. ranunculoides* subsp. *repens* and *Luronium natans* are atlantic and are absent from the boreal zone. In the temperate Atlantic zone boreal and atlantic species overlap. As a consequence, soft-water lakes are relatively richer in species in the temperate atlantic zone. Similar habitats in coastal dune slacks, with *Plantago uniflora* (= *Littorella uniflora*) as characteristic species, are considered part of habitat B1.8a. In soft-water lakes the vegetated layer extends from the littoral to lower parts of the sub-littoral zone. The littoral zone has fluctuating water levels and the littoral vegetation might be semi-permanent in the summer period. The vegetation and its substrate are mechanically influenced by water movement, ice sheets and wind exposition. Many large lakes in northern Europe represent this type or the more oligotrophic type C1.1a in terms of water chemistry and abundant isoetid vegetation. Occurrence and abundance of other growth forms (elodeids, aquatic mosses, sometimes also *Nitella* stands, nymphaeids and helophytes) vary according to shore and bottom material, topography, exposition and lake area exposed to wind and subsurface currents. Exposed shores have sparse stands of aquatic vegetation, in sheltered bays vegetation has clear zonation, but the stands are still open. The lower limit of submerged vegetation reaches typically the depth of 3-6 meters, sometimes close to 10 meters. Due to postglacial history deeper lakes host some glacial relict crustaceans and vertebrates, including salmonid fish and a critically endangered fresh water seal (*Pusa hispida* subsp. *saimensis*). Large lakes have diverse

waterfowl populations and are important parts of migration routes. This habitat type must not be confused with oligotrophic to mesotrophic ponds only periodically flooded, which is instead typical of the Mediterranean area and dominated by isoetid species of *Isoëtetalia* and *Nano-Cyperetalia* (class *Isoëto-Nanojuncetea*). The vegetation of these habitats is composed of a contribution of annual and ephemeral species. These drier habitats are not part of the habitat described here, but belong to types C1.6b "Mediterranean temporary waters" and C3.5b "Periodically exposed shores with stable, mainly mesotrophic sediments with pioneer and ephemeral vegetation".

Indicators of good quality:

- Large stands of soft-water species
- Absence or very low abundance of peat mosses
- Absence or very low abundance of water plants from eutrophic and alkaline waters
- Low abundance of water plants with large floating leaves (Nymphaeids) or emergent plants (e.g. *Phragmites australis*, *Typha* spp., *Equisetum fluviatile, Carex* spp.)
- Long-term habitat stability, with no rapid successional trends (e.g. no trends in acidification or eutrophication)
- Low concentrations of nutrients and chlorophyll (approximately P < 40 µg/L and chlorophyll < 5 µg/L)
- pH weakly acid to circumneutral (pH 5.5 - 7.5)
- Alkalinity 0.1 – 2 meq/L
- Thin layer of detritus (no accumulation of organic mud) over large parts of the lake
- Occurrence of conspicuous populations of salmonid fish, but population of roach (*Rutilus rutilus*) and other *Cyprinidae* low

Note: Chemical and physical parameters are only indicative, they may change in different geographical area and climatic conditions.

Characteristic species:

Vascular plants: Boreo-atlantic species: *Plantago uniflora* (=*Littorella uniflora*), *Lobelia dortmanna*, *Isoëtes echinospora*, *I. lacustris*, *Eleocharis acicularis, E. multicaulis, E. palustris, Juncus bulbosus, Lycopodiella inundata, Myriophyllum alterniflorum, Ranunculus flammula, R. reptans, Sparganium angustifolium, S. gramineum, Subularia aquatica, Potamogeton gramineus, P. polygonifolius, Samolus valerandi, Callitriche hamulata, C. palustris*; Atlantic species: *Eleogiton fluitans, Pilularia globulifera, Baldellia ranunculoides* subsp. *ranunculoides, B. Baldellia ranunculoides* subsp. *repens, Luronium natans, Hydrocotyle vulgaris, Ranunculus ololeucos, Deschampsia setacea*; Mediterranean-atlantic species: *Antinoria agrostidea, Baldellia alpestris, Juncus heterophyllus, J. emmanuelis*

Macroalgae: *Nitella opaca, N. flexilis, N. transluncens*

Mosses: *Fontinalis* spp. (e.g. *Fontinalis hypnoides*, *F. antipyretica*), *Fossombronia foveolata, Riccardia* spp., *Scapania* spp., *Warnstorfia exannulata, W. procera, W. trichophylla*, *Scorpidium scorpioides, Calliergon megalophyllum*

Phytoplankton: *Chrysophyceae; Bambusina borreri, Closterium lunula, Desmidium swartzii, Euastrum binale* var. *gutwinskii, E. oblongum, Micrasterias rotata, M. truncata, Pleurotaenium ehrenbergii, Spondylosium pulchellum, Staurodesmus convergens, Tetmemorus granulatus, Xanthidium antilopaeum.*

Phytobenthos*: Eunotia rhomboidea, E. incisa, Tabellaria flocculosa, T. binalis, Navicula heimansii, Anomoeoneis vitrea.*

Fauna: Macroinvertebrates: *Glaenocorisa propinqua, Sigara scotti, Arctocorisa germari*; Diptera: *Dicrotendipes tritomus, Psectrocladius psilopterus, Parakiefferiella bathophila, Pagastiella orophila; Chaoborus flavicans, Hygrotus novemlineatus*; Odonata: *Lestes dryas*; Trichoptera: *Molanna albicans*; Amphipoda: *Gammarus lacustris, Gammaracanthus lacustris;* Mysida: *Mysis relicta*.; In the

sediments *Limnodrilus hoffmeisteri, Spirosperma ferox, Potamothrix hammoniensis.*

Vertebrates: Fish*: Salmonidae (e.g. Coregonus* spp., *Salmo spp., Salvelinus spp., Thymallus spp.), Osmerus eperlanus, Lota lota, Sander lucioperca, Perca fluviatilis, Esox Lucius*; Birds*: Gavia arctica, G. stellata, Anas spp., Aythya spp., Bucephala clangula, Larus fuscus, Mergus merganser, M. serrator, M. albellus, Melanitta nigra,* Pandion haliaetus*;* Mammals*: Lutra lutra, Pusa hispida* subsp. *saimensis* (in Finland).

Classification

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

EUNIS:

C1.1 Permanent oligotrophic lakes, ponds and pools

C1.2 Permanent mesotrophic lakes, ponds and pools

EuroVegChecklist:

Littorellion uniflorae Koch ex Klika 1935

Hyperico elodis-Sparganion Br.-Bl. et Tx. ex Oberd. 1957

Nitellion flexilis Krause 1969

Annex 1:

3120 Oligotrophic waters containing very few minerals generally on sandy soils of the West Mediterranean with Isoetes spp.

3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

Emerald:

C.1.1 Permanent oligotrophic lakes, ponds and pools

C3.4 Species-poor beds of low-growing water-fringing or amphibious vegetation

MAES-2:

Rivers and lakes

IUCN:

5.5 Permanent freshwater lakes (over 8 ha)

5.7 Permanent freshwater marshes and pools (under 8 ha)

Water Framework Directive:

IC 101

LCB3

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

Yes

Regions
Atlantic
Boreal

Justification

The habitat C1.1b Permanent oligotrophic to mesotrophic waters with soft-water species, is characteristic of the Boreo-Atlantic region of Europe. In this habitat Boreal and Atlantic soft-water species overlap in their distribution range contributing to a relatively rich soft-water habitat. In the Boreal region by far the largest area is found. In the Atlantic region a combination of plant species with a boreal distribution and species with an Atlantic distribution results in the highest diversity.

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)
Austria	Present	64 Km^2	Decreasing	Decreasing
Belgium	Present	11 Km^2	Decreasing	Decreasing
Bulgaria	Present	6.9 Km^2	Decreasing	Decreasing
Croatia	Uncertain	Unknown Km^2	Unknown	Unknown
Cyprus	Uncertain	Unknown Km^2	Unknown	Unknown
Czech Republic	Present	0.6 Km^2	Decreasing	Decreasing
Denmark	Present	Unknown Km^2	Unknown	Unknown
Estonia	Present	2 Km^2	Decreasing	Decreasing
Finland	Aland Islands: Uncertain Finland mainland: Present	21000 Km^2	Stable	Decreasing
France	Corsica: Uncertain France mainland: Present	80 Km^2	Decreasing	Decreasing
Germany	Present	52 Km^2	Decreasing	Decreasing
Greece	Crete: Present East Aegean: Present Greece (mainland and other islands): Present	15 Km^2	Stable	Stable
Hungary	Uncertain	Unknown Km^2	Unknown	Unknown
Ireland	Present	558 Km^2	Stable	Unknown
Italy	Italy mainland: Present Sardinia: Present Sicily: Present	222 Km^2	Decreasing	Decreasing
Latvia	Present	Unknown Km^2	Unknown	Unknown
Lithuania	Present	4 Km^2	Decreasing	Decreasing
Luxembourg	Present	Unknown Km^2	Unknown	Unknown
Malta	Uncertain	Unknown Km^2	Unknown	Unknown
Netherlands	Present	4.2 Km^2	Decreasing	Decreasing
Poland	Present	Unknown Km^2	Unknown	Unknown
Portugal	Portugal Azores: Present Portugal mainland: Present	0.2 Km^2	Decreasing	Unknown
Romania	Present	unknown Km^2	Decreasing	Decreasing
Slovakia	Present	1 Km^2	Decreasing	Decreasing

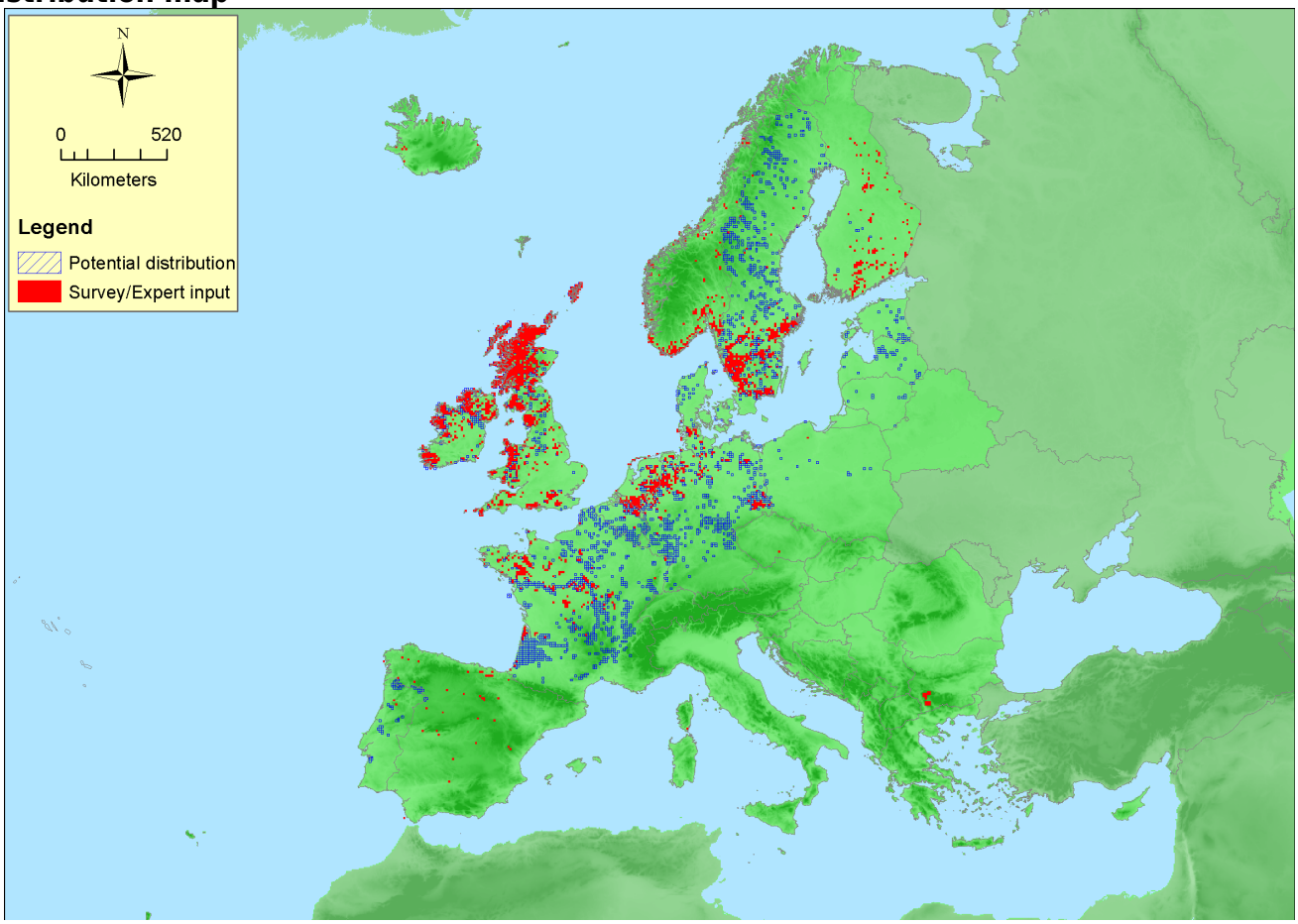
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Slovenia	Present	2.6 Km^2	Stable	Stable
Spain	Spain mainland: Present	77 Km^2	Decreasing	Decreasing
Sweden	Present	4865 Km^2	Stable	Decreasing
UK	Gibraltar: Uncertain Northern Island: Present United Kingdom: Present	705 Km^2	Stable	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)
Albania	Uncertain	Unknown Km^2	Unknown	Unknown
Andorra	Uncertain	Unknown Km^2	Unknown	Unknown
Bosnia and Herzegovina	Present	1 Km^2	Stable	Decreasing
Faroe Islands	Uncertain	Unknown Km^2	Unknown	Unknown
Former Yugoslavian Republic of Macedonia (FYROM)	Uncertain	Unknown Km^2	Unknown	Unknown
Guernsey	Uncertain	Unknown Km^2	Unknown	Unknown
Iceland	Uncertain	Unknown Km^2	Unknown	Unknown
Isle of Man	Uncertain	Unknown Km^2	Unknown	Unknown
Jersey	Uncertain	Unknown Km^2	Unknown	Unknown
Kaliningrad	Uncertain	Unknown Km^2	Unknown	Unknown
Kosovo	Uncertain	Unknown Km^2	Unknown	Unknown
Monaco	Uncertain	Unknown Km^2	Unknown	Unknown
Montenegro	Uncertain	Unknown Km^2	Unknown	Unknown
Norway	Norway Mainland: Present	3000 Km^2	Unknown	Unknown
San Marino	Uncertain	Unknown Km^2	Unknown	Unknown
Serbia	Uncertain	Unknown Km^2	Unknown	Unknown
Switzerland	Present	0.1 Km^2	Decreasing	Decreasing
Vatican City	Uncertain	Unknown Km^2	Unknown	Unknown

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	6834050 Km^2	5151	27687 Km^2	
EU 28+	8405650 Km^2	5348	30688 Km^2	For EU28+ only data from Switzerland, Norway and Bosnie Herzegovina are available.

Distribution map



The map is incomplete with data gaps filled by potential data, based on Art17 (HT3130). Data sources: EVA, GBIF, NAT and Art17 for potential.

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

80-90% of the area lies within the EU: about 28000 km^2, EU 28+ about 31000 km^2. Switzerland and Norway are outside the EU 28 having this type available. Especially Norway contributes to the EU 28+ area of this type. We have roughly estimated 10000 km^2 lakes in Norway of which ca. 30% might be oligo- to mesotrophic (i.e. 3000 km^2).

Trends in quantity

For the EU 28 the recent trends in quantity vary from stable to a decrease. For countries outside the EU 28 this information is unknown.

- Average current trend in quantity (extent)
  EU 28: Decreasing
  EU 28+: Decreasing
- Does the habitat type have a small natural range following regression?
  Yes
  Justification
  The habitat currently does not have a small natural range, however the decline is still going on. There is a future trend of decline mainly due to climate change and eutrophication in Central and Southern Europe.
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  Yes
  Justification

The habitat is not restricted by area in Scandinavia, however it is in Central and Southern Europe. So the picture differs between those two parts of Europe.

Trends in quality

The overall trend in quality is a decrease.

- Average current trend in quality
  EU 28: Decreasing
  EU 28+: Decreasing

Pressures and threats

In central Europe land use is the main pressure, including land change, agriculture and intensification of agriculture and changed hydorlogies. In Northern Europe hydraulic changes are the dominating pressure.

List of pressures and threats

Agriculture

Cultivation
Fertilisation

Pollution

Diffuse pollution to surface waters due to agricultural and forestry activities
Nutrient enrichment (N, P, organic matter)

Invasive, other problematic species and genes

Invasive non-native species

Natural System modifications

Human induced changes in hydraulic conditions
Modification of hydrographic functioning, general
Modifying structures of inland water courses
Small hydropower projects, weirs

Climate change

Changes in abiotic conditions
Temperature changes (e.g. rise of temperature & extremes)
pH-changes

Conservation and management

The main current approaches to conservation, management and restoration of this habitat are: 1. Restore the hydrology; 2. Limit nutrient input from surrounding agricultural areas; 3. Restore the sediment conditions and remove organic layers; 4. Remove dominating shore vegetation like reed beds and shrubs.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Other wetland related measures
Restoring/Improving water quality
Restoring/Improving the hydrological regime
Managing water abstraction

Measures related to hunting, taking and fishing and species management

Specific single species or species group management measures

Conservation status

Annex 1 types:

3120: ATL U2, MED U1

3130: ALP FV, ATL U1, BLS FV, BOR U1, CON U2, MED U1, PAN U1, STE U1

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

Experience from North-Western Atlantic Europe has shown that the vegetation can be restored from the diaspores left in the sediment. Restoration can be achieved within a period of 2-5 years.

Effort required

10 years
Through intervention

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-1.2 %	unknown %	unknown %	unknown %
EU 28+	-1.2 %	unknown %	unknown %	unknown %

The trend in quantity has been calculated based on quantitative data from 22 countries, of which only Switzerland and Bosnia & Herzegovina are outside the EU28. Many countries report negative trends, in some cases up to 80/90% decrease. However the countries with by far the largest area (Sweden, Finland) report stable areas, and these figures largely influence the overall European trend, which is only slightly negative. Some countries expect negative trends in the future as well, partly due to climate change. However too few data are available for assessing criterion A2a or A2b. Also long-time historical data is scarce, and as a result no assessment is carried out for criterion A3.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	> 50000 Km^2	Yes	Yes	Unknown	> 50	Yes	Yes	Unknown	Unknown
EU 28+	> 50000 Km^2	Yes	Yes	Unknown	> 50	Yes	Yes	Unknown	Unknown

The habitat has a large distribution over Europe, and the AOO, EOO and number of locations are all far beyond the thresholds for criteria under B.

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	3 %	52 %	unknown %	unknown %	unknown %	unknown %
EU 28+	3 %	52 %	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 %	unkown%	unknown %	unknown%	unknown %	unknown%

The extent of degradation of this habitat over Europe is 3% with a severity of 52% both for EU 28 and EU28+. These figures have been calculated based on 16 countries for EU 28 and 18 countries for EU 28+. The low value for affected extent is strongly influenced by Finland, for which country an improve in quality has been reported; Finland holds by far the largest area of the habitat. If the Scandinavian countries would be left out of the calculation, the available data would result in a negatively affected extent of 37% with a severity of 52% (both for EU 28 and EU 28+). These figures are very close to the thresholds for the red list category Vulnerable, and therefore would lead to the category Near Threatened. However, Finland included, the conclusion is Least Concenr (LC). The reported trends in quality are both for abiotic and biotic conditions, and therefore no split in criteria C or D has been made. Very little data has been reported on future or long-time historical trends in quality.

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 type.

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	LC	DD	DD	DD	LC	LC	DD	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	DD	LC	LC	DD	LC	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
Least Concern	-	Least Concern	-

Confidence in the assessment

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

Assessors

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