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**IMPACT ASSESSMENT REPORT**

**ANNEX VIII-a**

***Accompanying the***

**proposal for a Regulation of the European Parliament and of the Council**

**on nature restoration**

{COM(2022) 304 final} - {SEC(2022) 256 final} - {SWD(2022) 168 final}

# Annex VIII: Background information for potential restoration targets

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# Annex VIII-a: WETLANDS

## Introduction

This paper provides information derived from the Member States' reports and assessments under Article 17 of the Habitats Directive. It is a background information to help identify possible restoration targets for the 'legal binding instrument' under the EU Biodiversity Strategy to 2030.

The 'wetlands' group includes, 28 Annex I habitat types (see Table 1): all peatlands (71xx, 72xx, 73xx), several coastal wetlands and halophytic (salt) habitats, wet heaths, and wet forests (excluding alluvial and riparian forests[1]).

Table 1 – Wetland Annex I habitat types selected

| **Coastal and salt habitats (11 types)** | | **Mires, bogs and fens (12 types)** | |
|---|---|---|---|
| 1130 | Estuaries | 7110 | Active raised bogs |
| 1140 | Mudflats and sandflats not covered by seawater at low tide | 7120 | Degraded raised bogs still capable of natural regeneration |
| 1150 | Coastal lagoons | 7130 | Blanket bogs |
| 1310 | Salicornia and other annuals colonizing mud and sand | 7140 | Transition mires and quaking bogs |
| 1320 | Spartina swards (*Spartinion maritimae*) | 7150 | Depressions on peat substrates of the *Rhynchosporion* |
| 1330 | Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | 7160 | Fennoscandian mineral-rich springs and springfens |
| 1340 | Inland salt meadows | 7210 | Calcareous fens with Cladium mariscus and species of the *Caricion davallianae* |
| 1410 | Mediterranean salt meadows (*Juncetalia maritimi*) | 7220 | Petrifying springs with tufa formation (*Cratoneurion*) |
| 1420 | Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) | 7230 | Alkaline fens |
| 1530 | Pannonic salt steppes and salt marshes | 7240 | Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* |
| 1650 | Boreal Baltic narrow inlets | 7310 | Aapa mires |
| **Wet heaths and peat grassland (3 types)** | | 7320 | Palsa mires |
| 4010 | Northern Atlantic wet heaths with *Erica tetralix* | **Wet forests (2 types)** | |
| 4020 | Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* | 9080 | Fennoscandian deciduous swamp woods |
| 6460 | Peat grasslands of Troodos | 91D0 | Bog woodland |

[1] These have been included in the group 'river, lake and alluvial/riparian habitats'.

## Wetland coverage in the EU

The 28 habitat types selected cover close to **174 400 km²** (**4.5 %** of the EU terrestrial area[2]); this excludes areas reported by Romania, which are known to be largely overestimated[3].

The data available from Corine Land Cover[4] and from the Ecosystems Map of Europe[5] do not allow a straightforward comparison between the total area of wetlands in the EU and the area covered by Annex I wetlands. This is mainly due to the nomenclatures used and the spatial resolution of the datasets. A comparison between these data sources – excluding wet heaths and wet forests – is given in Table 2 below.

**Table 2 – Wetland areas (km²) from different sources (EU27)**

Corine Land Cover 2018 (level 3)

| **Inland & coastal wetlands, coastal waters** | **85 809** |
|---|---|
| 411 – Inland marshes | 10 347 |
| 412 – Peat bogs | 54 554 |
| 421 – Salt marshes | 3 402 |
| 422 – Salines | 539 |
| 423 – Intertidal flats | 8 592 |
| 521 – Coastal lagunes | 5 893 |
| 522 – Estuaries | 2 482 |

Ecosystems map (level 3)

| **D - Mires, bogs and fens, marshes, estuaries and lagunes** | **68 646** |
|---|---|
| D1 - Raised and blanket bogs | 15 245 |
| D2 - Valley mires, poor fens and transition mires | 2 096 |
| D3 - Aapa, palsa and polygon mires | 37 766 |
| D4 - Base-rich fens and calcareous spring mires | 464 |
| D5 - Sedge and reedbeds, normally without free-standing water | 4 827 |
| D6 - Inland saline and brackish marshes and reedbeds | 717 |
| X1 – Estuaries | 2 282 |
| X2 – Coastal lagunes | 5 249 |

The largest areas of wetlands, particularly peatlands, occur in northern and central Europe (see Map 1). The Member States with the biggest areas of wetlands – and higher proportion – are Finland

[2] Area of habitats calculated from the area reported by Member States as 'best estimate' or 'average of minimum/maximum'
[3] The average total area of wetlands reported by Romania is 34 261 km²
[4] https://www.eea.europa.eu/data-and-maps/dashboards/land-cover-and-change-statistics
[5] https://www.eea.europa.eu/themes/biodiversity/mapping-europes-ecosystems

(15 %), Sweden (15 %), Denmark (15 %), Ireland (9 %), Estonia (8 %), and the Netherlands (6 %); most Member States have less than 1 % of their territory covered by Annex I wetland habitats.

Two Member States reported very small wetland areas – less than 1 $km^2$: Malta (0.3 $km^2$) and Luxembourg (0.1 $km^2$).

Table 3 gives the areas and proportion of wetlands for each Member State, including coverage by Natura 2000. Maps illustrating the distribution of different Annex I wetland habitats in the EU are available in Annex A.

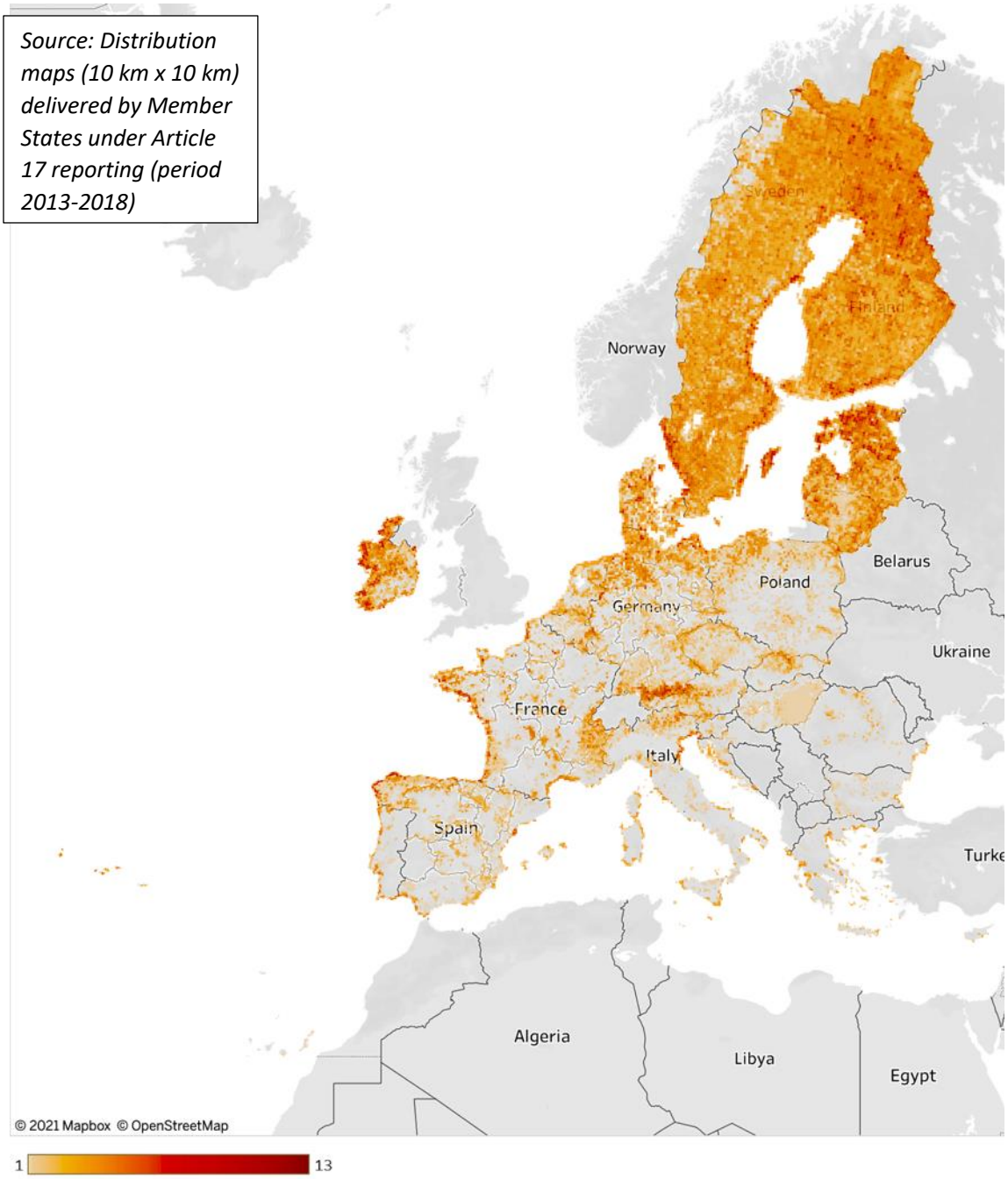
From the 174 400 $km^2$ of wetlands (excluding Romania), only **30 %** is estimated to be inside the Natura 2000 network (about **52 400 $km^2$**); this may be an underestimation since reports from Member States were not comprehensive on this regard. The coverage by Natura 2000 varies according to the wetland sub-group, **from 56 %** for 'coastal and salt habitats' **to 11 %** for 'wet forests'. The proportion of habitats per sub-group of wetlands and their coverage is detailed in Table 4.

Coverage by Natura 2000 also greatly varies according to the Member State: **from over 90 %** (Germany, Portugal[6], Cyprus and Slovenia) **to less than 25 %** (Austria, Denmark and Sweden) (Table 3).

The relatively low overall coverage of wetlands by Natura 2000 can also be explained by the fact that the Member States with the largest wetland areas (peatlands in particular) reported very low proportions in the network (Sweden = 11 %, Finland = 26 %). However, many Member States reported over 75 % of wetlands area inside Natura 2000 (Belgium, Bulgaria, Estonia, Germany, Hungary, Netherlands, Poland, Portugal and Slovenia).

[6] But there is an issue with the areas reported: coverage by Natura 2000 is 183 %

**Map 1 – Distribution of the 28 Annex I wetland habitats in the EU**




Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell.



Source: European Environment Agency – April 2021

**Table 3 – Area and proportion of wetlands per Member State**

| | Member State area ($km^2$) | In the Member State | | Proportion of the wetland area (%) | Inside Natura 2000 | |
|---|---|---|---|---|---|---|
| | | Wetland area ($km^2$) | Wetland area (%) | | Wetland area | % wetland area |
| Austria | 83 944 | 181.8 | 0.2 | 0.10 | 64.9 | 35.7 |
| Belgium | 30 683 | 169.4 | 0.6 | 0.10 | 134.5 | 79.4 |
| Bulgaria | 110 995 | 117.2 | 0.1 | 0.07 | 89.4 | 76.3 |
| Croatia | 55 590 | 95.0 | 0.2 | 0.05 | (5 896.2) (#) | 100.0 |
| Cyprus | 9 249 | 6.9 | 0.1 | 0.00 | 5.1 | 74.1 |
| Czechia | 78 874 | 197.8 | 0.3 | 0.11 | 135.2 | 68.4 |
| Denmark | 44 162 | 6 402.8 | 14.5 | 3.67 | 1 536.7 | 24.0 |
| Estonia | 45 382 | 3 624.8 | 8.0 | 2.08 | 2 627.7 | 72.5 |
| Finland | 338 004 | 52 060.0 | 15.4 | 29.86 | 13 447.3 | 25.8 |
| France | 551 881 | 11 969.4 | 2.2 | 6.87 | 3 962.2 | 33.1 |
| Germany | 362 177 | 6 743.5 | 1.9 | 3.87 | 6 191.8 | 91.8 |
| Greece | 132 014 | 1 612.1 | 1.2 | 0.92 | 645.7 | 40.1 |
| Hungary | 93 012 | 2 415.6 | 2.6 | 1.39 | 2 163.1 | 89.5 |
| Ireland | 70 699 | 5 979.9 | 8.5 | 3.43 | 3 872.6 | 64.8 |
| Italy | 301 321 | 2 147.8 | 0.7 | 1.23 | 1 420.5 | 66.1 |
| Latvia | 64 590 | 2 394.7 | 3.7 | 1.37 | 1 157.0 | 48.3 |
| Lithuania | 65 289 | 1 689.5 | 2.6 | 0.97 | 1 046.6 | 61.9 |
| Luxembourg | 2 595 | 0.1 | 0.0 | 0.00 | 0.0 | 68.7 |
| Malta | 316 | 0.3 | 0.1 | 0.00 | 0.1 | 50.8 |
| Netherlands | 39 898 | 2 394.2 | 6.0 | 1.37 | 2 074.2 | 86.6 |
| Poland | 312 683 | 2 242.9 | 0.7 | 1.29 | 1 842.2 | 82.1 |
| Portugal | 92 378 | 691.2 | 0.7 | 0.40 | 1 264.6 | 183.0 |
| *Romania (*)* | *238 404* | 34 260.5 | 14.4 | | (1 793.8) | 5.2 |
| Slovakia | 49 026 | 36.6 | 0.1 | 0.02 | 20.4 | 55.8 |
| Slovenia | 20 274 | 20.4 | 0.1 | 0.01 | 19.1 | 93.7 |
| Spain | 506 222 | 2 511.7 | 0.5 | 1.44 | 1 430.3 | 56.9 |
| Sweden | 450 110 | 68 647.0 | 15.3 | 39.37 | 7 288.6 | 10.6 |
| Total | 4 149 772 | 208 612.9 | 5.0 | | 54 233.6 | 26.0 |
| **Total (without Romania)** | **3 911 772** | **174 352.5** | **4.5** | | **52 439.8** | **30.1** |
| | | | | | | |

Notes: Member States with more than 4.5 % (the EU average) of their terrestrial area covered by wetlands are highlighted; (*) areas reported by Romania are overestimated; (#) area of a few



Source: European Environment Agency – April 2021

habitats inside Natura 2000 clearly wrong (e.g., 1140 = 5 896.2 km$^2$), therefore, this value was excluded.

**Table 4 – Area and proportion of wetlands per sub-group**

| | | **Inside Natura 2000** | |
|---|---|---|---|
| **EU27 excluding Romania** | **Area (km$^2$)** | **Wetland area (km$^2$)** | **% wetland area** |
| **Coastal and salt habitats** | **37 780** | **20 967** | **56** |
| 1130 | 7 505 | 3 581 | 48 |
| 1140 | 13 620 | 7 067(#) | 52 |
| 1150 | 10 052 | 4 420 | 44 |
| 1310 | 433 | 498 | 100(*) |
| 1320 | 159 | 265 | 100(*) |
| 1330 | 1 119 | 947 | 85 |
| 1340 | 38 | 27 | 72 |
| 1410 | 813 | 866 | 100(*) |
| 1420 | 867 | 906 | 100(*) |
| 1530 | 2 505 | 2 246 | 90 |
| 1650 | 670 | 145 | 22 |
| **Wet heaths** | **3 828** | **2 004** | **52** |
| 4010 | 2 651 | 1 518 | 57 |
| 4020 | 1 177 | 486 | 41 |
| 6460 | 0.02 | 0.02 | 100 |
| **Bogs, mires and fens** | **86 738** | **24 180** | **28** |
| 7110 | 8 086 | 3 682 | 46 |
| 7120 | 1 162 | 660 | 57 |
| 7130 | 2 817 | 1 781 | 63 |
| 7140 | 31 674 | 4 141 | 13 |
| 7150 | 219 | 152 | 70 |
| 7160 | 96 | 27 | 28 |
| 7210 | 656 | 378 | 58 |
| 7220 | 814 | 70 | 9 |
| 7230 | 4 691 | 1 328 | 28 |
| 7240 | 78 | 69 | 89 |
| 7310 | 36 020 | 11 376 | 32 |
| 7320 | 425 | 516 | 122 |
| **Wet forests** | **46 006** | **5 289** | **11** |
| 9080 | 1 422 | 633 | 45 |
| 91D0 | 44 585 | 4 657 | 10 |



Source: European Environment Agency – April 2021

| | | | |
|---|---|---|---|
| **TOTAL** | **174 352** | **52 440** | **23** |

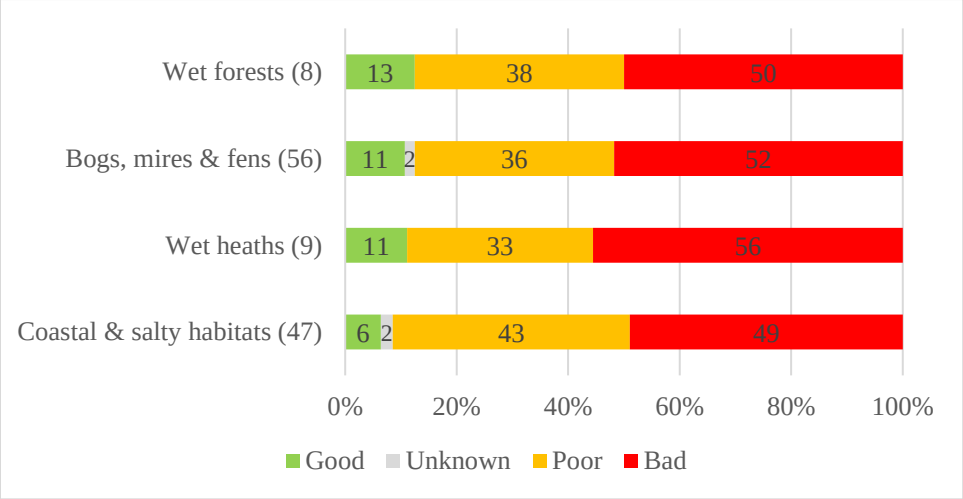
Note: (#) does not include the wrong value (5 800 km2) reported by Croatia; (*) percentage over 100 % due to inconsistencies in data reported

## Conservation status and trends

The vast majority (**89 %** of assessments) of the 28 wetland habitats at the EU level have an **unfavourable** conservation status (38 % poor and 51 % bad). Only **9 %** have a **good** conservation status. There are some differences between the different habitat groups (Figure 1): 'wet forests' has the highest proportion of good status (13 %) and the 'coastal and salty habitats' the worst status (92 % unfavourable).

Among the wetland habitat assessments that do not have a good status, more than half have a **deteriorating** trend (**51 %**) while only **7 %** have an improving trend. An additional **28 %** maintain their unfavourable status; the conservation status trend is unknow for **13 %** of the assessments. The wetland group with the worst conservation status trends are **'bogs, mires and fens'** (**66 % deteriorating**); **'wet heaths'** have the higher proportion of **improving** trends (**13** %) (Figure 2).

**Figure 1 – Conservation status at the EU level per wetland type (in percentage)**

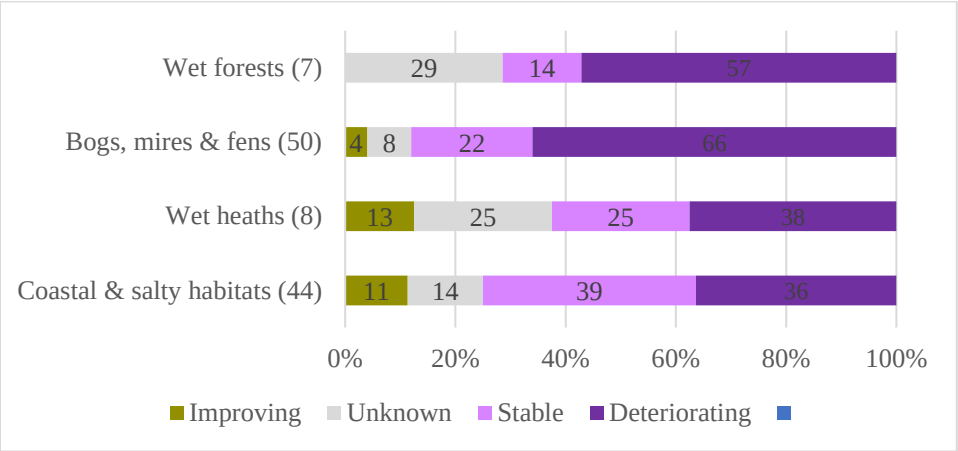



Note: Number of assessments per group shown in brackets.



Source: European Environment Agency – April 2021

**Figure 2 – Conservation status trends at the EU level per wetland type (in percentage)**




Note: Number of assessments/habitats per region shown in brackets.

Details on conservation status and conservation status trends for each Member State are given in Table 5.

**Table 5 – Conservation status and trends of wetland habitats in the Member States (in percentage)**

| Member State | FV | U1- | U1+ | U1= | U1x | U2- | U2+ | U2= | U2x | XX |
|---|---|---|---|---|---|---|---|---|---|---|
| AT (19) | | 5 | | 21 | | 21 | | 11 | 42 | |
| BE (21) | 5 | 5 | | | | | 29 | 43 | 19 | |
| BG (20) | 5 | | 10 | 40 | 45 | | | | | |
| CY (3) | | | | | | 100 | | | | |
| CZ (12) | 8 | 8 | | 33 | | 50 | | | | |
| DE (40) | 25 | 18 | | 20 | | 23 | | 13 | 3 | |
| DK (30) | 7 | 7 | | 3 | 3 | 33 | 7 | 20 | 20 | |
| EE (14) | 50 | | 7 | 29 | | 7 | | 7 | | |
| ES (36) | 3 | 25 | | 28 | 11 | 11 | | | 8 | 14 |
| FI (22) | 36 | 18 | 5 | | | 14 | | 18 | 5 | 5 |
| FR (52) | 2 | 12 | 2 | 27 | 17 | 17 | | 6 | 13 | 4 |
| GR (11) | 18 | 9 | 9 | 45 | | 9 | | | | 9 |
| HR (18) | | | | 28 | 11 | 22 | | 17 | | 22 |
| HU (6) | 17 | | | 33 | | 50 | | | | |
| IE (17) | 12 | 29 | | 6 | | 47 | | 6 | | |
| IT (31) | 10 | 10 | 6 | 26 | 3 | 23 | 6 | 10 | 3 | 3 |
| LT (12) | 25 | | | | 33 | 8 | | | 33 | |
| LU (3) | | | | | | 67 | | 33 | | |
| LV (13) | 8 | | 8 | 46 | 8 | 8 | | | 23 | |
| MT (4) | | | | 25 | | | | 75 | | |



Source: European Environment Agency – April 2021

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NL (14) | | | 21 | 21 | | 36 | 7 | 14 | | |
| PL (21) | 5 | 14 | 5 | 24 | 10 | 19 | | 14 | 5 | 5 |
| PT (29) | 14 | 34 | | 10 | | 28 | | 10 | | 3 |
| RO (25) | 40 | 16 | | 32 | 4 | 4 | | 4 | | |
| SE (40) | 23 | 10 | | 15 | | 28 | | 20 | 5 | |
| SI (19) | 37 | 16 | | 26 | | 11 | | 11 | | |
| SK (12) | | 8 | | 25 | 33 | 25 | | 8 | | |

Notes: FV = good, U1 = poor, U2 = bad, XX = unknown conservation status '-' = deteriorating, '+' = improving, '=' = stable, 'x' = unknown conservation status trend; number of assessments per Member State shown in brackets.

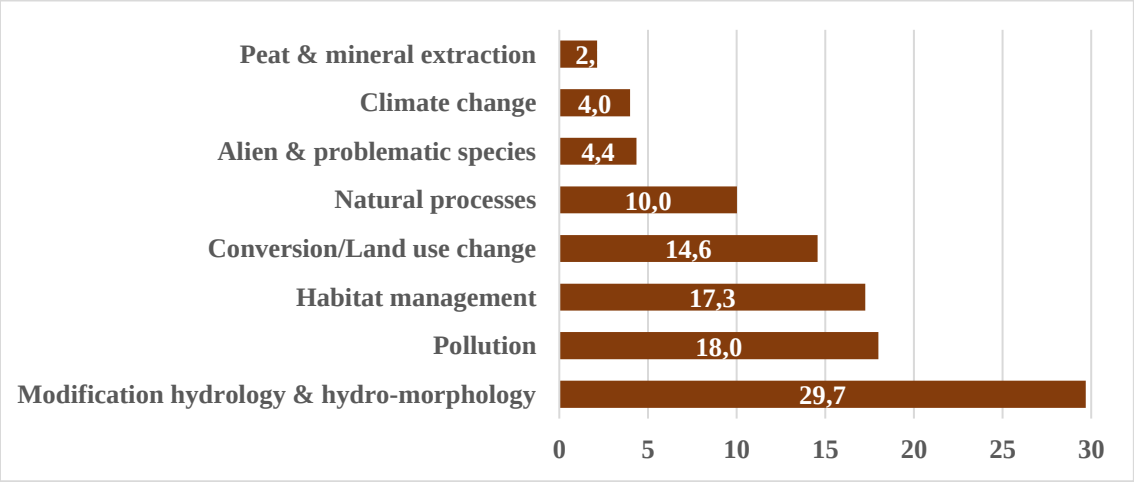
## Pressures

Wetland habitats are subject to a wide diversity of pressures resulting in their degradation and extirpation. According to Member States reports under Article 17 of the Habitats Directive, the top three groups of pressures (in percentage of the total) are:

- **Modification of hydrology and hydro-morphology** with close to **28 %** of all pressures; this includes e.g., drainage, water abstraction and dams
- **Pollution** from different origins with **18 %**; from these, near half is originated from agriculture and forestry activities, about 13 % from residential, industrial and recreational activities and over 37 % from mixed sources
- **Habitat management**, with over **17 %**; these include inadequate agricultural practices like under or overgrazing, mowing, harvesting (65 %), forestry like logging and burning (15 %) and fish and shellfish activities (17 %).

Equally important is the group '**conversion and land use change**' with near **15 %** of all reported pressures; this includes conversion of wetlands to other land uses (about 45 %) and development of infrastructure (near 55 %).

**Figure 3 – Pressures reported for wetlands habitats (in percentage)**






Source: European Environment Agency – April 2021

Note: based on pressures reported as 'high-ranking'

## Condition of habitats

Member States reported on the condition of habitat types under Article 17 of the Habitats Directive. This data can be used to estimate the area of wetlands assessed as degraded (condition not-good) therefore, requiring restoration.

The area of wetland habitats that would need to be restored, i.e., improved condition, is **at least 27 100 km$^2$**, representing **16 %** of the total wetland area reported (the values exclude Romania). However, the condition of habitats reported as 'unknown' (or not reported) is almost 84 300 km$^2$ (48 % of the total area). This means that the area requiring restoration is much bigger than 27 100 km$^2$; for example, assuming that half of the 'unknown' area is in a not-good condition, the area to be restored would be over 69 200 km$^2$ or 111 400 km$^2$ if all the 'unknown' is assumed to be in a 'not-good' condition (64 % of the total wetland area). Table 6 gives information for each of the 28 wetland habitats (excluding Romania) and Table 7 the condition areas and percentage for each of the Member States.

In addition to the habitat condition, Member States also reported on the 'favourable reference areas'[7]. Comparing this area with the actual habitat area allows to estimate how much area of the habitat would need to be re-created to achieve a good distribution and area of the habitat. Based on this data, it is estimated that a **strict minimum** of **3 100 km$^2$** would need to be **re-created** to achieve a 'favourable area':

- 271 km$^2$ of coastal and salty habitats
- 170 km$^2$ of wet heaths
- 1 716 km$^2$ of bogs, mires and fens
- 973 km$^2$ of wet forests

However, these values are much higher since several Member States did not provide enough information in their reports to allow a more realistic estimation.

[7] The surface area in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the habitat type; this should include necessary areas for restoration or development for those habitat types for which the present coverage is not sufficient to ensure long-term viability

**Table 6 – Condition of wetlands per Annex I habitat type**

| | | Condition (area in km2) | | | Condition (in percentage) | | |
|---|---|---|---|---|---|---|---|
| | **Habitat area** | **Good** | **Not-good** | **Unknown** | **Good** | **Not-good** | **Unknown** |
| **Wetlands** | **174 352.5** | **62 950.6** | **27 123.6** | **84 278.2** | **36** | **16** | **48** |
| **Coastal and salt habitats** | **37 780.0** | **10 494.8** | **7 896.9** | **19 388.3** | **28** | **21** | **51** |
| 1130 | 7 504.6 | 958.2 | 2 673.0 | 3 873.4 | 13 | 36 | 52 |
| 1140 | 13 619.8 | 4 650.1 | 1 148.0 | 7 821.6 | 34 | 8 | 57 |
| 1150 | 10 052.4 | 1 347.7 | 2 496.6 | 6 208.1 | 13 | 25 | 62 |
| 1310 | 433.3 | 355.2 | 30.6 | 47.4 | 82 | 7 | 11 |
| 1320 | 159.0 | 120.1 | 25.9 | 12.9 | 76 | 16 | 8 |
| 1330 | 1 118.7 | 684.0 | 390.6 | 44.1 | 61 | 35 | 4 |
| 1340 | 37.5 | 11.9 | 6.9 | 18.7 | 32 | 18 | 50 |
| 1410 | 812.8 | 159.8 | 85.7 | 567.3 | 20 | 11 | 70 |
| 1420 | 866.4 | 561.8 | 133.3 | 171.4 | 65 | 15 | 20 |
| 1530 | 2 505.4 | 1 573.5 | 608.7 | 323.3 | 63 | 24 | 13 |
| 1650 | 670.0 | 72.5 | 297.5 | 300.0 | 11 | 44 | 45 |
| **Wet heaths** | **3 828.4** | **857.9** | **1 564.5** | **1 405.9** | **22** | **41** | **37** |
| 4010 | 2 651.4 | 521.8 | 1 526.2 | 603.4 | 20 | 58 | 23 |
| 4020 | 1 176.9 | 336.2 | 38.3 | 802.5 | 29 | 3 | 68 |
| 6460 | 0.02 | 0.02 | 0.00 | 0.00 | 100 | 0 | 0 |
| **Bogs, mires and fens** | **86 738.1** | **47 556.2** | **9 330.8** | **29 851.0** | **55** | **11** | **34** |
| 7110 | 8 086.2 | 2 481.0 | 926.4 | 4 678.7 | 31 | 11 | 58 |
| 7120 | 1 161.7 | 289.8 | 537.8 | 334.0 | 25 | 46 | 29 |
| 7130 | 2 817.0 | 1 468.4 | 1 325.0 | 23.5 | 52 | 47 | 1 |
| 7140 | 31 674.4 | 25 001.3 | 3 553.6 | 3 119.5 | 79 | 11 | 10 |
| 7150 | 218.9 | 125.5 | 41.9 | 51.5 | 57 | 19 | 24 |
| 7160 | 95.8 | 47.9 | 33.0 | 15.0 | 50 | 34 | 16 |
| 7210 | 656.5 | 406.5 | 188.9 | 61.1 | 62 | 29 | 9 |
| 7220 | 813.9 | 45.2 | 21.5 | 747.3 | 6 | 3 | 92 |
| 7230 | 4 691.3 | 2 577.1 | 789.7 | 1 324.6 | 55 | 17 | 28 |
| 7240 | 77.7 | 60.1 | 13.8 | 3.9 | 77 | 18 | 5 |
| 7310 | 36 020.0 | 14 980.0 | 1 548.0 | 19 492.0 | 42 | 4 | 54 |
| 7320 | 424.7 | 73.5 | 351.2 | 0.0 | 17 | 83 | 0 |
| **Wet forests** | **46 006.1** | **4 041.7** | **8 331.4** | **33 632.9** | **9** | **18** | **73** |
| 9080 | 1 421.5 | 371.4 | 270.5 | 779.6 | 26 | 19 | 55 |
| 91D0 | 44 584.6 | 3 670.3 | 8 060.9 | 32 853.3 | 8 | 18 | 74 |



Source: European Environment Agency – April 2021

Notes: Areas reported by Romania excluded from the table.

**Table 7 – Condition of Annex I wetlands per Member State**

| | Wetland area ($km^2$) | | | | Percentage | | |
|---|---|---|---|---|---|---|---|
| **Member State** | **Total** | **Good** | **Not-good** | **Unknown** | **Good** | **Not-good** | **Unknown** |
| AT | 181.8 | 41.5 | 26.8 | 113.5 | 23 | 15 | 62 |
| BE | 169.4 | 8.9 | 17.1 | 143.5 | 5 | 10 | 85 |
| BG | 117.2 | 0.0 | 0.0 | 117.1 | 0 | 0 | 100 |
| CY | 6.9 | 4.3 | 2.7 | 0.0 | 62 | 39 | 0 |
| CZ | 197.8 | 153.4 | 17.1 | 27.3 | 78 | 9 | 14 |
| DE | 6 743.5 | 4 103.7 | 1 773.1 | 866.6 | 61 | 26 | 13 |
| DK | 6 402.8 | 289.7 | 1 382.0 | 4 731.1 | 5 | 22 | 74 |
| EE | 3 624.8 | 2 813.4 | 464.2 | 347.2 | 78 | 13 | 10 |
| ES | 2 511.7 | 390.0 | 481.5 | 1 640.1 | 16 | 19 | 65 |
| FI | 52 060.0 | 3 301.7 | 8 413.2 | 40 345.1 | 6 | 16 | 77 |
| FR | 11 969.4 | 2 069.1 | 787.6 | 9 112.6 | 17 | 7 | 76 |
| GR | 1 612.1 | 278.6 | 260.5 | 1 073.1 | 17 | 16 | 67 |
| HR | 95.0 | 6.0 | 0.2 | 88.8 | 6 | 0 | 93 |
| HU | 2 415.6 | 1 570.3 | 602.9 | 242.4 | 65 | 25 | 10 |
| IE | 5 979.9 | 2 453.1 | 3 526.8 | 0.0 | 41 | 59 | 0 |
| IT | 2 147.8 | 1 106.2 | 191.4 | 850.2 | 52 | 9 | 40 |
| LT | 1 689.5 | 524.7 | 77.0 | 1 087.8 | 31 | 5 | 64 |
| LU | 0.1 | 0.0 | 0.0 | 0.1 | 0 | 16 | 84 |
| LV | 2 394.7 | 1 166.4 | 366.8 | 861.5 | 49 | 15 | 36 |
| MT | 0.3 | 0.1 | 0.2 | 0.0 | 31 | 73 | -4 |
| NL | 2 394.2 | 119.0 | 559.9 | 1 715.3 | 5 | 23 | 72 |
| PL | 2 242.9 | 543.5 | 1 702.3 | -2.9 | 24 | 76 | 0 |
| PT | 691.2 | 215.2 | 338.2 | 137.9 | 31 | 49 | 20 |
| *RO (*)* | 34 260.5 | 26 001.9 | 2 250.5 | 6 008.0 | 76 | 7 | 18 |
| SE | 68 647.0 | 41 768.8 | 6 125.2 | 20 753.1 | 61 | 9 | 30 |
| SI | 20.4 | 16.5 | 3.4 | 0.4 | 81 | 17 | 2 |
| SK | 36.6 | 6.8 | 3.4 | 26.4 | 19 | 9 | 72 |

(*) areas reported by Romania largely overestimated



Source: European Environment Agency – April 2021

## Carbon stock and sequestration

Literature on carbon stock and sequestration rates of wetlands is rather diverse and numbers for the individual habitats widely vary across the different studies. However, for many habitats values could still only be attributed by expert assessment.

Coastal and salty habitats listed in Annex I are reported to have high carbon sequestration rates but are relatively low in carbon storage. Covering less than 22% of the wetland area their share to the sequestration potential is about 45%. The contribution to the carbon stocks is less than 5%.

Wet heaths, bogs, mires, fens and wet forests are characterized by relatively low sequestration rates as productivity of the vegetation in wetlands is often relatively low. In contrast, carbon storage is usually very high as they are mostly characterized by peat soils which are very rich in organic soil carbon. In Europe, agriculture on drained peat soils is responsible for a large part of the total greenhouse gas emissions from agriculture. In the EU27, – where peat soils cover more than 3 % of the agricultural area – these peat soils contribute 25 % to the annual greenhouse gas emissions associated with agricultural land use. Member States reported under the LULUCF Regulation that managed wetlands (mostly on peat soils) are net sources of $CO_2$, with increasing emissions to the atmosphere by 5 % between 2000 and 2012.

Despite carbon sequestration rates of most peatland habitats reach only 50 % or less compared to forests (<1.5 tC/ha*yr compared to ca 2.6 tC/ha*yr), carbon stocks in peatland habitats are twice that high (260 t/ha compared to 130 t/ha) as they continuously accumulate carbon over centuries. The area of peatlands reported under Annex I of the Habitat Directive covers almost 137 000 $km^2$. The respective potential annual carbon sequestration rate would be around 10.25 Mio tonnes equivalent to about 38 Mio tons of $CO_2$, but only if habitats are in good condition. In principle, coastal and salty habitats would contribute another 30 Mio tons of $CO_2$-equivalent but currently available data indicates that most of this carbon is not stored in the respective habitats.

Overall, the carbon storage potential of wetland habitats is estimated between 1.6 Gt and 4.7 Gt of carbon, if habitats are in good condition (Table 8).

**Table 8 – Carbon stock and sequestration of Annex I wetlands**

| **EU27 excluding Romania** | Wetland area ($km^2$) | Total Carbon Stock (Mt) | | Potential carbon sequestration rate (Mt $y^{-1}$) |
|---|---|---|---|---|
| | EU27 | min | max | mean |
| **Coastal and salt habitats** | **37 780** | **0.00** | **283.35** | **8.37** |
| 1130 | 7 505 | 0.00 | 56.28 | 1.69 |
| 1140 | 13 620 | 0.00 | 102.15 | 3.06 |
| 1150 | 10 052 | 0.00 | 75.39 | 2.26 |
| 1310 | 433 | 0.00 | 3.25 | 0.13 |
| 1320 | 159 | 0.00 | 1.19 | 0.05 |
| 1330 | 1 119 | 0.00 | 8.39 | 0.34 |
| 1340 | 38 | 0.00 | 0.28 | 0.01 |
| 1410 | 813 | 0.00 | 6.10 | 0.24 |
| 1420 | 867 | 0.00 | 6.50 | 0.06 |
| 1530 | 2 505 | 0.00 | 18.79 | 0.38 |
| 1650 | 670 | 0.00 | 5.03 | 0.15 |
| **Wet heaths and peat grasland** | **3 828** | **28.71** | **173.60** | **0.87** |
| 4010 | 2 651 | 19.88 | 39.77 | 0.20 |
| 4020 | 1 177 | 8.83 | 17.66 | 0.09 |
| 6460 | 0.02 | 0.00 | 116.18 | 0.58 |
| **Bogs. mires and fens** | **86 738** | **917.77** | **2 490.80** | **6.51** |
| 7110 | 8 086 | 60.65 | 181.94 | 0.61 |
| 7120 | 1 162 | 8.72 | 26.15 | 0.09 |
| 7130 | 2 817 | 21.13 | 63.38 | 0.21 |
| 7140 | 31 674 | 237.56 | 712.67 | 2.38 |
| 7150 | 219 | 1.64 | 8.21 | 0.02 |
| 7160 | 96 | 0.72 | 3.60 | 0.01 |
| 7210 | 656 | 4.92 | 14.76 | 0.05 |
| 7220 | 814 | 0.00 | 6.11 | 0.06 |
| 7230 | 4 691 | 35.18 | 105.55 | 0.35 |
| 7240 | 78 | 0.59 | 1.76 | 0.01 |
| 7310 | 36 020 | 540.30 | 1 350.75 | 2.70 |
| 7320 | 425 | 6.38 | 15.94 | 0.03 |
| **Wet forests** | **46 006** | **690.11** | **1 725.26** | **3.45** |
| 9080 | 1 422 | 21.33 | 53.33 | 0.11 |
| 91D0 | 44 585 | 668.78 | 1 671.94 | 3.34 |
| **TOTAL** | **174 352** | **1 636.58** | **4 673.01** | **19.19** |

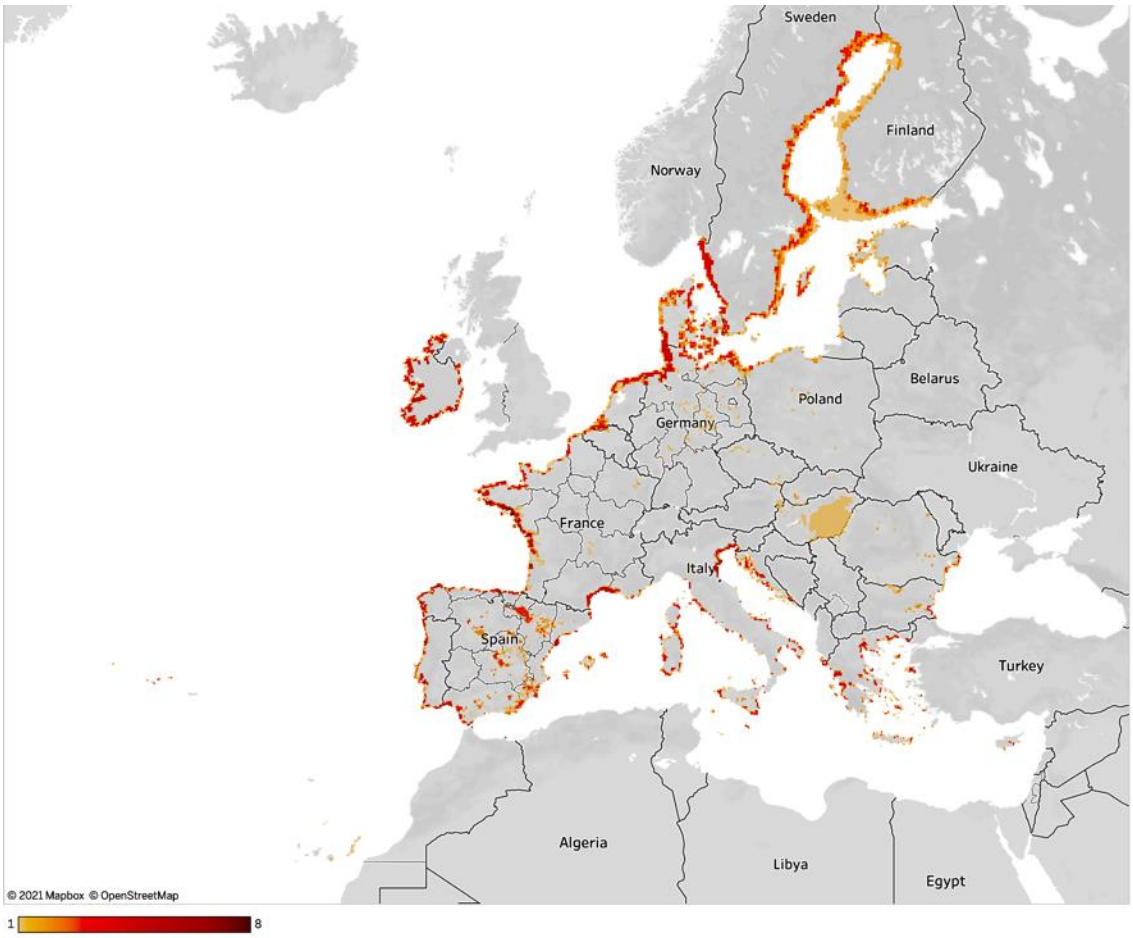
Note: areas reported by Romania note included



Source: European Environment Agency – April 2021

# Annex A

**Map 2 – Distribution of Annex I coastal and salt habitats (1130, 1140, 1150, 1310, 1320, 1330, 1340, 1410, 1420, 1530, 1650)**

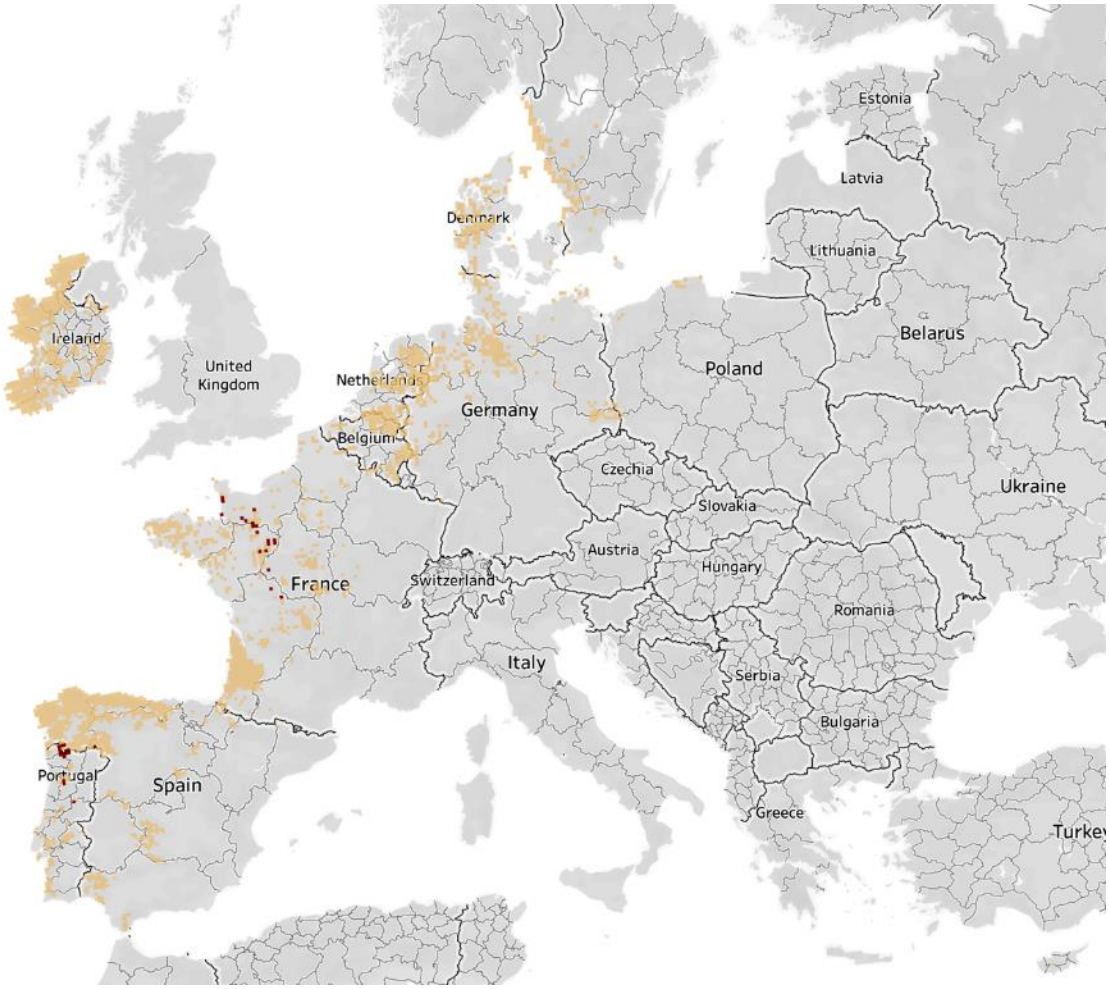



Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell.



Source: European Environment Agency – April 2021

**Map 3 – Distribution of Annex I wet heaths (4010, 4020) and peat grassland (6460)**

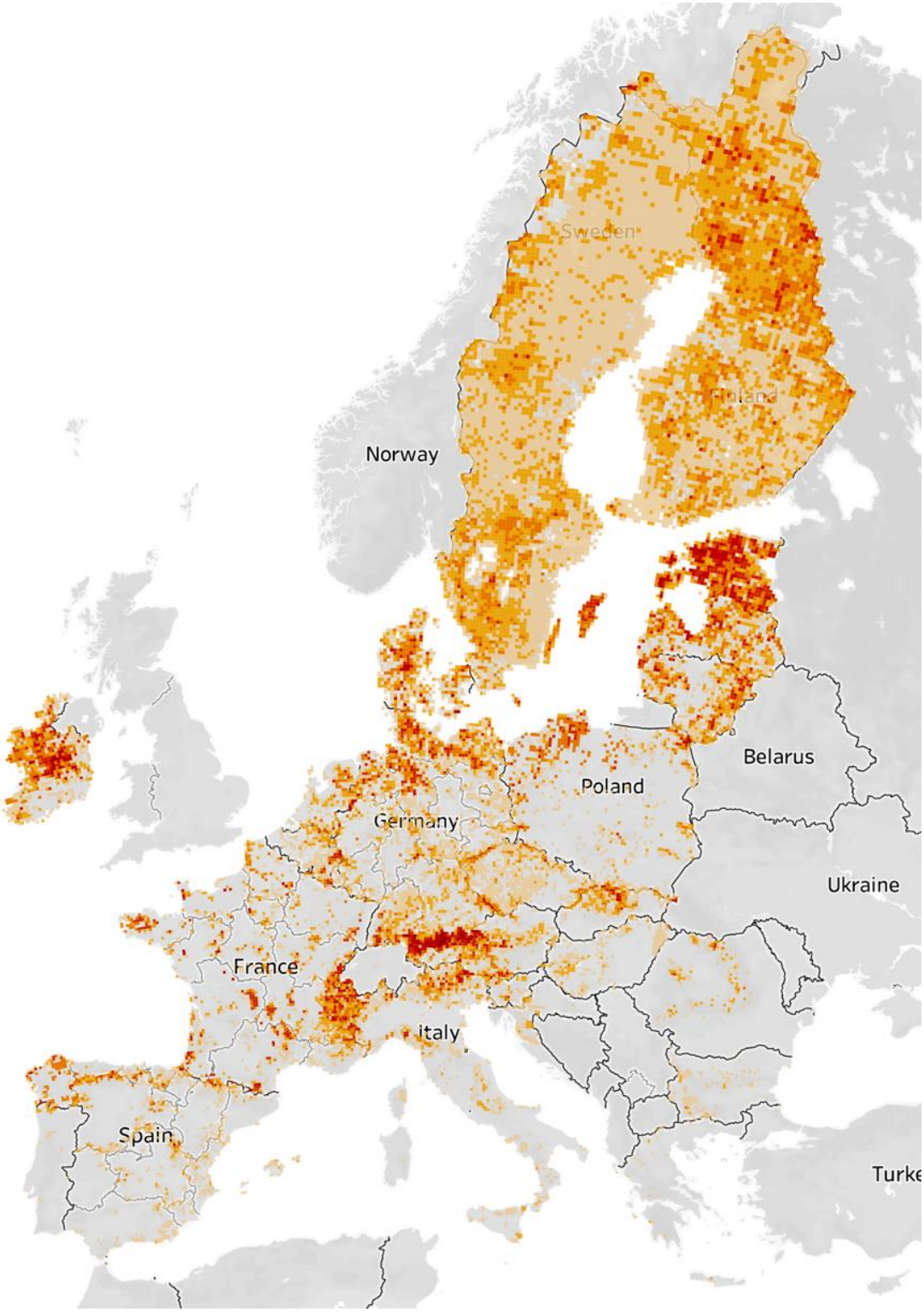



Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell. Macaronesian islands not shown in the map.



Source: European Environment Agency – April 2021

**Map 4 – Distribution of Annex I bogs, mires and fens (7110, 7120, 7130, 7140, 7150, 7160, 7210, 7220, 7230, 7240, 7310, 7320)**

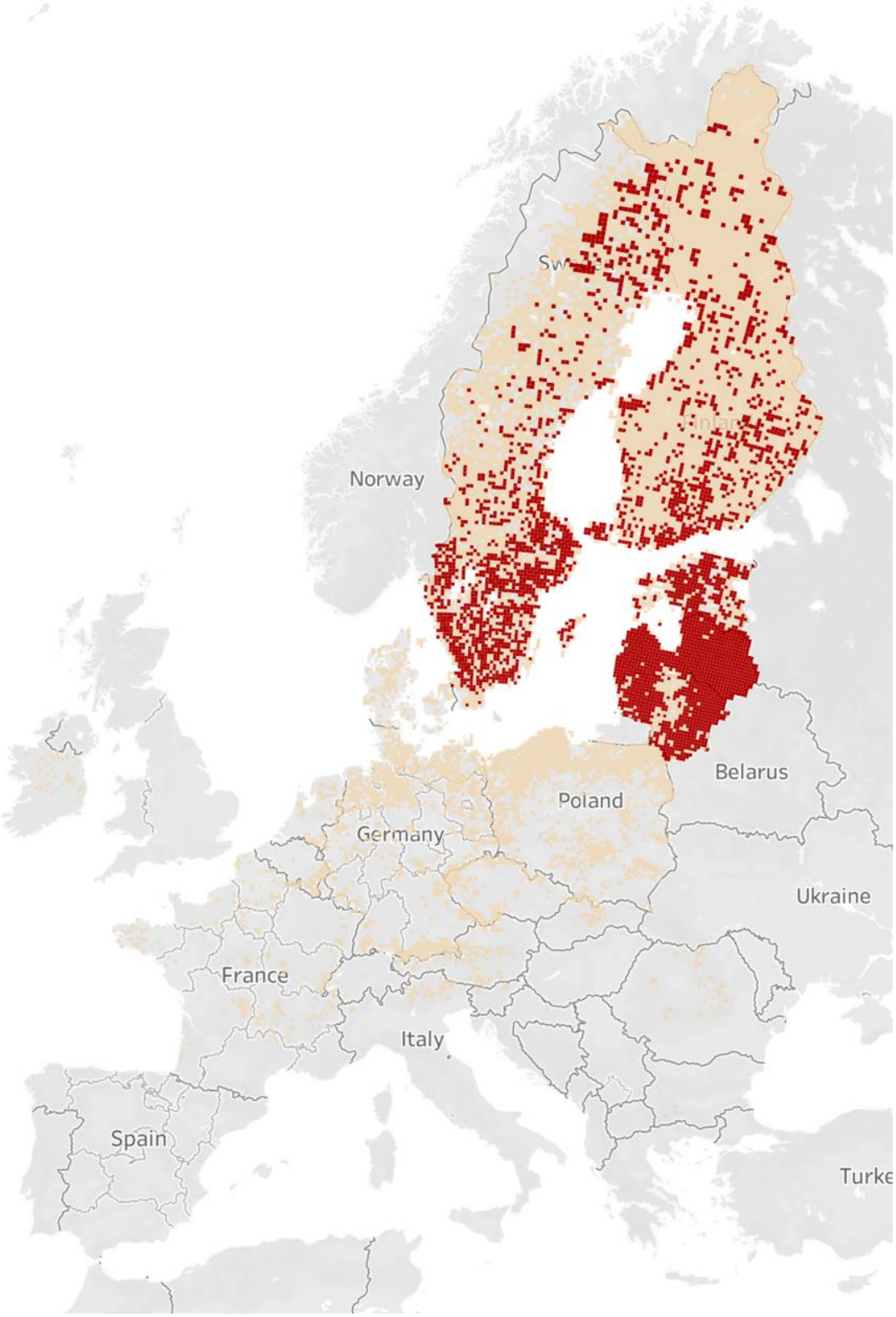



Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell. Macaronesian islands not shown in the map.



Source: European Environment Agency – April 2021

**Map 5 – Distribution of Annex I wet forests (9080, 91D0)**




Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell. Macaronesian islands not shown in the map.



Source: European Environment Agency – April 2021