

D2.2c Intermediate fen and soft-water spring mire

Summary

These weakly acidic minerotrophic mires occur on peats fed from upper catchments by diffuse seepage of non-calcareous ground water discharged via springs and they occur widely through temperate Europe, though at higher altitudes in the warmer south. The vegetation is typically dominated by a carpet of brown mosses and Sphagna of more minerotrophic situations, small sedges and associated herbs, though generally without rich- fen indicators, and sometimes with drier hummocks on which sub-shrubs and occasional trees can be found. Dependent on constant flow of uncontaminated ground water, they are vulnerable to interruptions of hydrological conditions, pollution/eutrophication and peat extraction and have declined widely over the past 50 years, probably much more in longer historic time, with widespread loss of quality. Conservation depends on maintenance or restoration of the underlying hydrological system and control of throughput of contaminated waters.

Synthesis

The habitat type is assessed as Vulnerable (VU) in EU28 and Near Threatened in EU28+ based on declines in area over the last 50 years (criterion A1). In the case of EU28+, the assessment is corrected for a considered and likely underestimation of the calculated 28% decline of area during past 50 years. The criterion C/D1 indicated Near Threatened (NT) but it is also quite close to the Vulnerable threshold. The data provide quite good cover over Europe but many entries lacked details. The Swedish data were especially influential and these were combined with literature sources, since this habitat is not separated in Swedish national inventories.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Vulnerable	A1	Near Threatened	A1

Sub-habitat types that may require further examination

There are many subtypes that would call for separate assessments on a more local level. The subtypes mainly concern different vegetation types as depicted by the range of fen alliances included under the EuroVegChecklist classification.

Habitat Type

Code and name

D2.2c Intermediate fen and soft-water spring mire



Intermediate fen with soft-water spring influence and thin peat layer, high water pH but low mineral concentrations, with abundant *Eriophorum angustifolium* and *Carex rotundata*, *Loeskyppnum badium*, *Straminergon stramineum*, *Warnstorfia sarmentosa* and *Warnstorfia procera*, true rich fen species are missing, northern Lapland, Finland. (Photo: Teemu Tahvanainen).



Intermediate fen in a sloping, soligenous basin with *Molinia caerulea* and abundant *Sphagnum fallax*, *S. flexuosum*, *S. subfulvum* and *S. warnstorffii* with *Loeskyppnum badium* and *Sphagnum subsecundum* in wet soaks, northern Finland (Photo: Teemu Tahvanainen).

Habitat description

These are weakly acidic (pH 5-6) minerotrophic mires with a plant species composition intermediate between D2.2a Poor fens and D4.1a Short-sedge rich fens and calcareous spring fens. Intermediate fens occur on sodden peats fed from upper catchments by diffuse seepage of non-calcareous ground water discharged via springs with an influence typically confined to soaks or small brooks. They have unidirectional slope and lateral water flow but the kind of hummock-string patterning typical to D3.2 Aapa mires is missing or very limited. Intermediate fen vegetation can represent the general character of the main mire surfaces or be confined to more or less distinct patterns. True rich fen indicator species (e.g. *Campylium stellatum*, *Philonotis calcarea*, *Scorpidium cossoni*, *Tomentypnum nitens*) are missing or very scarce, one distinction from calcareous types. Since the transition between poor and rich fen characters differs across the extensive range through temperate Europe, variations in species composition in different regions can be seen.

Intermediate fens are characterized by abundance of mainly short-sedges like *Carex canescens*, *C. echinata*, *C. nigra*, *C. panicea*, *Eriophorum scheuchzeri*, *Trichophorum alpinum*, while also poor fen species like *T. cespitosum* and *C. lasiocarpa* are found. Other vascular plants include *Cardamine pratensis*, *Dactylorhiza maculata*, *Molinia caerulea*, *Parnassia palustris*, *Potentilla erecta*, *Selaginella selaginoides*, *Tofieldia pusilla* and *Viola palustris*. Common mire species like *Andromeda polifolia*, *Eriophorum vaginatum* and *Vaccinium oxycoccos* are also abundant. The ground layer may have *Sphagnum contortum*, *S. subfulvum*, *S. subnitens*, *S. subsecundum*, *S. obtusum*, *S. teres* or *S. warnstorffii*, also poor fen *Sphagnum* species can be found, and species composition varies between regions. Characteristically, brown mosses are abundant, but calciphilous species are absent. Characteristic species include *Loeskyppnum badium* and *Warnstorfia sarmentosa*. Also *Paludella squarrosa* and *Scorpidium revolvens* are sometimes found. Especially in soft-water springs, *Brachythecium rivulare*, *Bryum weigelii*, *Calliergon giganteum*, *Philonotis fontana*, *Plagiomnium spp.*, *Rhizomnium spp.* and *Warnstorfia exannulata* are characteristic mosses and *Cardamine amara* and *Montia fontana* may characterize the spring influence among vascular plants. Hummocks with, for example, *Sphagnum fuscum*, *Polytrichum strictum*, *Calluna vulgaris* and *Empetrum nigrum* are sometimes found, with *Salix spp.*, *Rhamnus frangula*, *Betula pubescens* or individual cranked *Pinus sylvestris*.

Indicators of good quality:

- Under natural conditions, the water table is close to the peat surface (5-20 cm)
- carpets of mosses prevail with abundant short-sedges
- Species diversity of vegetation is high reflecting transition between poor fens and rich fens

- There are no ditches that drain or disconnect seepage or spring flow from the upper drainage area to the mire
- Tree growth is limited to scattered individuals on hummocks or margins
- Overgrowth by acidophilic *Sphagnum* spp. or by generalist tall sedges.

Characteristic species:

Vascular plants: *Agrostis canina*, *A. capillaris*, *Allium sibiricum*, *Andromeda polifolia*, *Betula nana*, *Calamagrostis stricta*, *Cardamine pratensis*, *Carex canescens*, *C. diandra*, *C. dioica*, *C. lasiocarpa*, *C. magellanica* ssp. *irrigua*, *Crepis paludosa*, *Dactylorhiza incarnata*, *D. maculata*, *D. traunsteinerii*, *Drosera rotundifolia*, *D. longifolia*, *Epilobium alsinifolium*, *E. palustre*, *Eriophorum angustifolium*, *E. scheuchzeri*, *Equisetum palustre*, *Hammarbya paludosa*, *Huperzia selago*, *Juncus filiformis*, *Parnassia palustris*, *Pedicularis palustris*, *Potentilla erecta*, *Rhynchospora fusca*, *Salix herbacea*, *Selaginella selaginoides*, *Trichophorum alpinum*, *T. cespitosum*, *Vaccinium oxycoccos*, *Viola palustris*

Mosses: *Aulacomnium palustre*, *Brachythecium rivulare*, *Bryum pseudotriquetrum*, *B. weigelii*, *Calliergon cordifolium*, *C. giganteum*, *Calliergonella cuspidata*, *Chiloskyphus polyanthos*, *Hamatocaulis vernicosus*, *Helodium blandowii*, *Hypnum pratense*, *Loeskygnum badium*, *Marchantia polyanthos*, *Mniobryum wahlenbergii*, *Paludella squarrosa*, *Plagiomnium medium*, *P. ellipticum*, *P. undulatum*, *Philonotis fontana*, *P. seriata*, *Pseudobryum cinclioides*, *Rhizomnium magnifolium*, *R. pseudopunctatum*, *Scapania paludicola*, *Scorpidium revolvens*, *Sphagnum aongstroemii*, *S. flexuosum*, *S. magellanicum*, *S. obtusum*, *S. papillosum*, *S. subnitens*, *S. subsecundum*, *S. teres*, *S. warnstorffii*, *Straminergon stramineum*, *Trichocolea tomentella*, *Warnstorffia fluitans*, *W. exannulata*, *W. sarmentosa*

Classification

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

EUNIS:

D2.2 Poor fens and soft-water spring mires

EuroVegChecklist:

Caricion fuscae Koch 1926

Caricion remotae Kastner 1941z

Cardamino-Montion Br.-Bl. 1926

Annex 1:

7140 Transition mires and quaking bogs

7150 Depressions on peat substrates of the Rhynchosporion

7160 Fennoscandian mineral-rich springs and springfens

Emerald:

D2.226 Peri-Danubian black-white-star sedge fens

D2.3 Transition mires and quaking bogs

MAES-2:

Wetlands

IUCN:

5.4 Bogs, marshes, swamps, fens, peatlands.

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

No

Justification

This is a widespread and very variable type that is mainly dependent on local hydrology like the recharge of non-calcareous ground water but it includes certain subtypes that are outstanding examples of biogeographic regions, e.g. boreal-alpine intermediate fens.

Geographic occurrence and trends

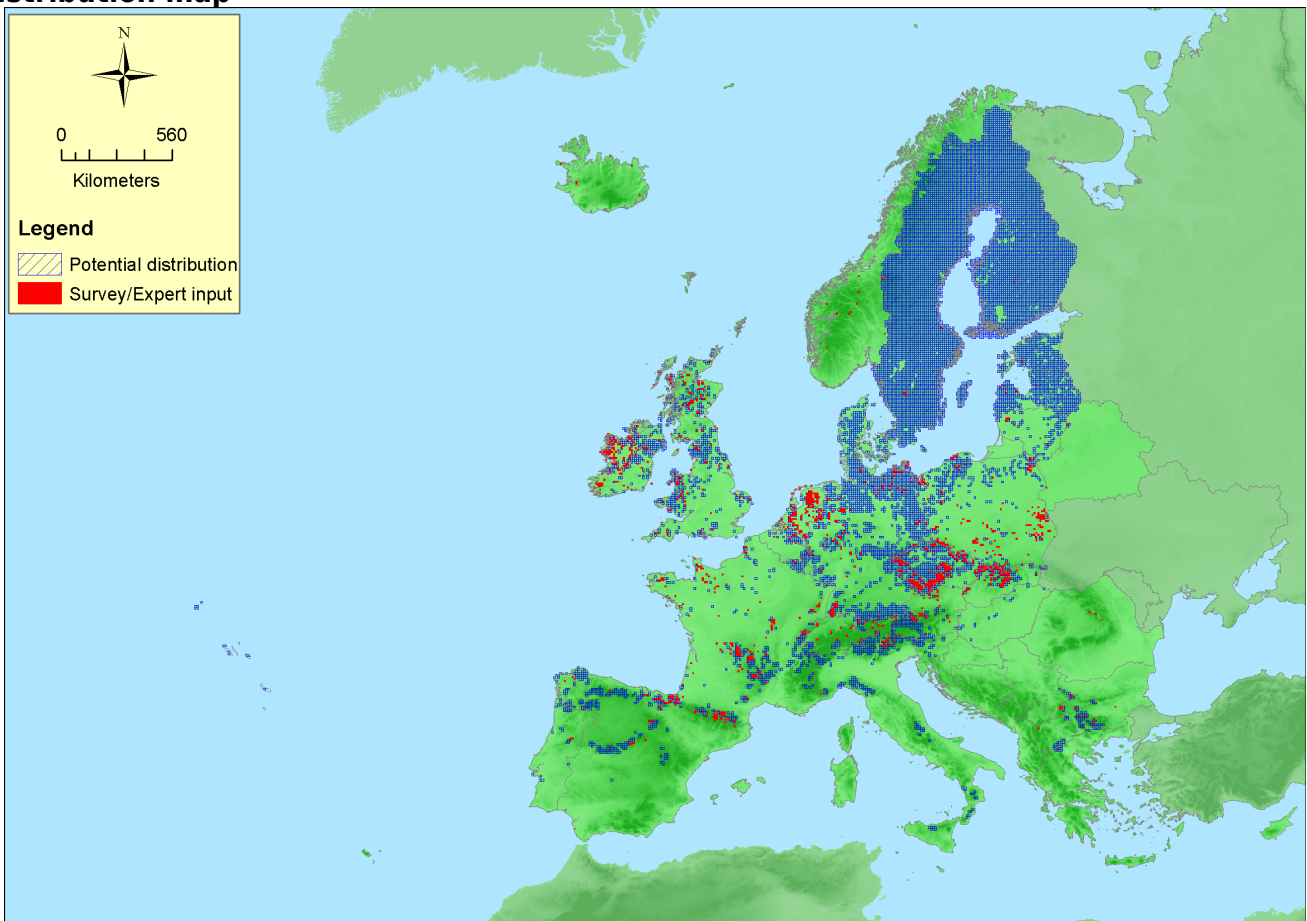
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Austria</i>	Present	21 Km ²	Decreasing	Decreasing
<i>Belgium</i>	Present	unknown Km ²	Decreasing	Decreasing
<i>Bulgaria</i>	Present	0.9 Km ²	Decreasing	Decreasing
<i>Czech Republic</i>	Present	12 Km ²	Decreasing	Decreasing
<i>Denmark</i>	Present	unknown Km ²	Unknown	Unknown
<i>Estonia</i>	Present	80-100 Km ²	Decreasing	Decreasing
<i>Finland</i>	Åland Islands: Uncertain Finland mainland: Present	1670 Km ²	Decreasing	Decreasing
<i>France</i>	France mainland: Present	55-150 Km ²	Decreasing	Decreasing
<i>Germany</i>	Present	<100 Km ²	Decreasing	Decreasing
<i>Ireland</i>	Present	unknown Km ²	Decreasing	Unknown
<i>Italy</i>	Italy mainland: Present	36-62 Km ²	Decreasing	Decreasing
<i>Latvia</i>	Present	unknown Km ²	Decreasing	Decreasing
<i>Lithuania</i>	Present	40-45 Km ²	Decreasing	Decreasing
<i>Netherlands</i>	Present	4 Km ²	Decreasing	Decreasing
<i>Poland</i>	Present	0.2 Km ²	Decreasing	Decreasing
<i>Portugal</i>	Portugal Azores: Uncertain Portugal mainland: Present	0.7 Km ²	Decreasing	Decreasing
<i>Slovakia</i>	Present	1 Km ²	Decreasing	Decreasing
<i>Slovenia</i>	Present	2.6 Km ²	Stable	Stable
<i>Spain</i>	Spain mainland: Present	unknown Km ²	Unknown	Unknown
<i>Sweden</i>	Present	4800 Km ²	Decreasing	Decreasing
<i>UK</i>	United Kingdom: Present	Unknown Km ²	Unknown	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)
<i>Bosnia and Herzegovina</i>	Present	1.3 Km ²	Decreasing	Decreasing
<i>Iceland</i>	Uncertain	Km ²	-	-
<i>Norway</i>	Norway Mainland: Present	4500 Km ²	Decreasing	Decreasing
<i>Switzerland</i>	Present	65 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
<i>EU 28</i>	10053250 Km ²	14480	Km ²	AOO and EOO incl. potential distribution
<i>EU 28+</i>	12244200 Km ²	14518	Km ²	AOO and EOO incl. potential distribution

Distribution map



The habitat is quite widespread in Europe, being most common in Scandinavia and in cold non-calcareous mountains of temperate Europe. It further occurs in low altitudes of Central (Germany, Czech Republic, the Alps, Massif Central) and Southern (Bulgaria, Spain), where a more species-rich type with grassland species does occur. The map is rather incomplete (a.o. in Romania and Norway), but the potential distribution is given for the EU28 based on HT7140 distribution. Data sources: EVA, ART17.

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

5-15%

Trends in quantity

The general trend is decreasing. The data indicates recent trend of decline by 28% and, though the historic trend cannot be reliably assessed, it has probably been a remarkable decrease, since these habitats have been cleared for agricultural land and drained for forestry, as they provide more fertile soils than bogs. The total area is governed by Finland and Sweden, where decline is estimated between 20-40%.

- 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

Widespread type

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

No

Justification

Widespread type

Trends in quality

Slight to moderate decrease of quality is reported over more than one third of the assessed total area. The Finnish and Swedish data dominate the assessment and input is missing from several countries with stronger general quality decrease of mires. Already historic decline may have been significant but data is insufficient.

- Average current trend in quality

EU 28: Decreasing

EU 28+: Decreasing

Pressures and threats

Main pressures and threats are different types of hydrological modifications like canalizations, ditchings and ground water abstraction. Increase of nutrients due to fertilisation and nitrogen deposition and connected succession are other main threat factors. Few minor threats are mentioned: overgrazing and peat extraction.

List of pressures and threats

Agriculture

Intensive grazing

Abandonment of pastoral systems, lack of grazing

Fertilisation

Sylviculture, forestry

Forestry activities not referred to above

Mining, extraction of materials and energy production

Peat extraction

Transportation and service corridors

Roads, paths and railroads

Urbanisation, residential and commercial development

Urbanised areas, human habitation

Human intrusions and disturbances

Outdoor sports and leisure activities, recreational activities

Skiing, off-piste

Pollution

Pollution to groundwater (point sources and diffuse sources)

Air pollution, air-borne pollutants

Nitrogen-input

Natural System modifications

Human induced changes in hydraulic conditions

Canalisation & water deviation

Modification of hydrographic functioning, general

Water abstractions from groundwater

Other human induced changes in hydraulic conditions

Natural biotic and abiotic processes (without catastrophes)

Abiotic (slow) natural processes

Biocenotic evolution, succession

Conservation and management

Establishing protected areas and restoration by improving hydrological regime of disturbed sites are the main approaches.

List of conservation and management needs

Measures related to forests and wooded habitats

Other forestry-related measures

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 spatial planning

Establish protected areas/sites

Legal protection of habitats and species

Measures related to special resource use

Regulating/Management exploitation of natural resources on land

Conservation status

7140 ALP FV, ATL U2, BOR, U1, CON U1, PAN U2

7150 ALP U2, ATL U2, BOR U1, CON U2, MED U1

7160 ALP FV, BOR U2, CON U2

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

When severely damaged in terms of hydrological disturbance, restoration by blocking and damming ditches can be effective in habitat recovery. Problems may arise if the hydrological connection to ground water supply from the catchment is not regained or if nutrient mineralisation causes eutrophication. If loss of key species like characteristic mosses has taken place, reintroduction by transplanting should be considered, as well as active measures to suppress overgrowing by unwanted plant cover.

Effort required

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

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-28 (22/42) %	unknown %	unknown %	unknown %
EU 28+	-24 (/30) %	unknown %	unknown %	unknown %

An area decline of 28% is indicated in recent 50 years in EU28. A1 limits are estimated to be 22-42% based on ranges of values given in data entries. Since data of area decline are missing from several countries (e.g. Latvia, Ireland, Denmark) with presumably stronger declines than in the Nordic countries that dominate total area, the decline may be underestimated. It is considered that better data availability would rise the estimated decline and passing the threshold of greater than 30% recent area decline is likely. This is supported by the estimated upper bound to A1. Therefore the habitat type is assessed as Vulnerable (VU) in EU28 based on criterion A1. In Norway, a substantial area of this type is reported with 15% recent decline in area, which lowers the estimated area decline to 24% in EU28+ and Near Threatened (NT) assessment is therefore concluded for EU28+, as the lack of data from many countries with stronger decline affects also the EU28+ assessment.

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		>50	Yes	Yes		
EU 28+	>50000 Km ²	Yes	Yes		>50	Yes	Yes		

Ongoing decrease is indicated by most data entries and threatening processes are expected to continue. Geographic distribution is very large, however, and the assessment under B criteria is hence Least Concern (LC).

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	39 %	45 %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	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 criterion C/D1 is the only quality-criterion with sufficient data for assessment. European extent of 39% for quality decline of 45% severity was indicated by average calculation from the data, indicating Near Threatened (NT) status. The extent of degradation is very uncertain and the VU-threshold might be crossed with better data. Data was lacking of quality trends from Norway, which has significant area of the habitat, and therefore EU28+ assessment was not possible under C/D criteria.

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	VU	DD	DD	DD	LC	LC	LC	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	NT	DD	DD	DD	LC	LC	LC	DD	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
Vulnerable	A1	Near Threatened	A1

Confidence in the assessment

Low (mainly based on uncertain or indirect information, inferred and suspected data values, and/or limited expert knowledge)

Assessors

T. Tahvanainen & M. Hájek

Contributors

Habitat definition: T. Tahvanainen

Territorial data: M. Hájek, L. Auniņa, R. Delarze, J. Janssen, Đ. Milanović, J. Capelo & D. Espírito-Santo, P. Perrin, D. Paelinckx, P. Frankard, J. Paal, E. Leibak, Alexis Mikolajczak, D. Paternoster, T. Kontula, A. Ssymank, P. Finck, U. Raths, U. Riecken, E. Agrillo, S. Armiraglio, S. Assini, F. Attorre, G. Buffa, L. Casella, D. Gigante, G. Giusso Del Galdo, C. Marcenò, G. Pezzi, R. Venanzoni, D. Viciani, S. Armiraglio, S. Assini, G.

Buffa, J. Šibík, Z. Kącki, B. Nygaard, V. Rašomavičius, Čarni/Juvan, J.A.Molina, P Ivanov, T. Tahvanainen, E. Weeda

Working Group Mires & bogs: C. Bitá-Nicholae, F. Jansen, M. Hájek & T. Tahvanainen

Reviewers

J. Rodwell

Date of assessment

15/12/2015

Date of review

30/03/2016

References

Barthelmes A, Couwenberg J, Risager M, Tegetmeyer C and Joosten H 2015. Peatlands and Climate in a Ramsar context A Nordic-Baltic Perspective. TemaNord 2015: 544.

European Environment Agency. Habitats Directive Article 17 Reporting. 7140 : Transition mires and quaking bogs.

European Environment Agency. Habitats Directive Article 17 Reporting. 7150 Depressions on peat surface of the Rhynchosporion.

European Environment Agency. Habitats Directive Article 17 Reporting. 7160 Fennoscandian mineral-rich springs and springfens .

Fremstad E 1997. Vegetasjonstyper in Norge. NINA Temahäfte 12: 1-279.

Gunnarsson, U & Löfroth, M 2009. Våtmarksinventeringen – resultat från 25 års inventeringar. Nationell slutrapport för våtmarksinventeringen (VMI) i Sverige. NATURVÅRDSVERKET Rapport 5925.

Jeglum, J, Sandring, S, Christensen, P, Glimskär, A, Allard, A, Nilsson, L & Svensson, J 2014. Main ecosystem characteristics and distribution of wetlands in boreal and alpine landscapes in the northern Sweden under climate change. In Grillo, O & Venora, G (eds.) Ecosystem Biodiversity, Intech, pp. 193-218.