C1.4 Permanent dystrophic waterbody

Summary

Dystrophic lakes, ponds and pools are characterized by dark brown water, usually shallow, rich in humic substances and generally of low nutrient content, with usually soft organic bottom sediments, the humus being derived from mires, wetlands and paludified forests. They occur particularly in the boreal region, often in watershed areas rich in mires but they are common also in Atlantic north-west Europe, though rare in more continental and in southern Europe. In alpine and arctic areas dystrophic waters are not common due to the slow paludification process. The plant communities are composed of many plants with a wide ecological amplitude, and often with an obvious contribution of mire species, notably *Utricularia* spp. and aquatic mosses, and there can be a contingent of shoreline or bog pool margin plants. Dystrophic water bodies have deteriorated largely due to land reclamation and drainage of peatlands for forestry, peat excavation and from eutrophication from settlements and air-born nitrogen. For recovery, these habitats require intervention, such as restoration of natural hydrology, filling of drainage ditches and removal of vegetation.

Synthesis

The quantity of the habitat declined severely in historical times, largely by large-scale land reclamation, suggesting category Vulnerable (VU) according to the criterion A3. However, the situation has since stabilized, therefore data from 50 last years have been used for the assessment. In the recent past the quality of the habitat has degraded clearly, severity of degradation being 30 %, affecting 75 % of current area. This is based on data from 7 countries with quantitative data from both extent of degraded area and severity of degradation. This data covers most of the habitat area. Criterion C/D1 qualifies the habitat to the category Near-Threatened (NT). Most area of the habitat in EU28+ occur in the EU28 area, therefore NT category may be used also for EU28+

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Near Threatened	C/D1	Near Threatened	C/D1

Sub-habitat types that may require further examination

Dystrophic waters cover a wide range of waters. Small ponds and pools, usually situating close to mires could be assessed separately from larger lakes. The latter have many features in general with C1.1a, C1.1b, sometimes also with C1.2b, and can be evaluated using same parameters.

Habitat Type

Code and name

C1.4 Permanent dystrophic waterbody

Middle-size dystrophic lake with low helophyte belts and scarce aquatic vegetation in Lake Kivisammal, Finland (Photo: Heikki Toivonen).

Small dystrophic pond in the Isojärvi National Park, Finland (Photo: Heikki Toivonen).

Habitat description

The term 'dystrophic' is applied to a water body that is usually shallow, rich in humus giving its water a brown colour, with variable amounts of nutrients (though the availability of nutrients in most cases is low), and with the deeper water often depleted of oxygen. Most boreal lakes and ponds have humic substances in the water, but only polyhumic ones (with colour >90 Pt mg/L) are recognized as dystrophic here, the humic substances in the water being derived from mires, wetlands or paludified forests. Oligo- (< 30) and mesohumic (30 – 90 Pt mg/L) lakes and ponds are included in types based on their trophic state (habitats C1.1a, C1.1b and C1.2a, C1.2b). In most dystrophic lakes and ponds the water is acid, (pH 3-6), but some have a higher pH, often caused by eutrophication. Bottom sediments consist of organogenic mud and debris, and the soft bottom can be some metres thick. Shores consist usually at least partially of peat, representing bog and fen communities, often quaking due to overgrowth from pond margins to the open water. Dystrophic pools with a similar appearance occur also in raised bog systems but as the origin of those pools is usually related to the development of mire complexes, they are included in the D habitats. Small dystrophic ponds (usually <10 hectares) and pools are often in contact with swamps and mires, therefore the water near the shores is often characterized by overgrowth of fen and bog vegetation. Floating-leaved plants are constant, elodeids and isoetids sparse. *Potamogeton* species are often missing, due to low nutrient status and pH. Freely floating and drifting aquatic mosses (*Sphagnum* spp., *Warnstorfia* spp., *Drepanocladus* spp., *Fontinalis* spp.) can be abundant. *Utricularia minor* and *U. intermedia* are characteristic species. The cover of helophytes and vascular shore plants varies, typical species being *Carex lasiocarpa, C. rostrata, Phragmites australis, Equisetum fluviatile, Menyanthes trifoliata, Comarum palustre, Calla palustris* etc. Moss cover, often dominated by *Sphagnum* spp., is well developed on shores.

In boreal regions there are many larger lakes with polyhumic water. Beside peaty shores they have mineral bottoms and shores, often of till or glacifluvial origin. Floristically these lakes are close to habitat C1.1b maintaining sparse stands of helophytes (*Phragmites, Equisetum fluviatile, Schoenoplectus lacustris, Eleocharis palustris, Carex rostrata, C. lasiocarpa*), floating-leaved macrophytes (*Nymphaea alba, Nuphar lutea, N. pumila, Sparganium* spp.), elodeids (*Potamogeton perfoliatus, Myriophyllum alterniflorum*) and isoetids (I*soëtes* spp., *Subularia aquatica, Eleocharis acicularis*). Aquatic mosses are common. The vegetation of Lobelion dortmannae is typically occurring in this habitat type in oceanic Europe (e.g. Scandinavia and Ireland) but is absent in north-west European lowlands. Dystrophic water bodies are abundant in the boreal region with large mire areas, occurring typically on watersheds. They occur commonly in oceanic NW Europe as well but in continental Europe and southern Europe they are rare. Due to slow peat formation they are rare in northern boreal, arctic and alpine areas. Dystrophic lakes have deteriorated largely by forestry activities and drainage of peatlands for forestry, peat excavation etc., resulting in increase of humic substances, and in lowering of the water table. This has changed the bottom quality and depleted oxygen. Many lakes and ponds have also eutrophicated because of human habitation,

construction activities and air-born nitrogen.

Indicators of good quality:

- Water body has natural hydrology and water chemistry,
- The pH should be < 6, colour >90 Pt mg/L,
- Catchment area has undisturbed hydrology and natural land cover,
- Typical structure of vegetation and co-existence of Utricularids, aquatic mosses, floating-leaved plants,
- Intact shore vegetation,
- Low anthropogenic influence, in terms of drainage, construction activities, forestry, water exploitation, and eutrophication,
- Absence of invasive alien species.

Characteristic species:

Flora: Vascular plants: *Sparganium minimum, S. angustifolium, S. emersum, Utricularia minor, U. intermedia, U. vulgaris, Juncus bulbosus, Myriophyllum alterniflorum, Potamogeton alpinus, P. perfoliatus, Isoëtes* spp. Close to the shores are characterized by helophytes growing on organic muddy sediments such as *Equisetum fluviatile, Comarum palustre, Calla palustris, Menyanthes trifoliata, Thelypteris palustris*. Generalist macrophytes such as *Nuphar* spp., *Nymphaea* spp., *Potamogeton natans, Phragmites australis, Typha angustifolia, T. latifolia, Schoenoplectus lacustris, Carex lasiocarpa, C. rostrata*, and mire plants, such as *Rhynchospora alba, Carex limosa, C. magellanica, Drosera longifolia, D. rotundifolia.*

Mosses: *Sphagnum cuspidatum, S. fallax, S. angustifolium, Calliergon* spp., *Warnstorfia* spp. (*W. procera, W. trichophylla), Fontinalis antipyretica, F. dalecarlica, Chiloscyphus polyanthos, Scapania* spp.

Algae : *Batrachospermum spp., Nitella flexilis, Chara* spp. (occassional).

Fauna: Birds: *Gavia stellata, Cygnus cygnus, Anas crecca*. Insects: *Chironomidae, Trichoptera, Odonata.* Mammals: *Castor fiber, Lutra lutra.* Amphibians: *Bufo* spp, *Triturus* spp., *Rana* spp. Fish: *Perca fluviatilis.*

Classification

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

EUNIS

C1.4 Permanent dystrophic lakes, ponds and pools

EuroVegChecklist alliances:

Sphagno-Utricularion T. Müller et Görs 1960

Subularion aquaticae Hadac 1971

Lobelion dortmannae Van den Berghen 1964, partly (Isoëto-Lobelion)

Sphagnion cuspidati Krajina 1934

Caricion lasiocarpae Van den Berghen in Lebrun et al. 1949

Annex 1:

3160 Natural dystrophic lakes and ponds

Emerald:

C1.4 Permanent dystrophic lakes, ponds and pools

MAES:

4.2.2 Freshwater ecosystem. Rivers and Lakes

IUCN:

5.5. Permanent Freshwater Lakes

5.7. Permanent Freshwater Marshes / Pools

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

Regions
Atlantic
Boreal

Justification
Dystrophic lakes, ponds and pools are characteristic of boreal and atlantic areas with humid, cool temperate climate with an active paludification process accumulating peat. Species assemblages in water ecosystems with high humus content are often highly specialized. The amphi-Atlantic element in the flora is representative of these conditions.

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	11 Km^2	Decreasing	Decreasing
Belgium	Present	0.8 Km^2	Decreasing	Decreasing
Bulgaria	Present	0.3 Km^2	Decreasing	Decreasing
Croatia	Present	Unknown Km^2	Unknown	Unknown
Czech Republic	Present	0.3 Km^2	Decreasing	Unknown
Denmark	Present	Unknown Km^2	Unknown	Unknown
Estonia	Present	15.6 Km^2	Increasing	Unknown
Finland	Aland Islands: Present Finland mainland: Present	3200 Km^2	Stable	Decreasing
France	France mainland: Present	7.5 Km^2	Decreasing	Decreasing
Germany	Present	20 Km^2	Decreasing	Decreasing
Greece	Greece (mainland and other islands): Present	Unknown Km^2	Unknown	Unknown
Hungary	Present	2 Km^2	Decreasing	Unknown
Ireland	Present	32 Km^2	Unknown	Unknown
Italy	Italy mainland: Present	5.8 Km^2	Decreasing	Decreasing
Latvia	Present	Unknown Km^2	Unknown	Unknown
Lithuania	Present	17 Km^2	Decreasing	Decreasing
Luxembourg	Present	Unknown Km^2	Unknown	Unknown
Netherlands	Present	7 Km^2	Stable	Stable
Poland	Present	Unknown Km^2	Unknown	Unknown
Portugal	Portugal mainland: Present	5.9 Km^2	Stable	Unknown

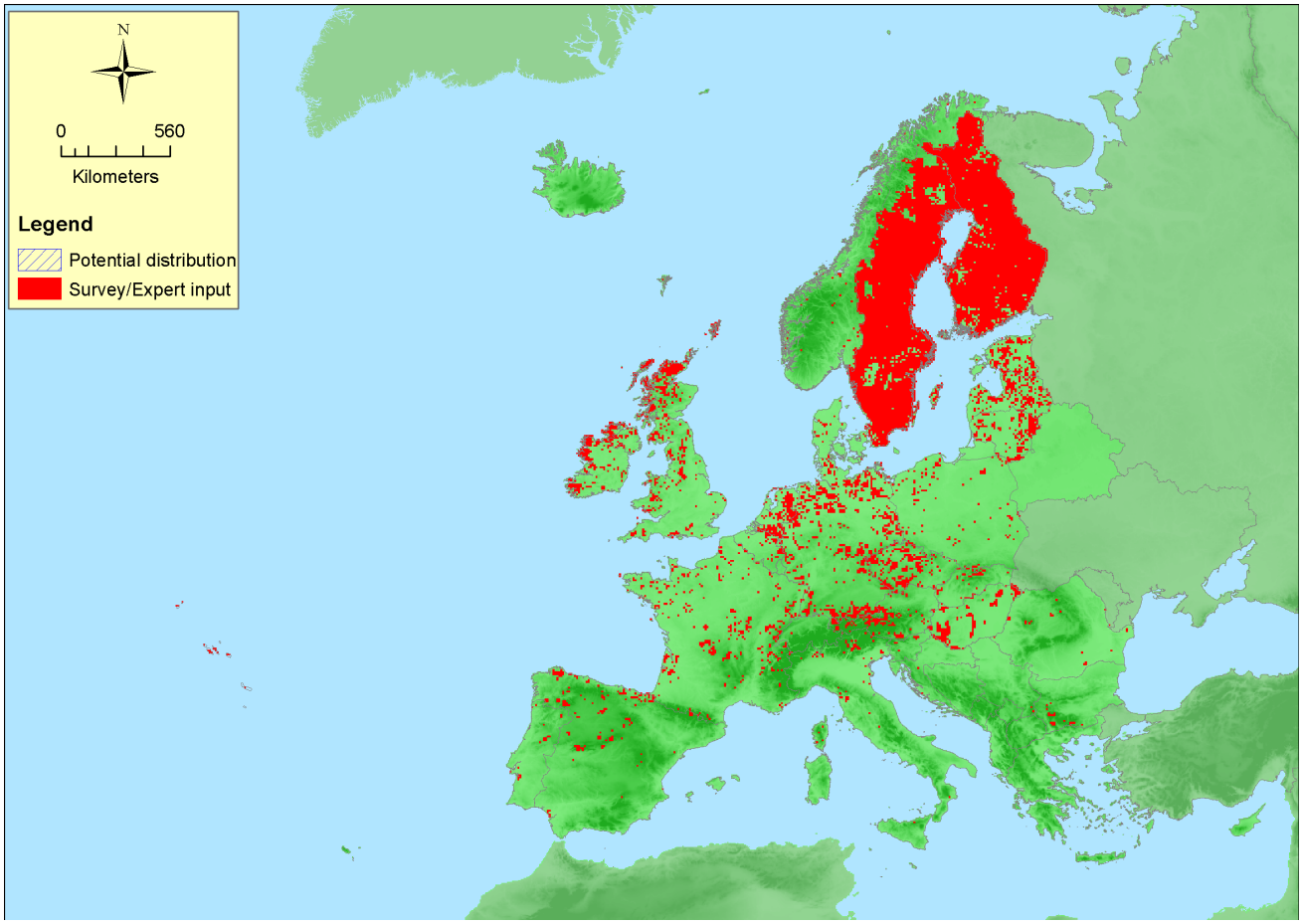
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Romania	Present	10 Km^2	Decreasing	Decreasing
Slovakia	Present	marginal Km^2	Decreasing	Decreasing
Slovenia	Present	marginal Km^2	Stable	Stable
Spain	Spain mainland: Present	31 Km^2	Decreasing	Decreasing
Sweden	Present	Unknown Km^2	Unknown	Unknown
UK	Northern Island: Present United Kingdom: Present	16 Km^2	Stable	Stable

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	Present	Unknown Km^2	Unknown	Unknown
Faroe Islands	Present	Unknown Km^2	Unknown	Unknown
Former Yugoslavian Republic of Macedonia (FYROM)	Uncertain	Unknown Km^2	Unknown	Unknown
Iceland	Present	Unknown Km^2	Unknown	Unknown
Montenegro	Uncertain	Unknown Km^2	Unknown	Unknown
Norway	Norway Mainland: Present	Unknown Km^2	Unknown	Unknown
Serbia	Uncertain	Unknown Km^2	Unknown	Unknown
Switzerland	Present	10 Km^2	Decreasing	Decreasing

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	10592350 Km^2	10853	3289 Km^2	might be 20-25 % higher due to gaps of data from countries
EU 28+	10905550 Km^2	10903	Unknown Km^2	data insufficient, Norway and Iceland are missing

Distribution map



Map rather complete for EU28, but data gaps outside EU28 in Balkan and Switzerland. Data sources: Art17, EVA, GBIF.

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

Fresh-water bodies related to peatlands and areas under paludification have a wide distrubution in Eurasia and North America, particularly in boreal areas, but also in temperate and alpine areas, EU 28+ might constitute less than 10 % of the total area of these ecosystems globally.

Trends in quantity

Dystrophic waters are often situated on mire-rich lowland and watershed areas. Therefore their quantity has historically declined due to drainage of mires and land reclamation. This was earlier intensive in Central and Western Europe, particularly in the Netherlands, Germany, Austria, Czech Republic and Hungary. Negative trends have taken place in northern Europe as well, but their intensity was much lower. In the last 50 years and in the near future, the quantity of dystrophic waters seems to be more or less stable, showing some losses in the southern part of the European range. On the other hand, recent land use, as well as increased natural leaching of humic substances from the catchment areas due to climate change may increase amount of humus-rich waters (so called 'brownification of waters').

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

No

Justification

The habitat has a large EOO but becomes more scattered in southern parts of its European range. These occurrences are in different situation as compared to the continuous main area in the northern Europe.

Trends in quality

The quality of the habitat has declined in Europe to a considerable extent during the last 50 years. The severity of degradation is 30% affecting 75% of its current area, on the basis of data from seven EU28 countries, including the major part of its extent. The figures are heavily determined by the large area of this habitat in Finland and, if Finnish data are excluded, the severity is somewhat higher. In Germany and Italy the quality has declined to considerable extent in the recent past. In some countries, the quality has been estimated to be stable or becoming better due to restoration and conservation measures.

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

Pressures and threats

Dystrophic waters were earlier subjected to land reclamation and drainage, particularly in the Netherlands. At present, the main pressure affecting large areas is diffuse pollution caused by intensive land use, especially recent agricultural and forestry activities. Some pollution from human settlements and industrial sites occurs in many countries. In central Europe input from the air-borne pollutants, particularly nitrogen, is important. Beside pollution, changes in hydrology are another main pressure, caused by regulation of the water table or by water abstraction. Changes in hydrology cause low water levels, lack of flooding etc., in some cases drying of the habitat. Drainage of peatlands for forestry purposes and peat excavation increase humus load to waters, at least episodically, causing increased sedimentation, anoxia, and increased colour in the water. The nutrient input and changes in hydrological regimes is accelerating succession towards more eutrophic sites with denser littoral communities.

List of pressures and threats

Agriculture

Cultivation

Mining, extraction of materials and energy production

Mining and quarrying
  Peat extraction

Pollution

Pollution to surface waters (limnic, terrestrial, marine & brackish)
  Diffuse pollution to surface waters due to agricultural and forestry activities
  Nutrient enrichment (N, P, organic matter)
Air pollution, air-borne pollutants
  Nitrogen-input

Natural System modifications

Landfill, land reclamation and drying out, general
Polderisation
Modification of hydrographic functioning, general
Water abstractions from surface waters
Anthropogenic reduction of habitat connectivity

Conservation and management

Water protection measures decreasing nutrient and contaminant loading from the catchment areas are needed in many areas with intensive land use. That means in many cases changes in agricultural and forestry practices, resulting in lower loads of nutrients and humic substances. Another main approach is maintaining natural hydrology of the waters, meaning ecologically sound regulation regimes, maintaining natural flooding etc. Most representative sites should by protected (e.g. as Natura 2000 sites), and in some cases managed actively. Restoration activities are needed, including changes to natural hydrology, reduction of eutrophication, management of littoral communities, in extreme cases also removal of sediment.

List of conservation and management needs

Measures related to forests and wooded habitats

Restoring/Improving forest habitats

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality
Restoring/Improving the hydrological regime

Measures related to spatial planning

Establish protected areas/sites
Establishing wilderness areas/allowing succession

Measures related to special resouce use

Regulating/Management exploitation of natural resources on land

Conservation status

Annex 1:

3160: ALP FV, ATL U2, BOR U1, CON U2, MAC U1, MED XX, PAN U2, STE XX

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

Many sites are able to recover after some ten of years. In sites with heavy eutrophication and/or changes in the hydrological regime, active intervention is needed. Natural recovery of the habitat can take place after intervention if pressures from land use in catchment areas are controlled. Restoration measures include changes in hydrology (often need to fill ditches etc.), management of littoral vegetation, removal of sediments etc.

Effort required

10 years	50+ years	200+ years
Through intervention	Naturally	Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-1 %	unknown %	unknown %	-68 %
EU 28+	-1 %	unknown %	unknown %	unknown %

The reduction in quantity of the habitat was very pronounced in the Netherlands in the 19th and early 20th century. The land reclamation and drainage of dystrophic water bodies continued in many countries until the 1950s and 1960s. In the recent past (last 50 years) the quantity of the habitat has remained rather stable, and this seems to be the case also in the near future.

Criterion B: Restricted geographic distribution

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

Habitat type has a wide distribution and has many sites in various countries, therefore criterion B is not used in the European scale.

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	75 %	30 %	unknown %	unknown %	unknown %	unknown %
EU 28+	75 %	30 %	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%

Extent of degradation and relative severity of degradation were estimated using abiotic (physical and chemical parameters) and biotic parameters combined. Data derives often from the Art. 17 (Habitat Directive) and WPD reporting. Future trends might be stable or decreasing, partly because of the climate change. Data from extent of degradation was received from 13 countries and estimates for severity of degradation from 15 countries. Quantitative data combining extent and severity of degradation were available from 7 EU 28 countries, covering most of the area of the habitat.

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

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

Quantitative analysis to evaluate risk of the habitat collapse has not been made.

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	VU	LC	LC	DD	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	VU	LC	NE	DD	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
Near Threatened	C/D1	Near Threatened	C/D1

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

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