Necessidades e potencial de restauro de sistemas de água doce na Europa

Paulo Branco

Duarte G., Peponi A., Leite T., Faro A., Cabo J., Moreno D., Anjinho P., Segurado P., Borgwardt F., Baattrup-Pedersen A., Hering D., Birk S., Mameri D., Santos J.M., Ferreira, M.T.

VIII JORNADAS DE RESTAURO FLUVIAL
Laboratório Nacional de Engenharia Civil (Lisboa)
28 novembro 2024
ASSOCIAÇÃO PORTUGUESA DOS RECURSOS HÍDRICOS

MERLiN

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INSTITUTO SUPERIOR DE AGRONOMIA
Universidade de Lisboa
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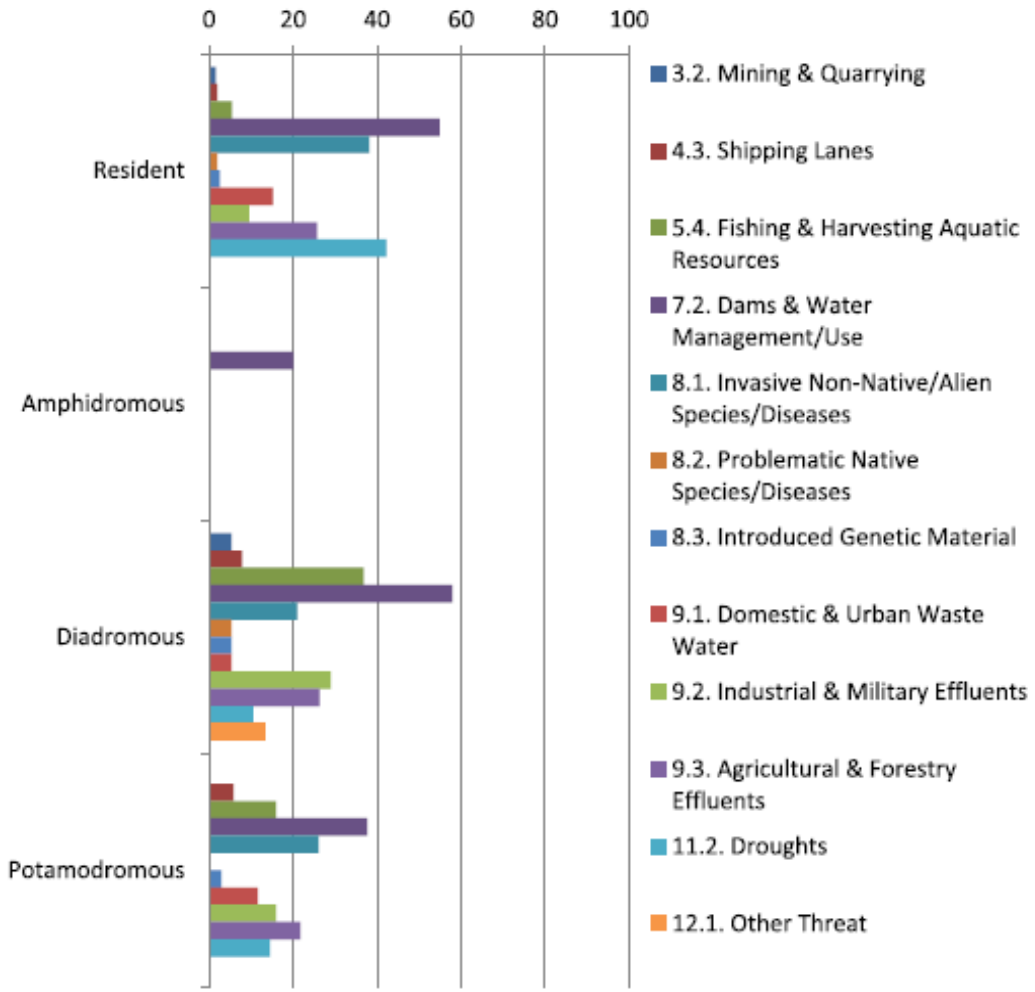
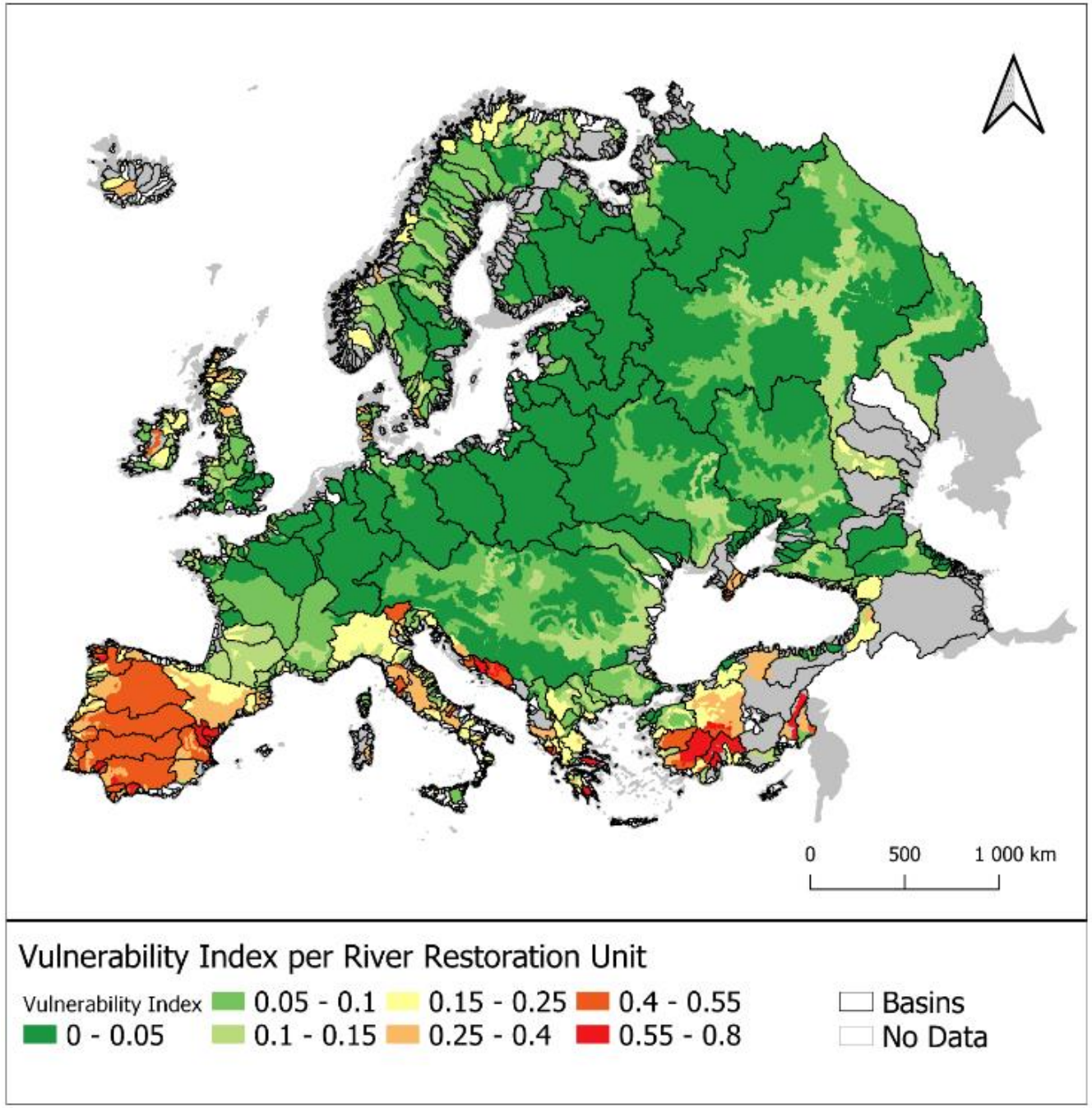
cef Centro de Estudos Florestais

TERRA
Laboratory for sustainable land use and ecosystem services

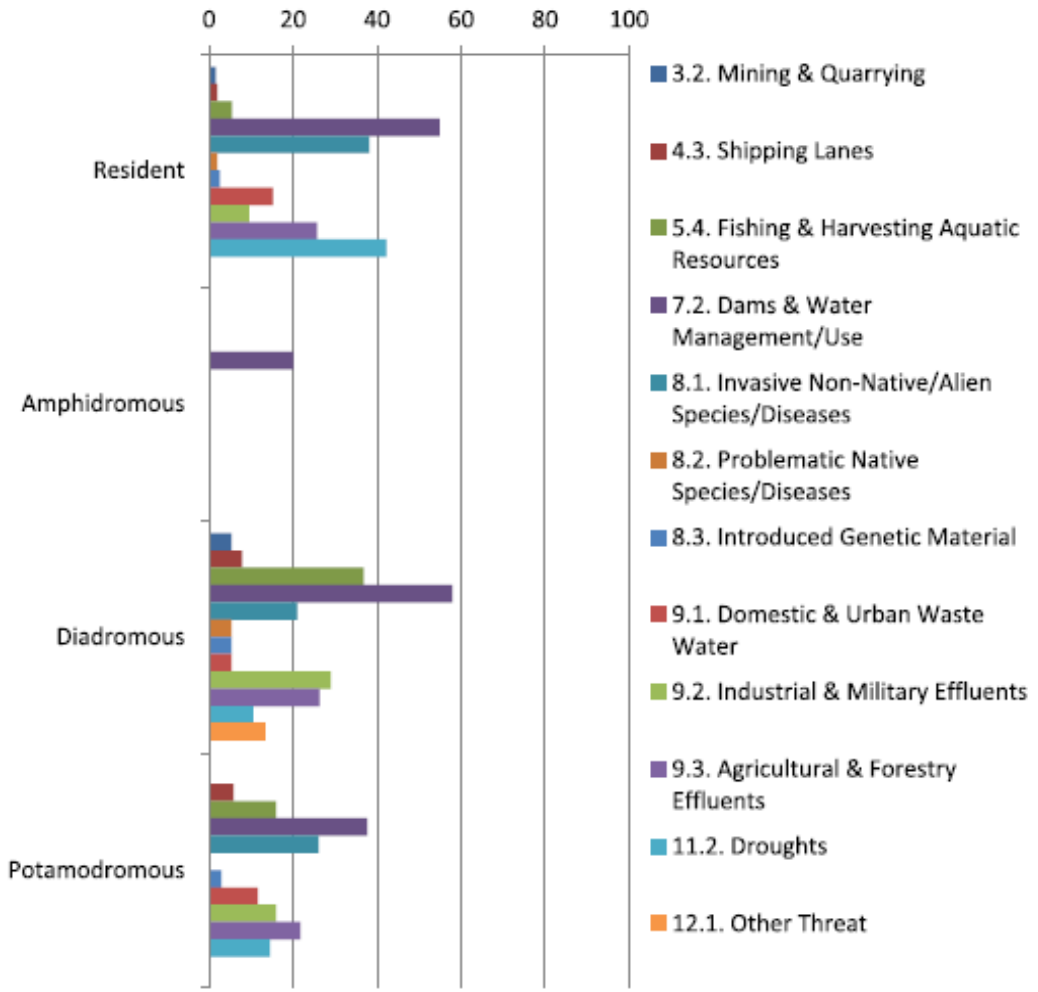
DammedFish



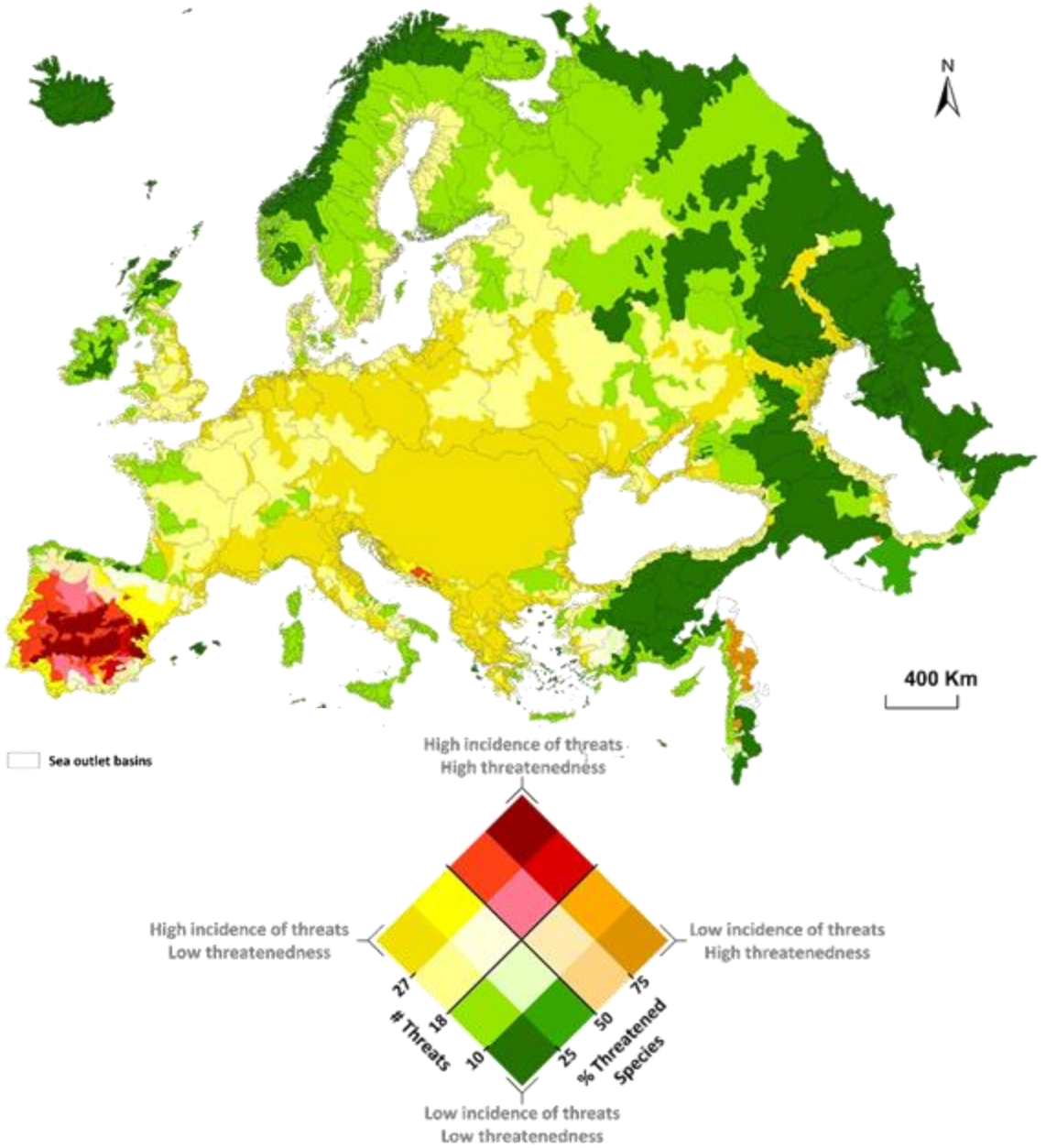


Costa et. al., 2021 (10.1016/j.scitotenv.2021.149105)

In Prep



Threatenedness vs. Potential threat incidence



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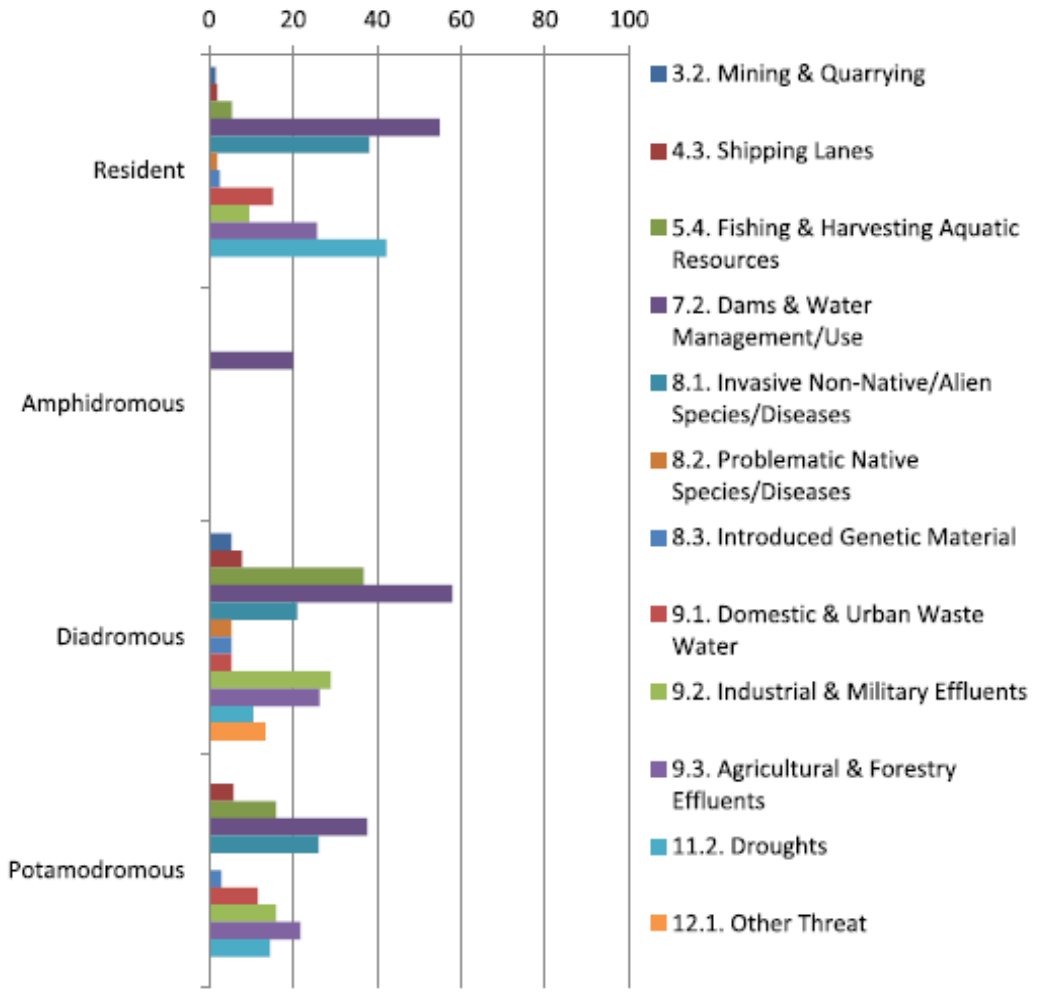

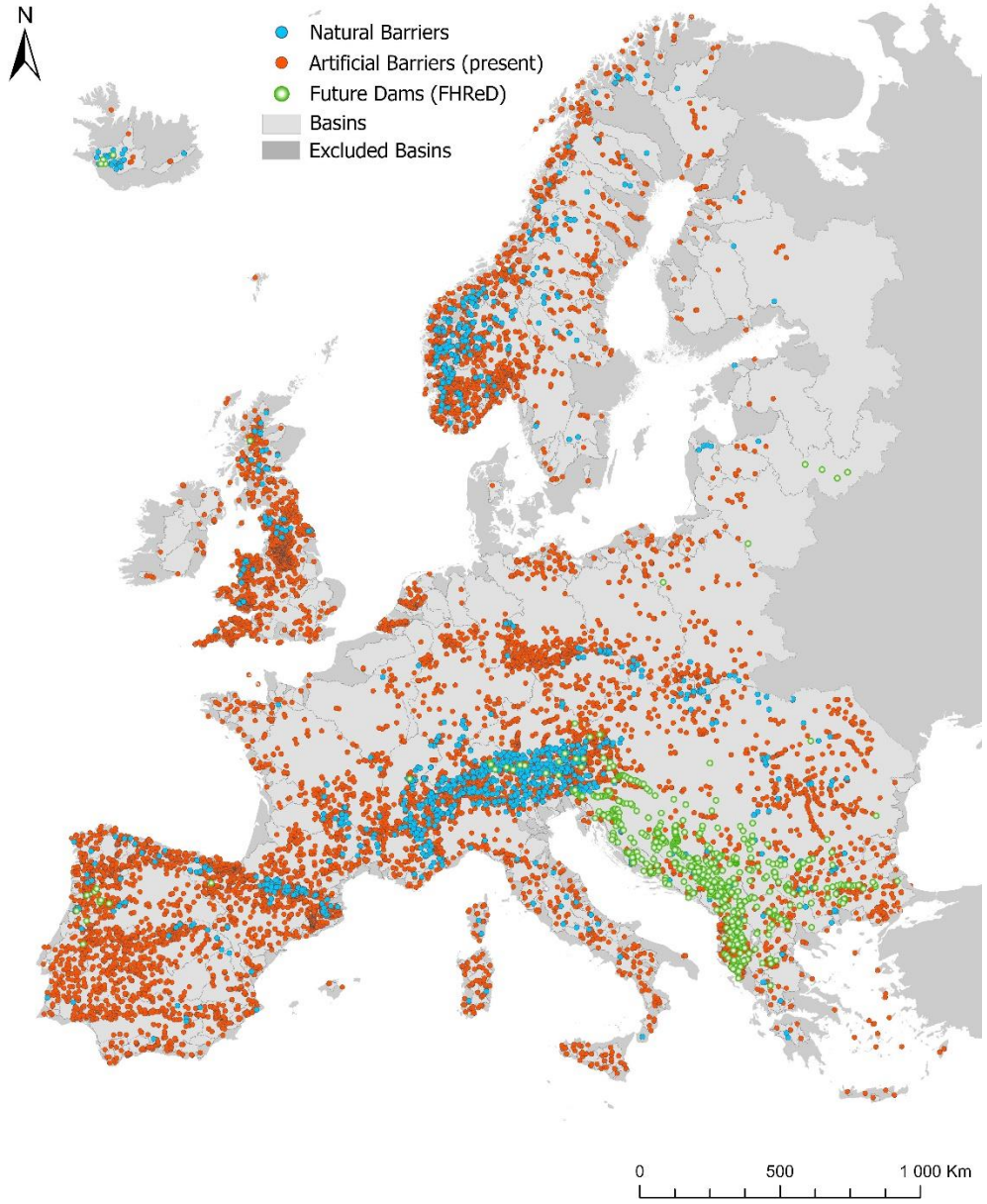

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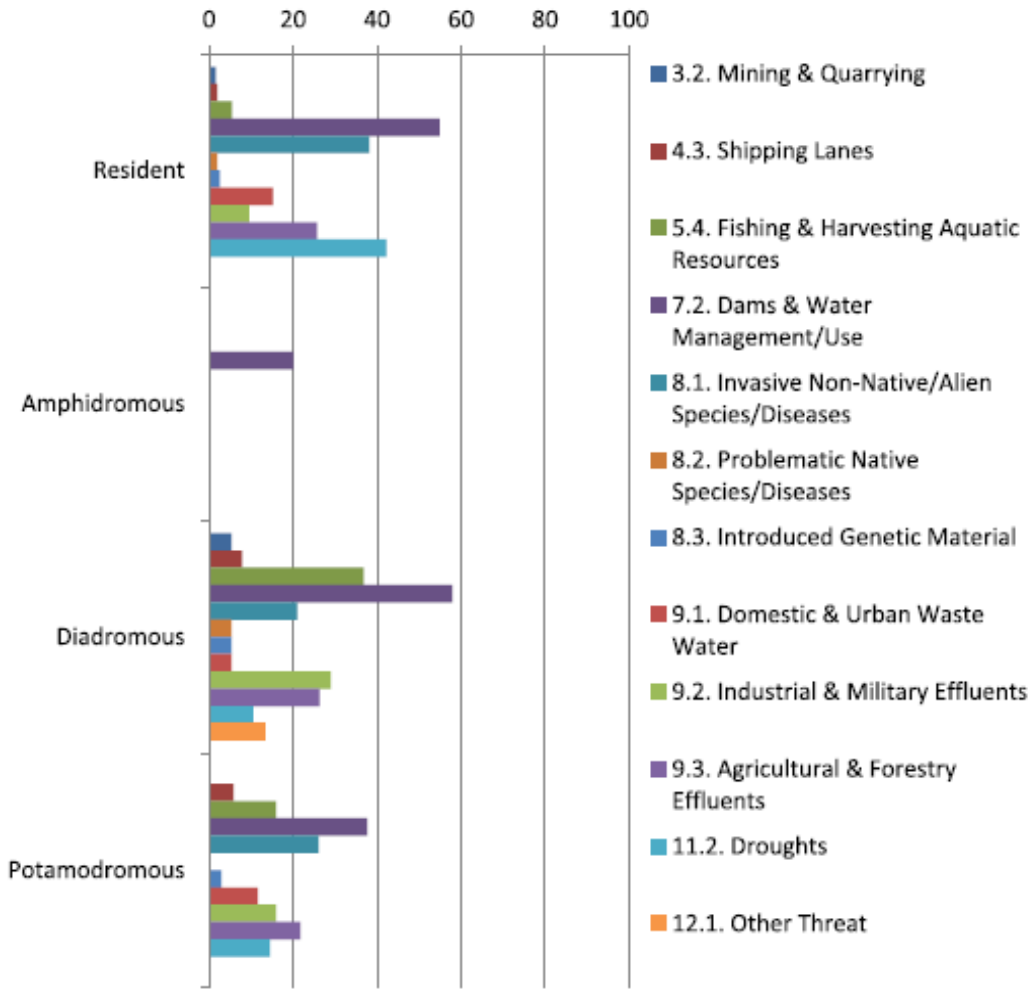
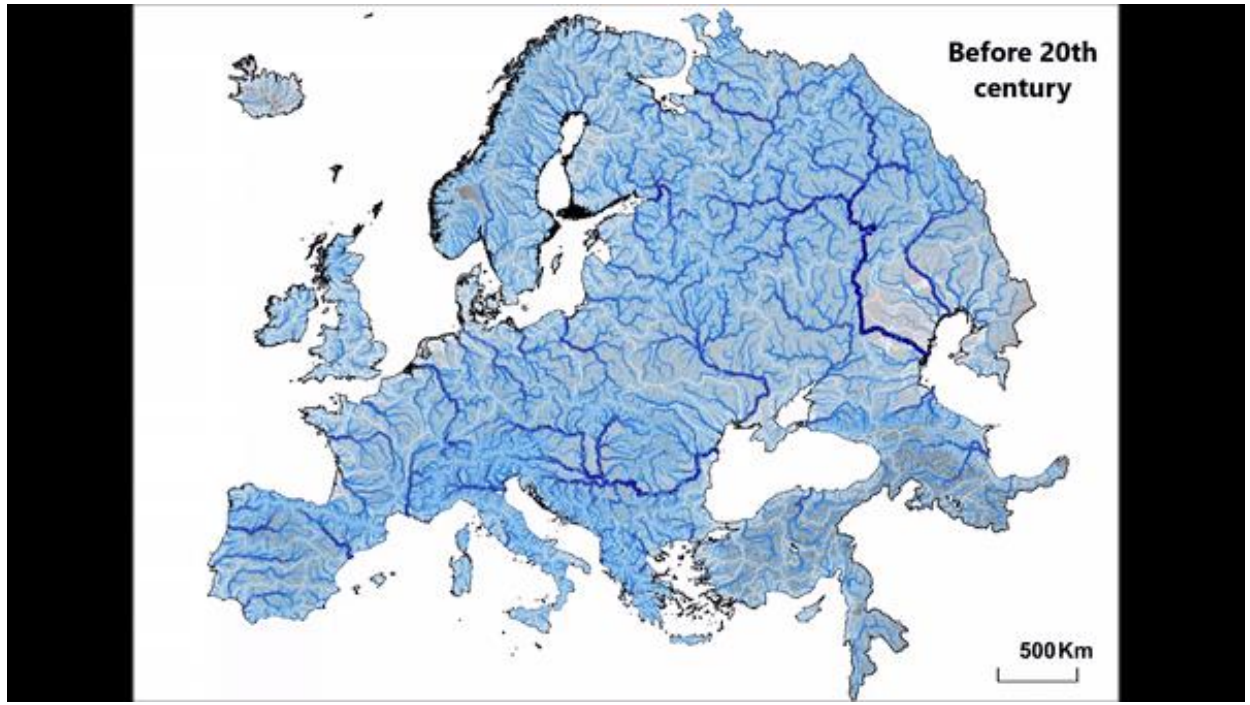


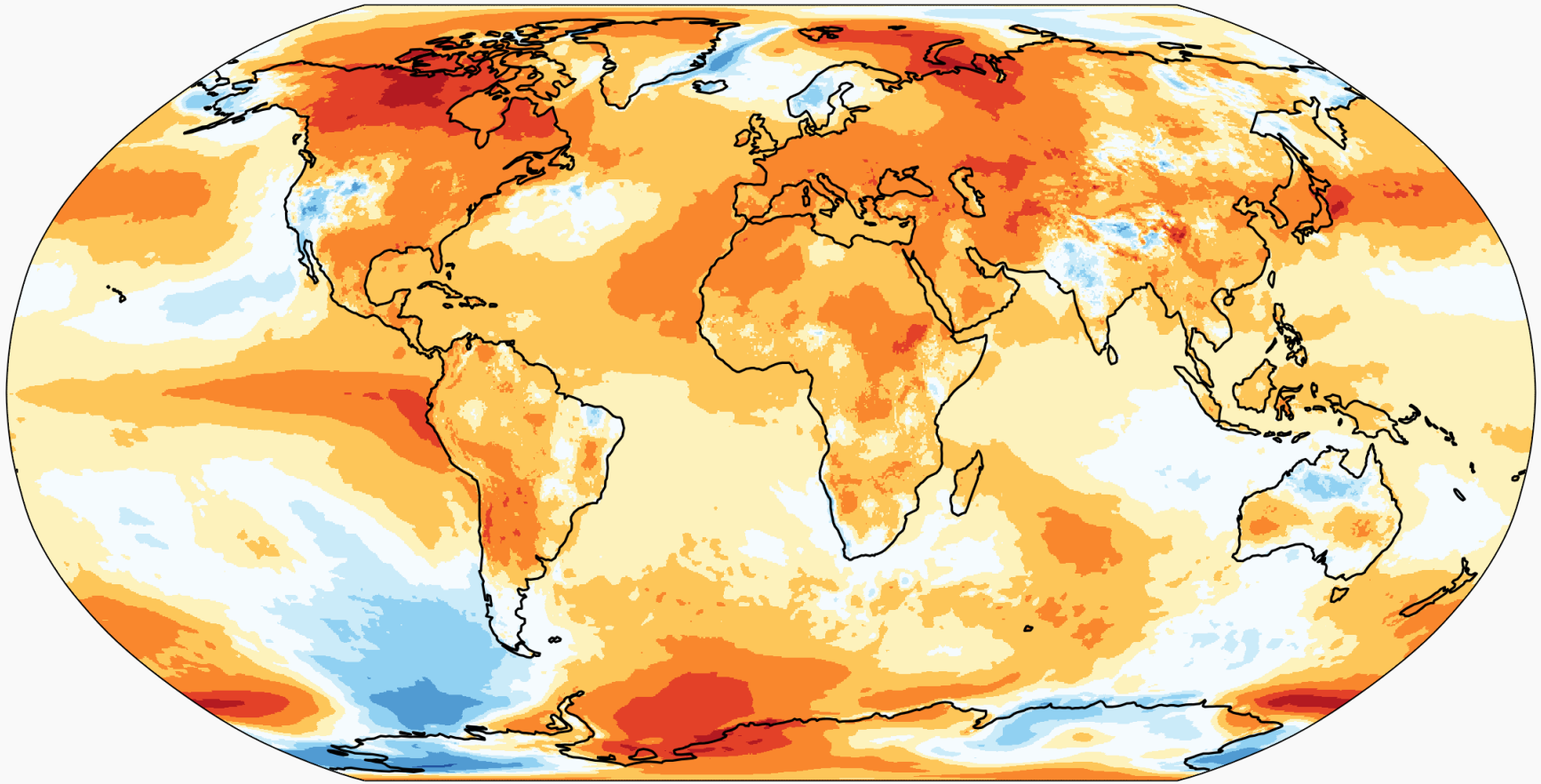


Costa et. al., 2021 (10.1016/j.scitotenv.2021.149105)

Duarte et. al., 2021 (10.1016/j.scitotenv.2020.143293)

SURFACE AIR TEMPERATURE ANOMALY • 2023

Reference period: 1991–2020 • Data: ERA5 • Credit: C3S/ECMWF



Temperature anomaly (°C)

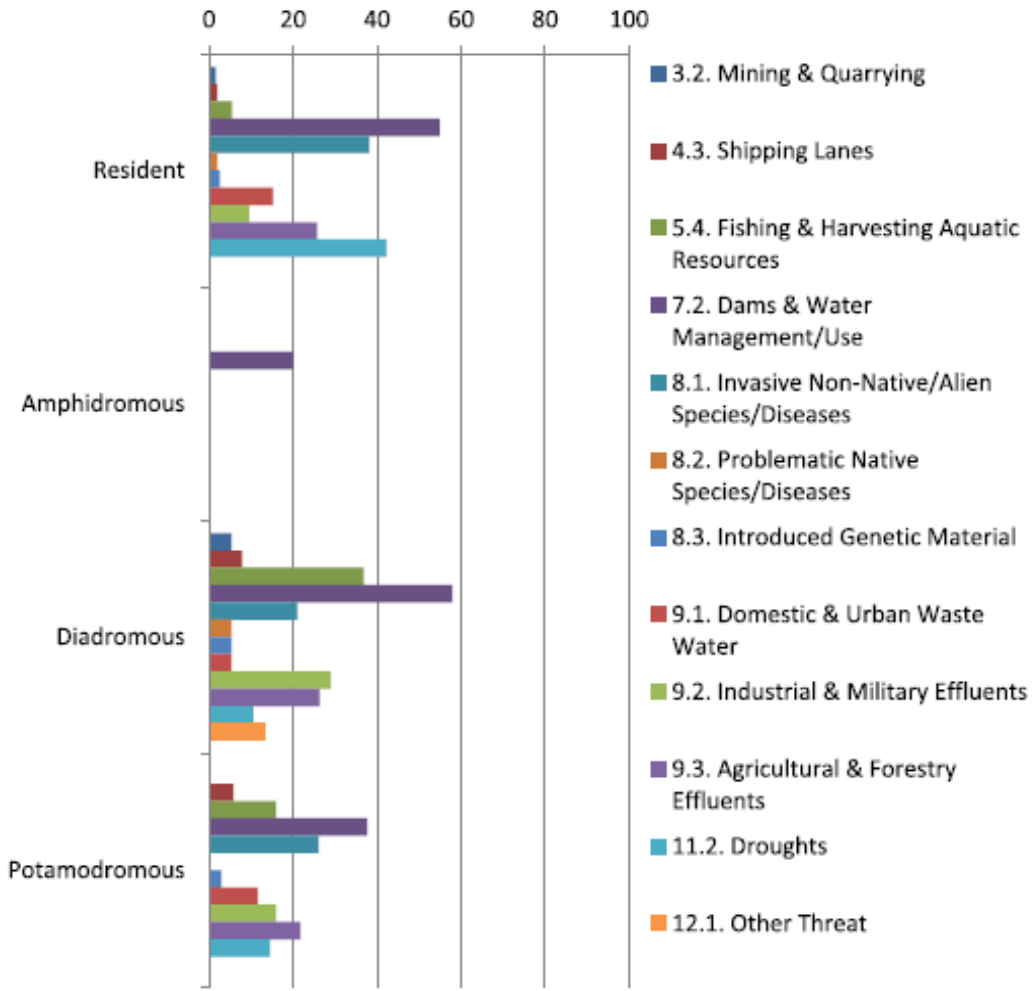
-6 -3 -2 -1 -0.5 -0.2 0.2 0.5 1 2 3 6

PROGRAMME OF THE EUROPEAN UNION

opernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

Climate Change Service climate.copernicus.eu



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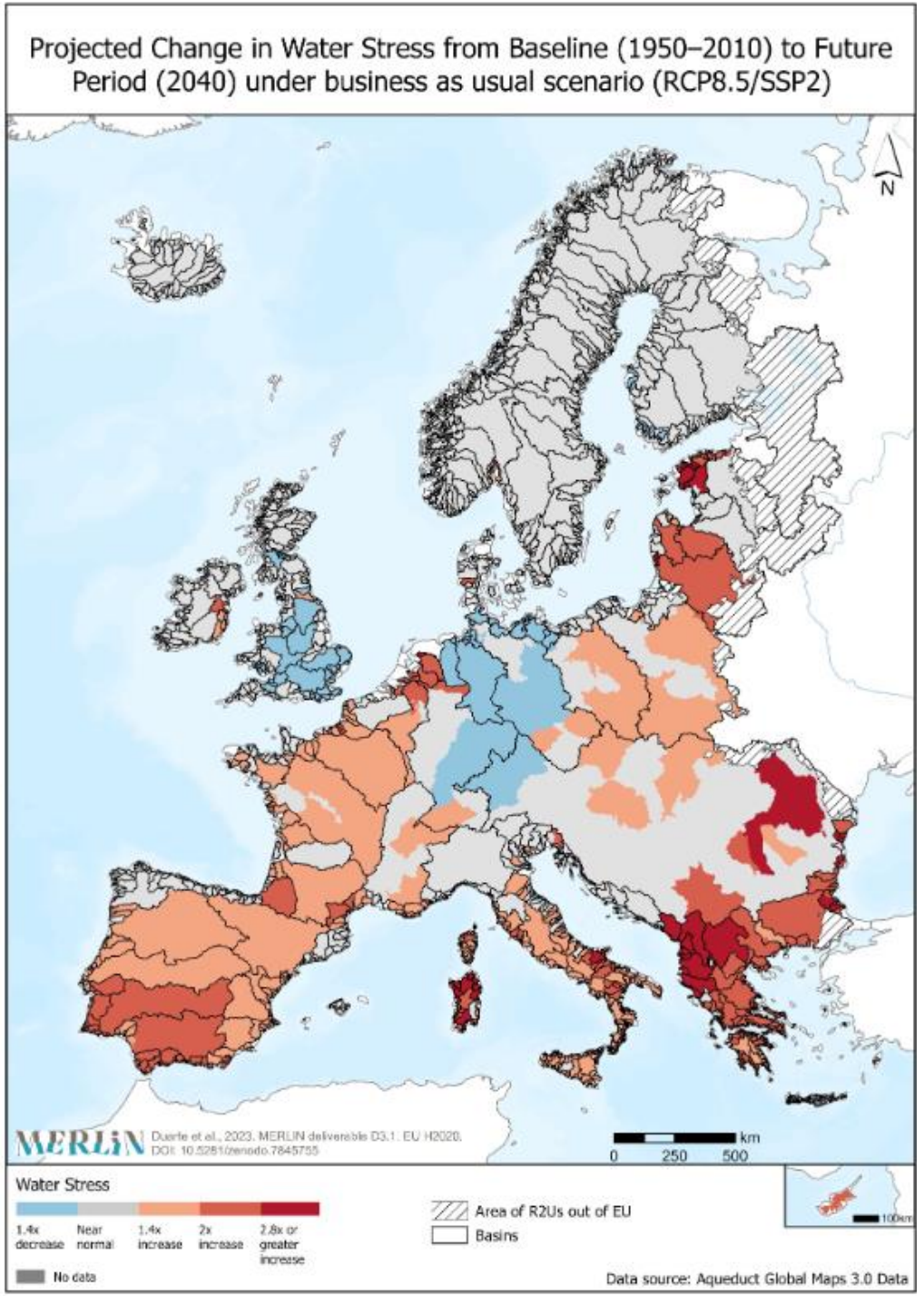

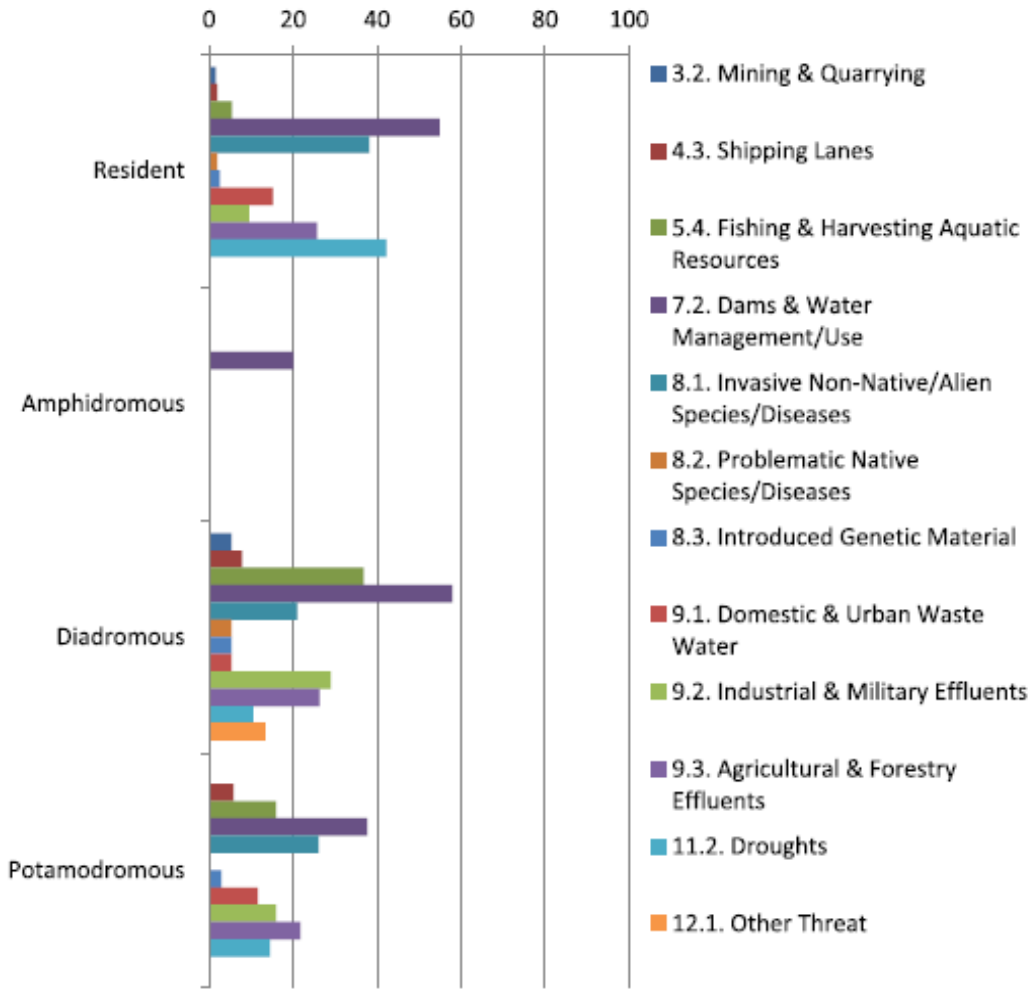

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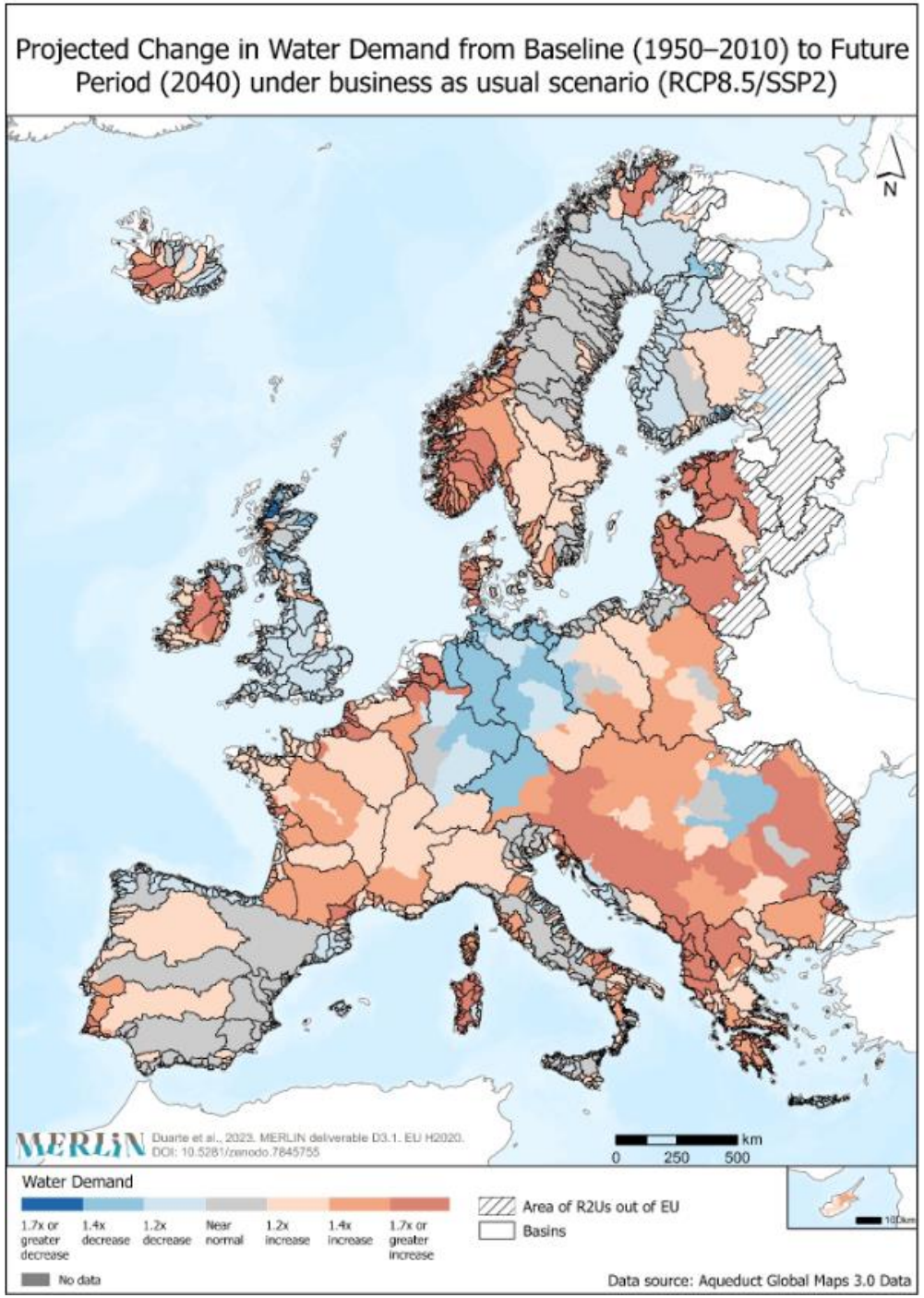
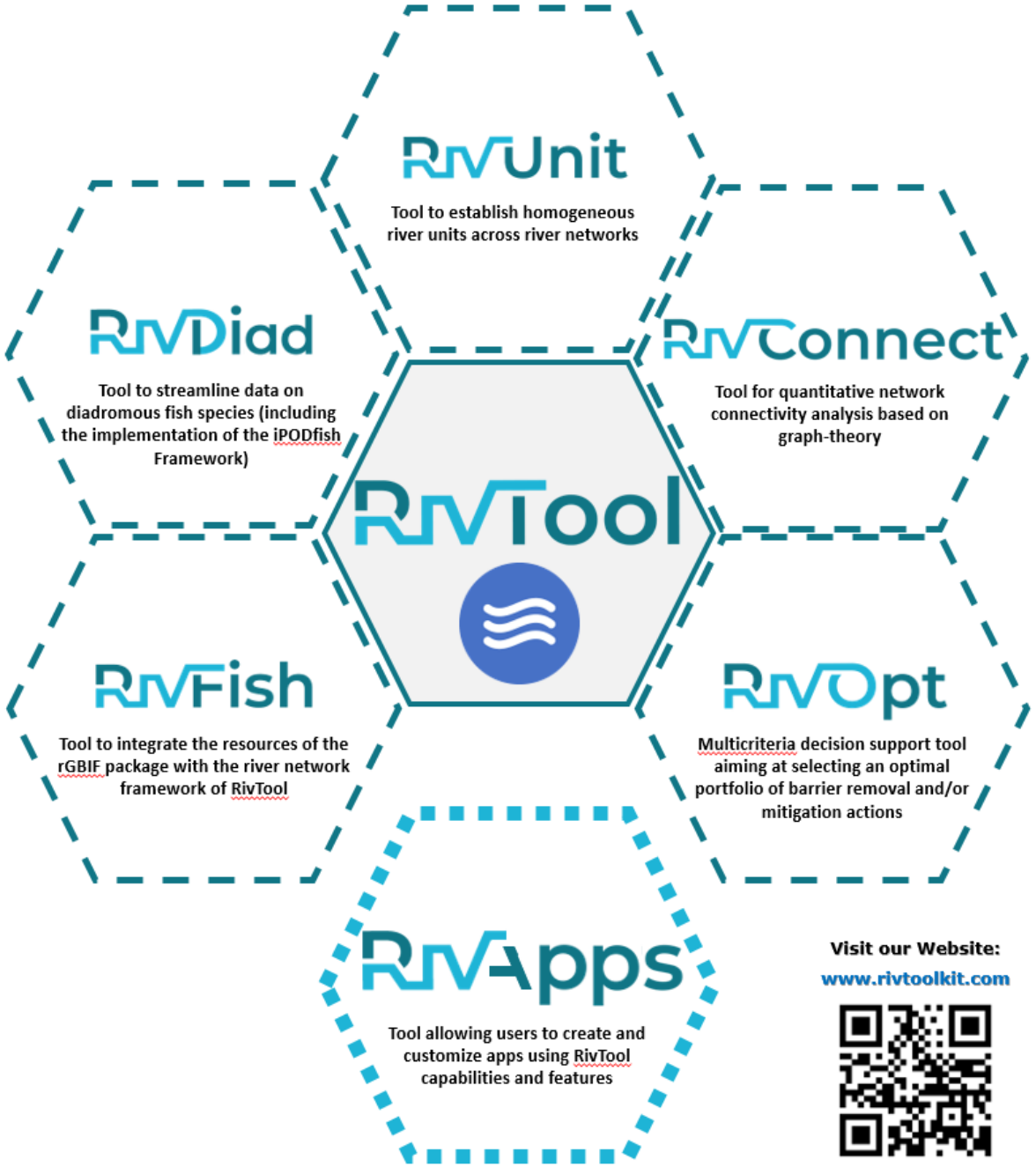



Dammed
Fish


IPDIF


RivUnit
Tool to establish homogeneous river units across river networks
RivDiad
Tool to streamline data on diadromous fish species (including the implementation of the iPODfish Framework)
RivConnect
Tool for quantitative network connectivity analysis based on graph-theory
RivTool
RivFish
Tool to integrate the resources of the rGBIF package with the river network framework of RivTool
RivOpt
Multicriteria decision support tool aiming at selecting an optimal portfolio of barrier removal and/or mitigation actions
RivApps
Tool allowing users to create and customize apps using RivTool capabilities and features
Visit our Website:
www.rivtoolkit.com

Necessidades e potencial de restauro de sistemas de água doce na Europa

LEI DO RESTAURO

da natureza

PIB GLOBAL

Mais da metade do PIB global depende da natureza e dos serviços que ela oferece. Setores como construção, agricultura, alimentos e saúde são todos altamente dependentes desses serviços dos ecossistemas.

Cada euro investido em restauro da natureza adiciona benefícios de **8** a **38** euros.

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LEI DO RESTAURO

da natureza

A Lei do Restauro da Natureza prevê a recuperação dos ecossistemas a longo prazo, tanto a nível terrestre como a nível marinho.

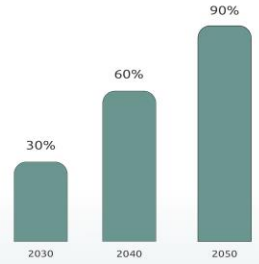
A proposta da Comissão Europeia para uma Lei de Restauração da Natureza é a primeira lei abrangente do seu tipo em todo o continente. É um elemento-chave da Estratégia de Biodiversidade da UE, que exige metas vinculativas para restaurar ecossistemas degradados, em particular aqueles com maior potencial para capturar e armazenar carbono e prevenir e reduzir o impacto de desastres naturais.

Os Estados membros têm de apresentar Planos Nacionais de Restauro à Comissão Europeia no prazo de dois anos a partir da entrada em vigor do regulamento. Esses planos devem demonstrar como os Estados membros planeiam alcançar as metas estabelecidas. Além disso, os Estados membros serão obrigados a monitorizar e reportar regularmente sobre o progresso da implementação.

81% dos habitats encontram-se em mau estado

Na última década, houve um declínio das populações de peixes e de anfíbios

% DE HABITATS
em mau estado que os Estados Membros devem restaurar.



PIB GLOBAL

Mais da metade do PIB global depende da natureza e dos serviços que ela oferece. Setores como construção, agricultura, alimentos e saúde são todos altamente dependentes desses serviços dos ecossistemas.

Cada euro investido em restauro da natureza adiciona benefícios de **8** a **38** euros.

A PROPOSTA CONTÉM OS SEGUINTES OBJETIVOS ESPECÍFICOS:

- Restaurar habitats e espécies protegidas pela legislação ambiental da União Europeia.
- Reverter o declínio dos polinizadores até 2030.
- Garantir que não haja perda líquida de espaços verdes urbanos até 2030, com pelo menos 10% de cobertura de copa de árvores em cidades europeias.
- Melhorar a biodiversidade em terras agrícolas, incluindo borboletas, aves agrícolas e características paisagísticas de alta diversidade.
- Restaurar áreas húmidas drenadas.
- Promover florestas mais saudáveis com maior biodiversidade.
- Alcançar pelo menos 25.000 km de rios em estado livre até 2030.
- Restaurar pradarias de ervas marinhas e fundos marinhos.

O RESTAURO DOS HABITATS VAI PERMITIR:

NÚMEROS IMPORTANTES

Mais de 75% das culturas alimentares globais dependem de polinizadores

40% do solo do mundo está degradado. Os custos associados à degradação do solo na União Europeia já ultrapassam 50 mil milhões de euros por ano.

Os sistemas alimentares globais são responsáveis por 80% da desflorestação.

Os sistemas alimentares globais são responsáveis por 70% do uso de água doce e são a principal causa de perda de biodiversidade terrestre.

TERRA

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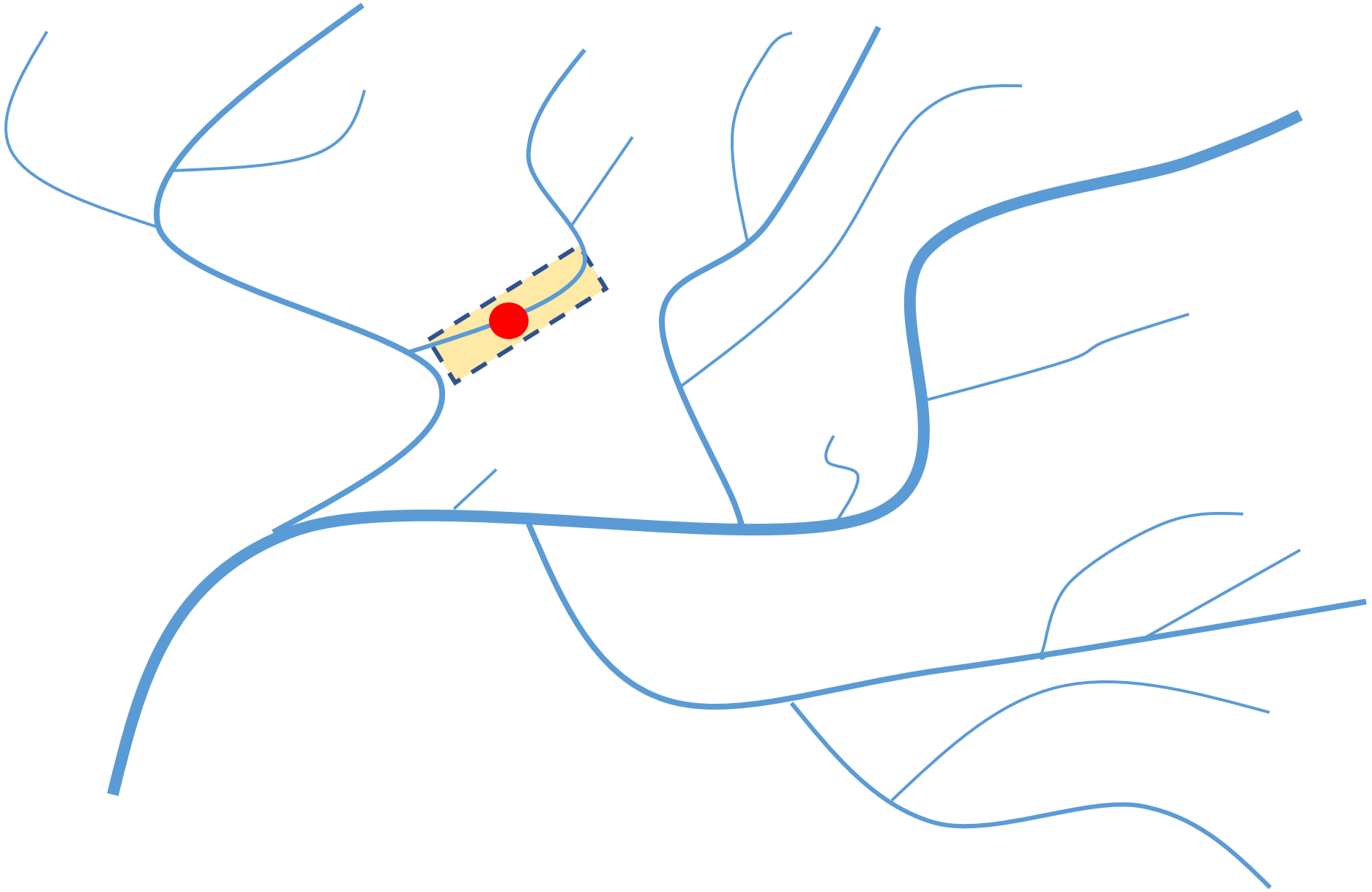
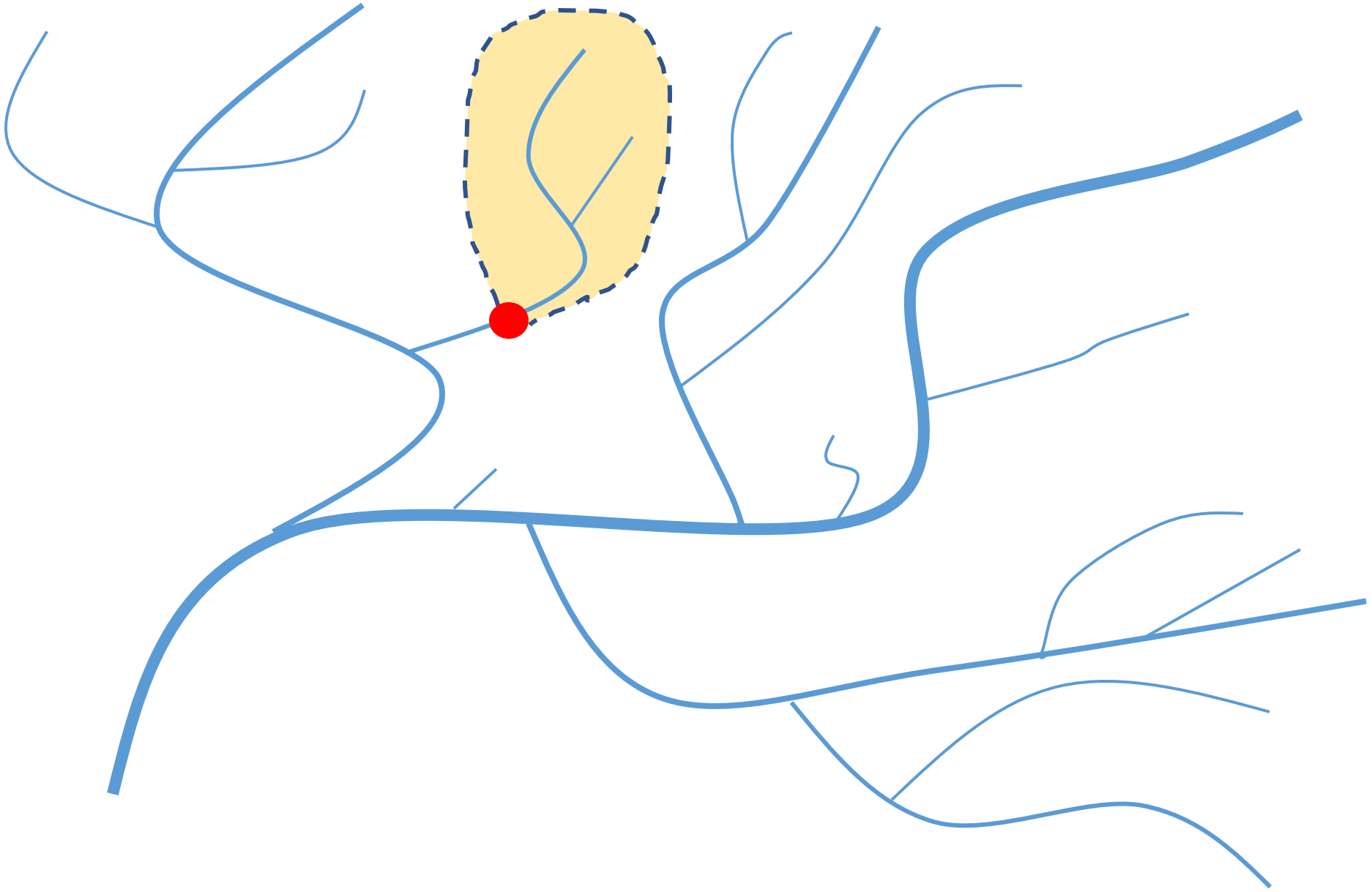
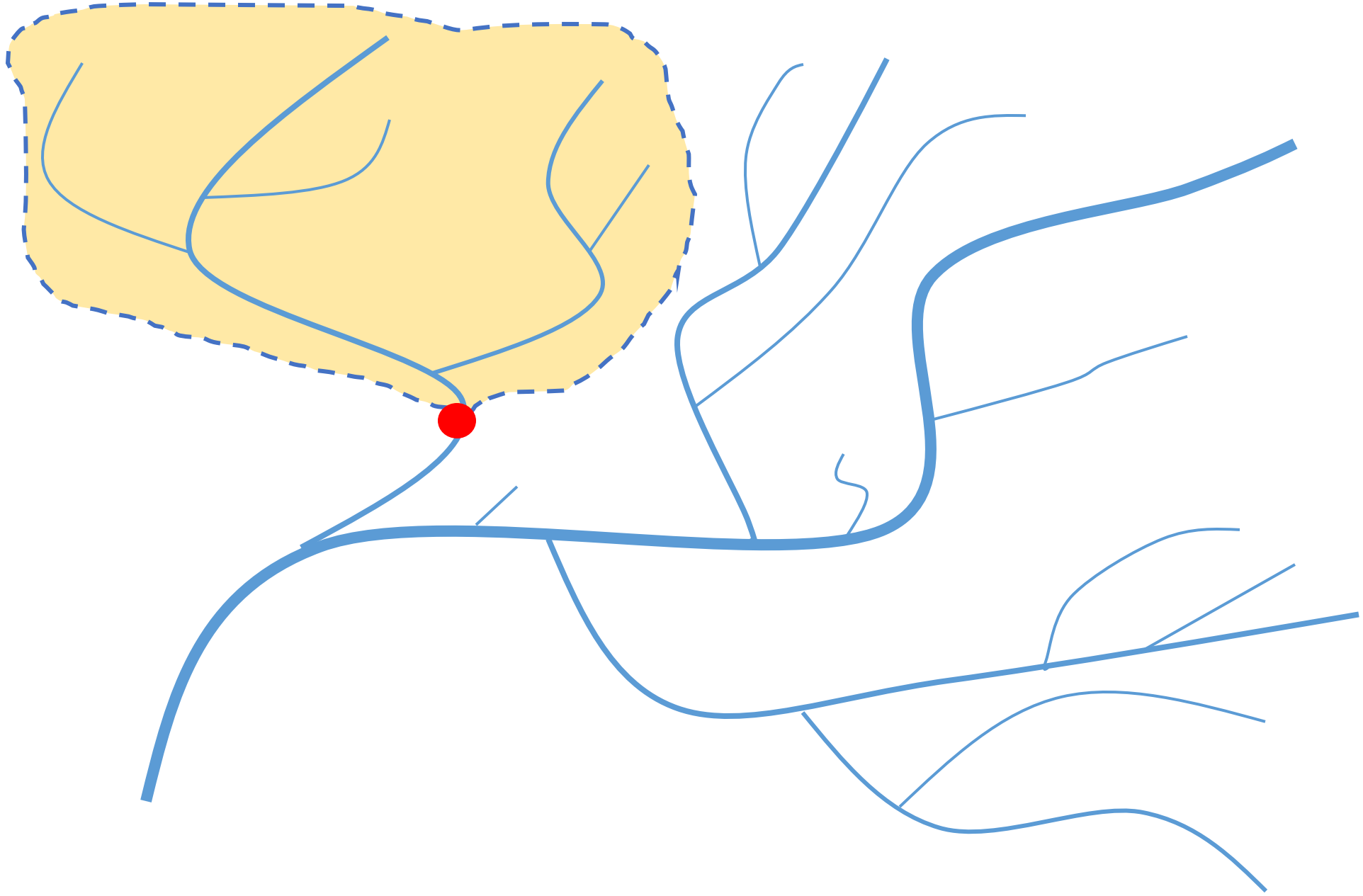
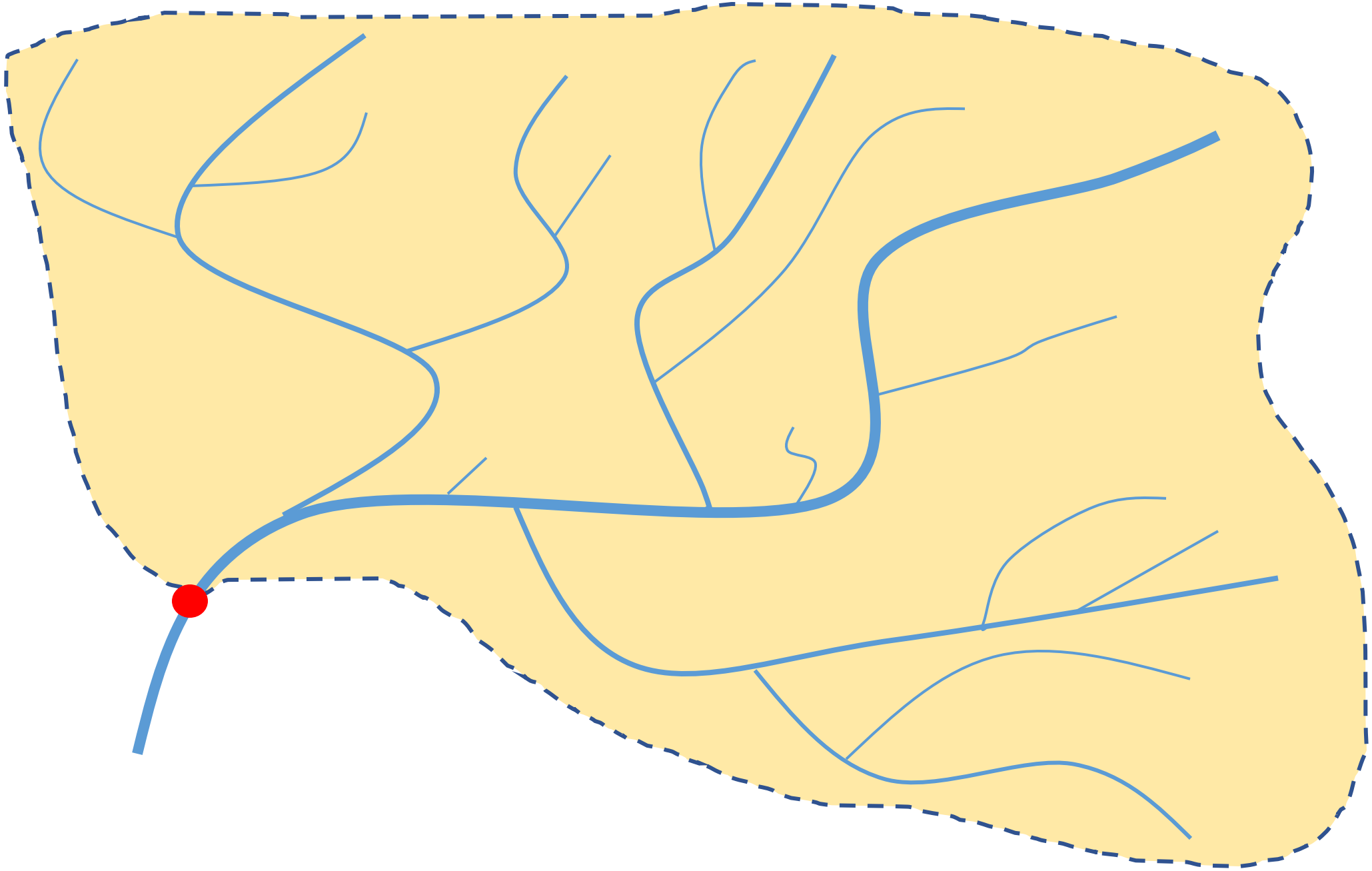
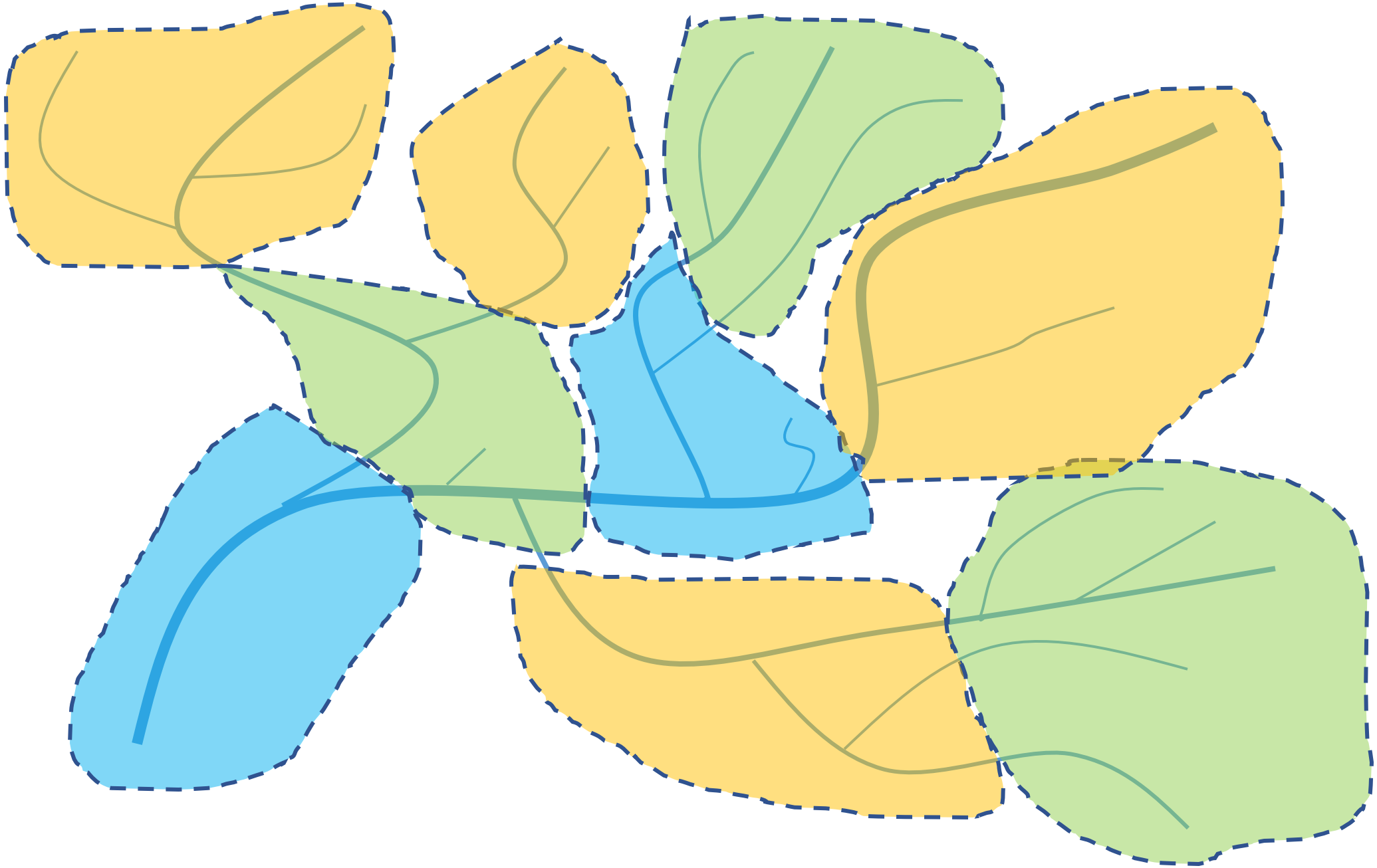
Necessidades e potencial de restauro de sistemas de água doce na Europa

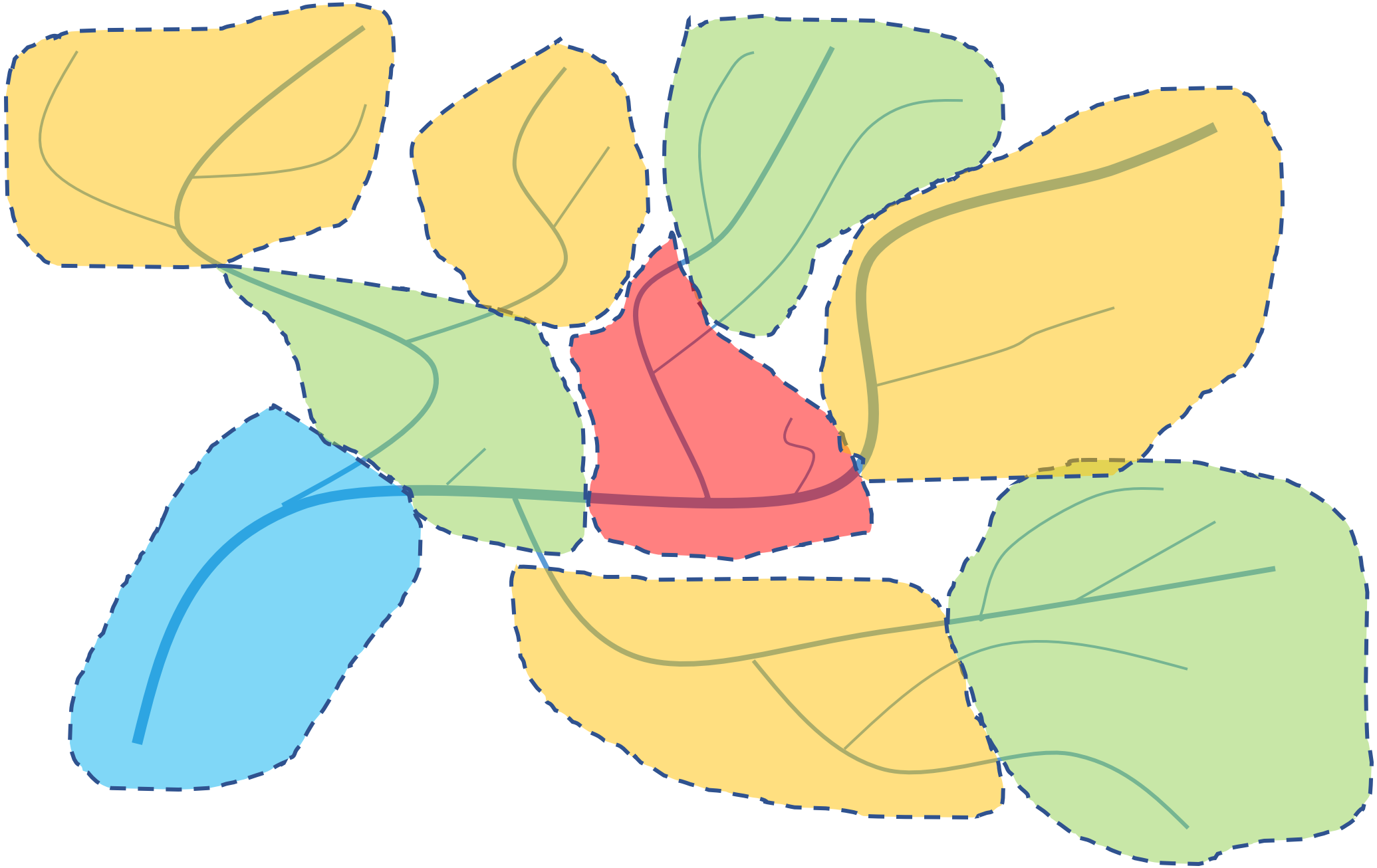


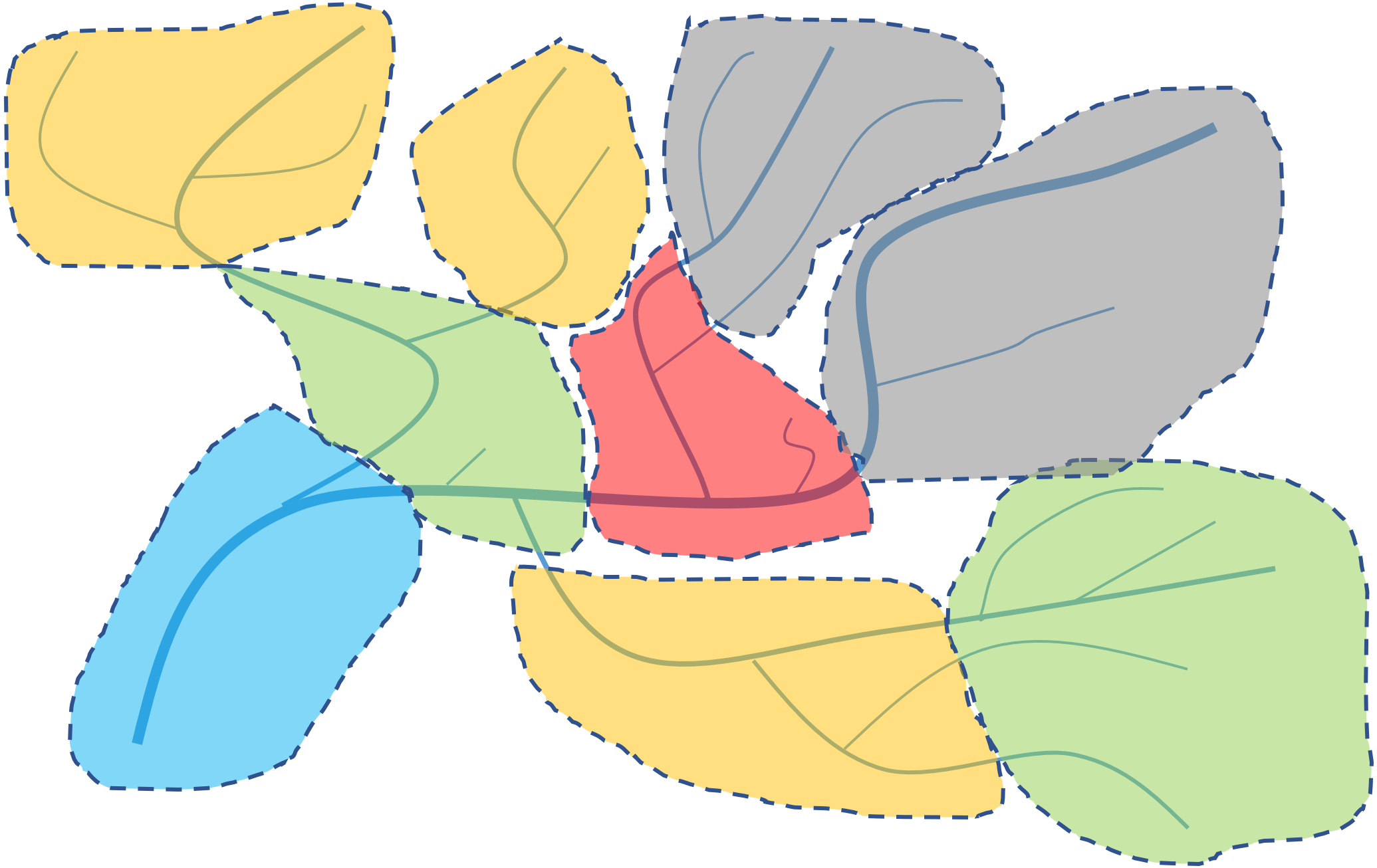


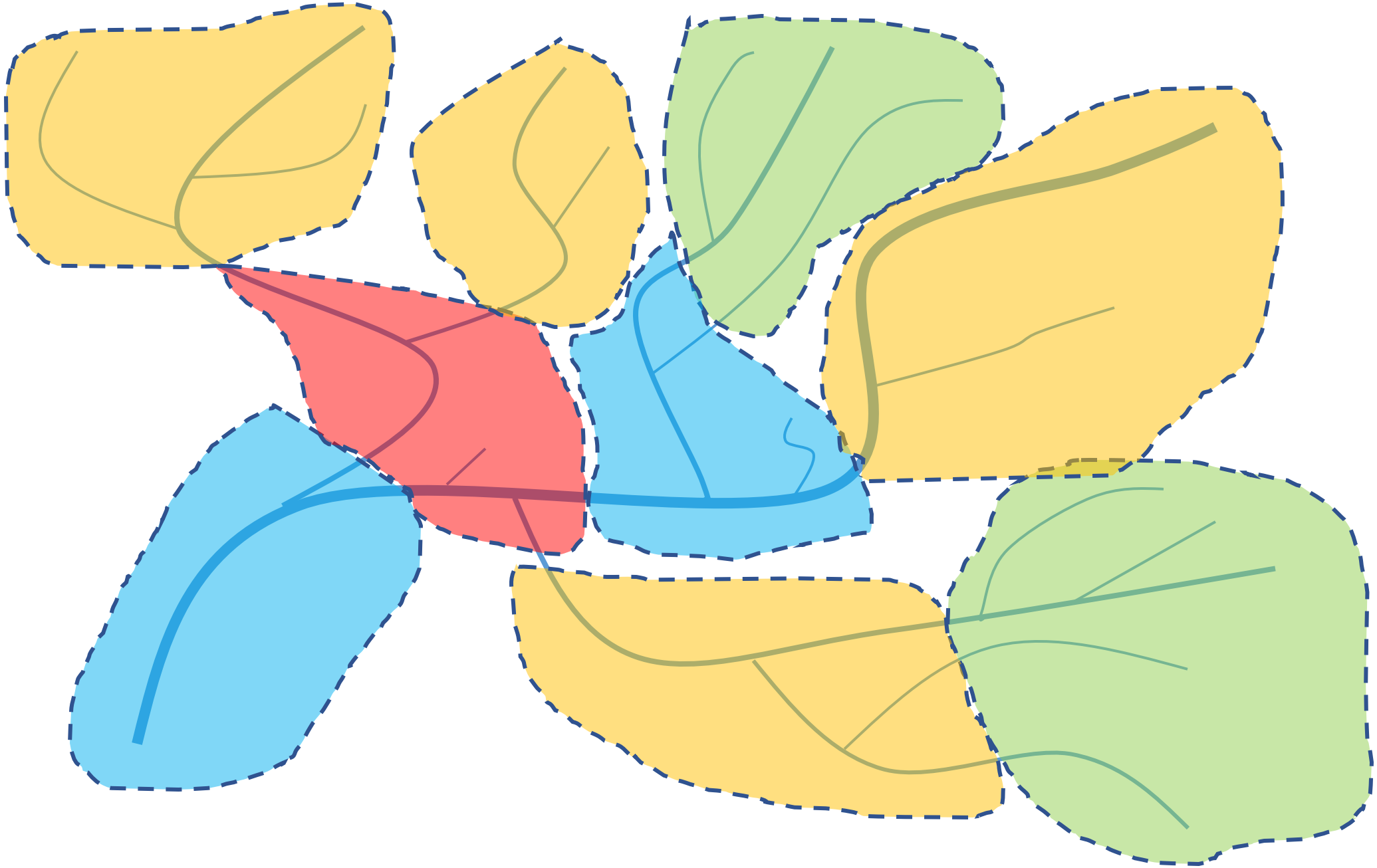


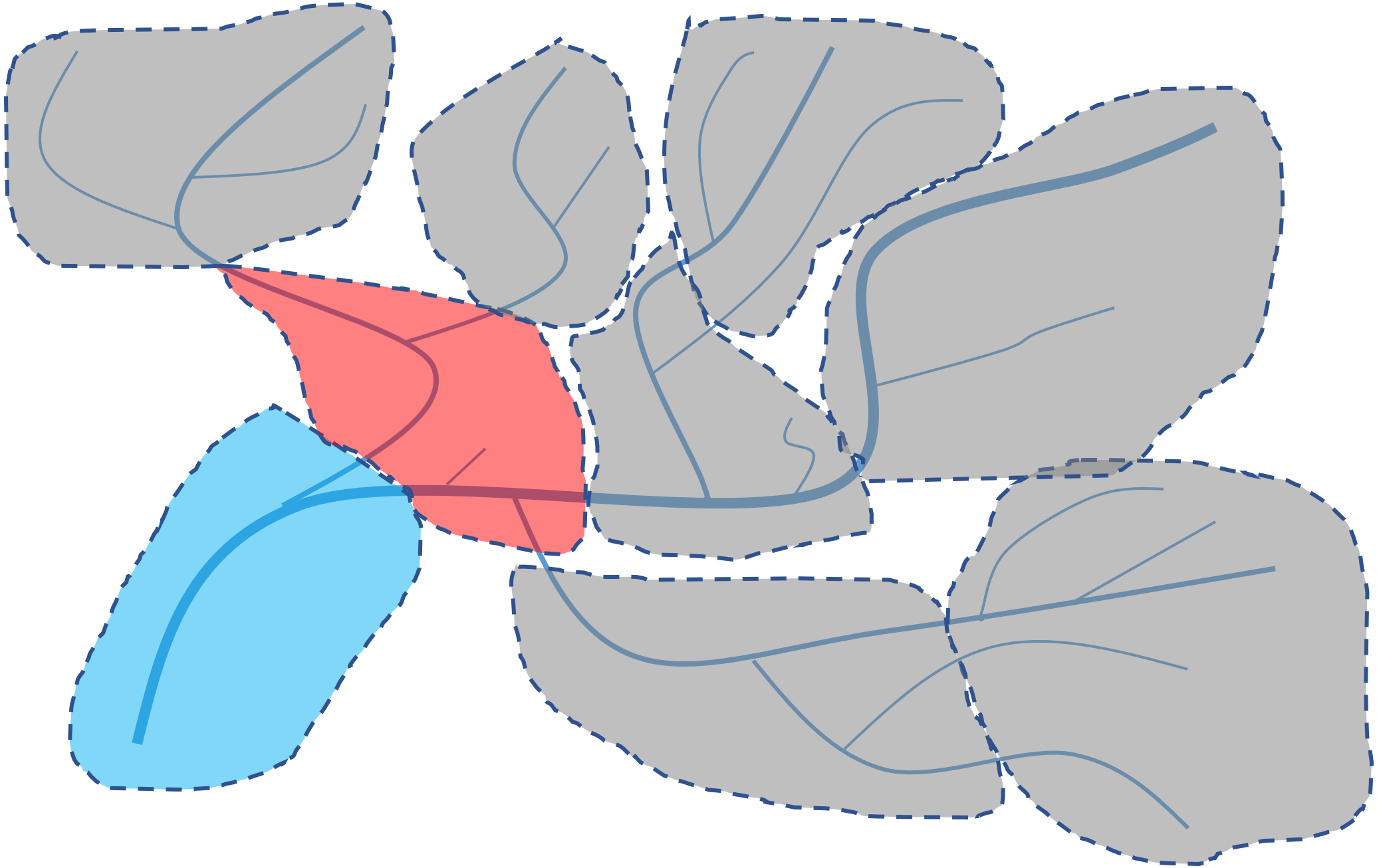


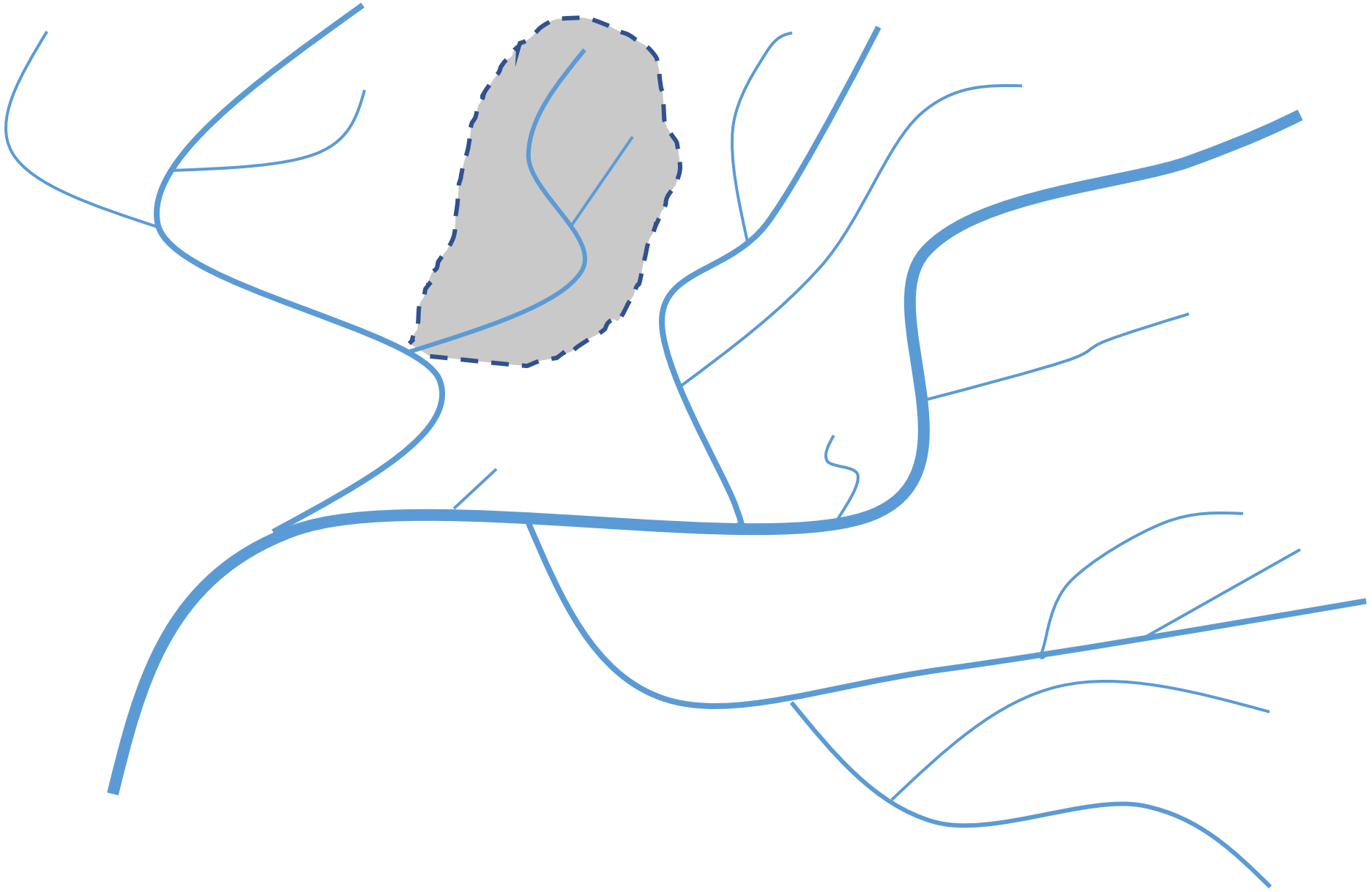


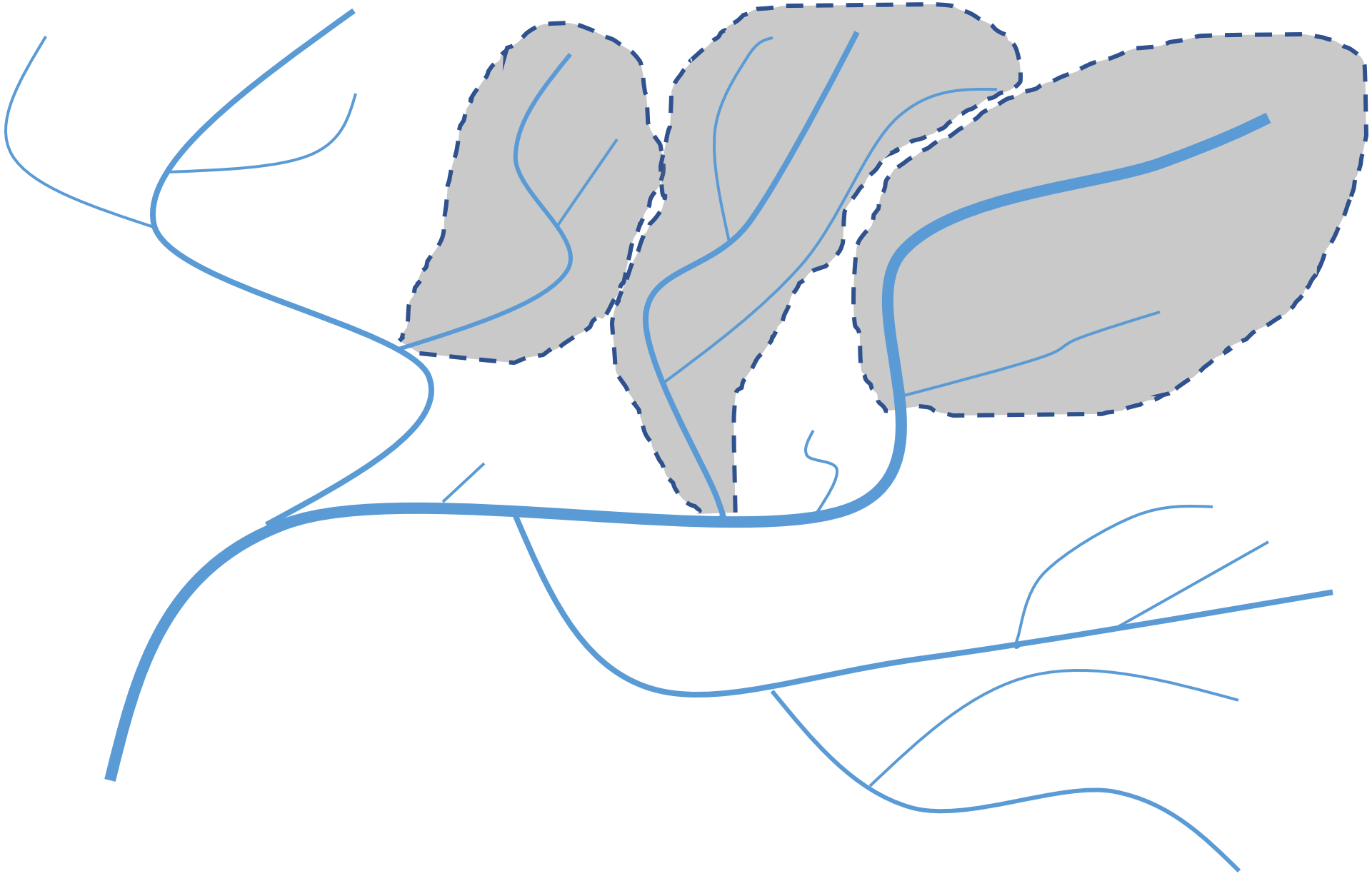


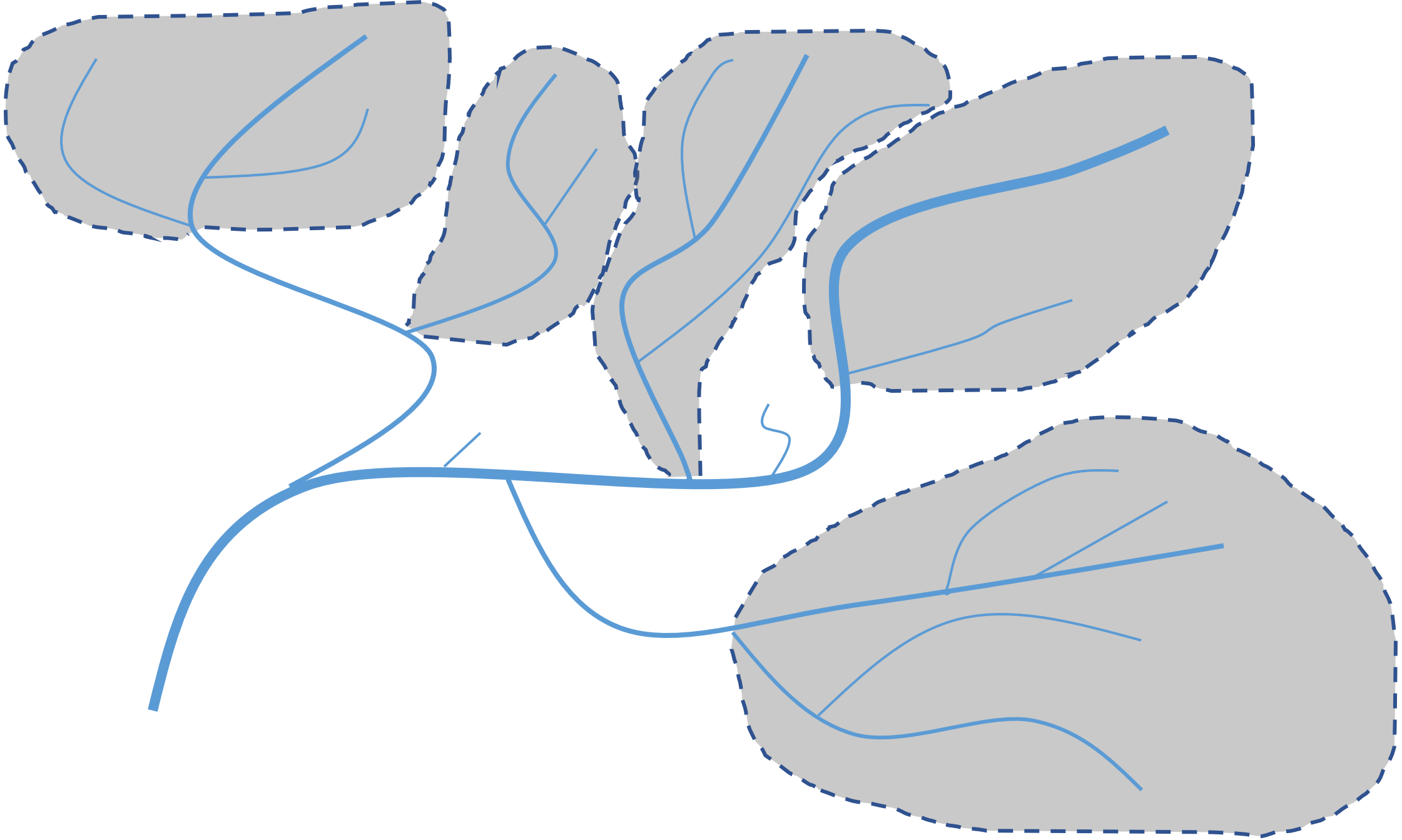


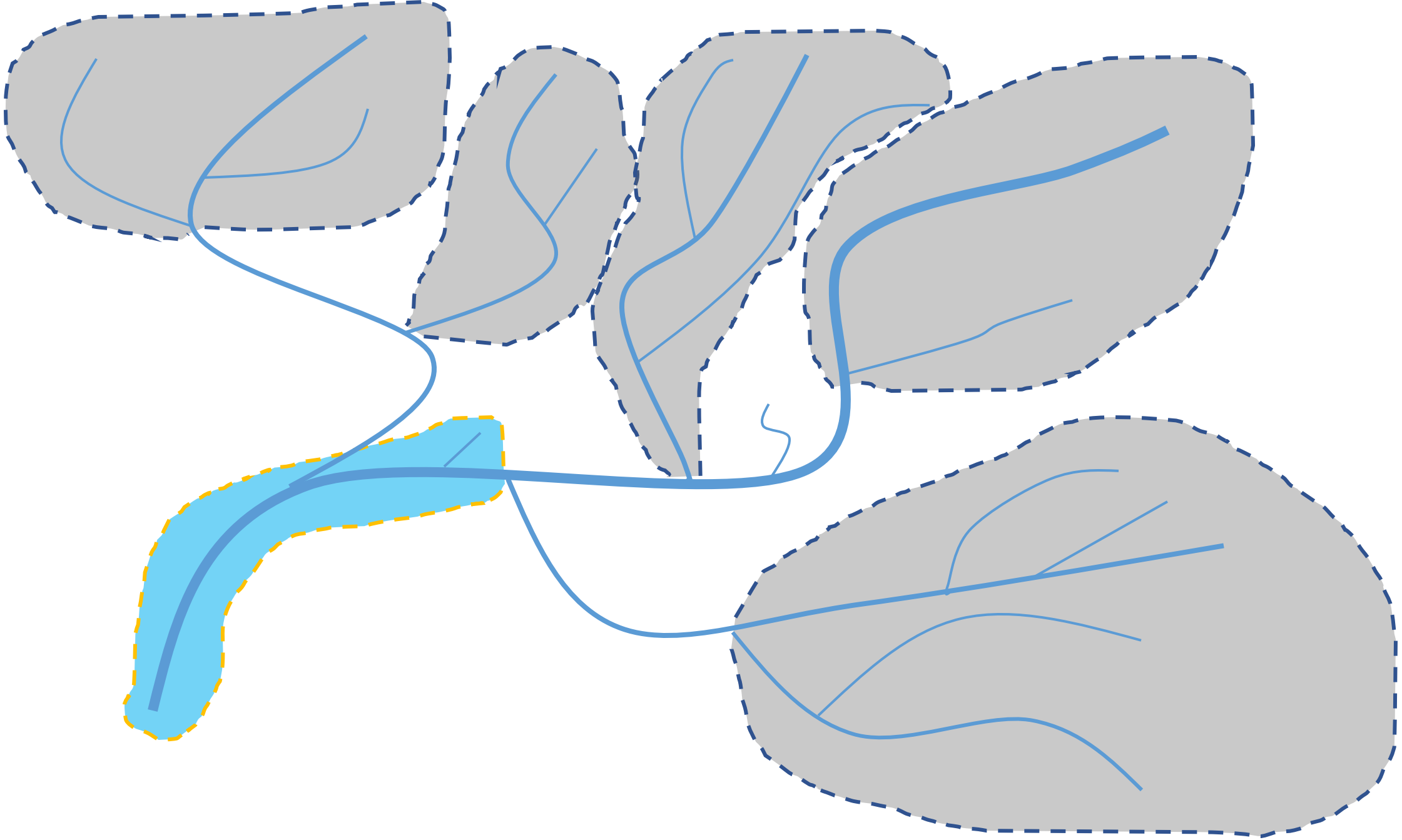


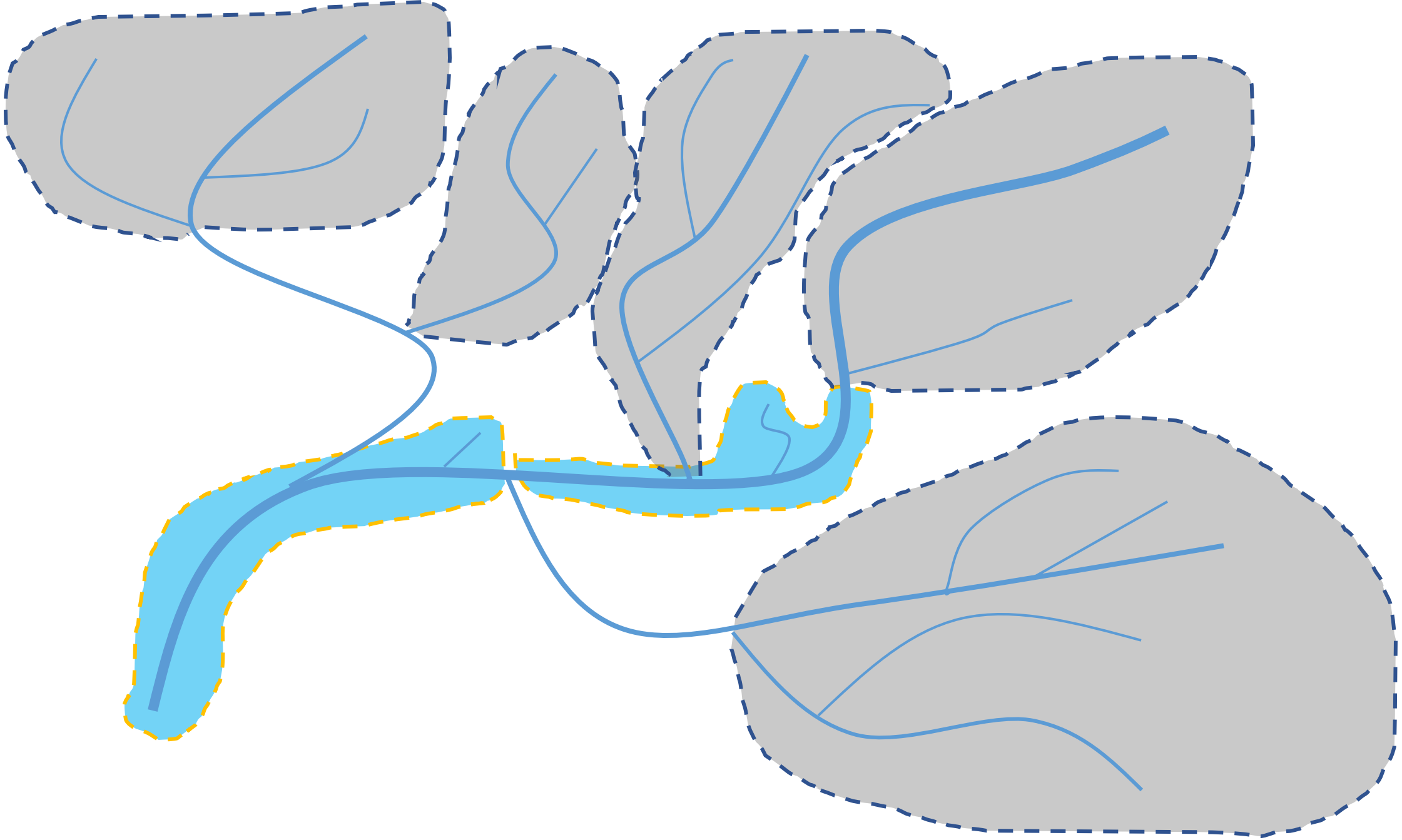


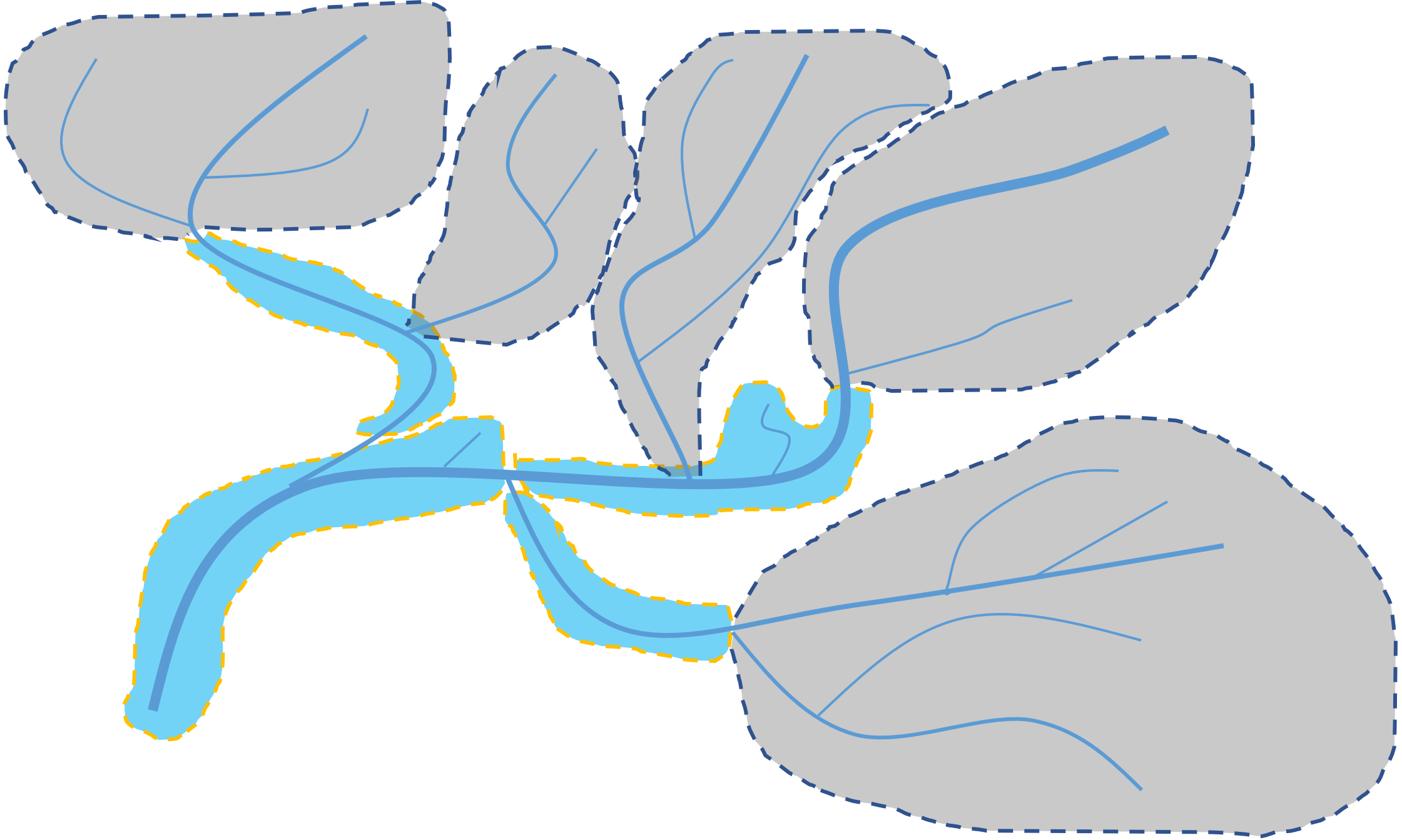


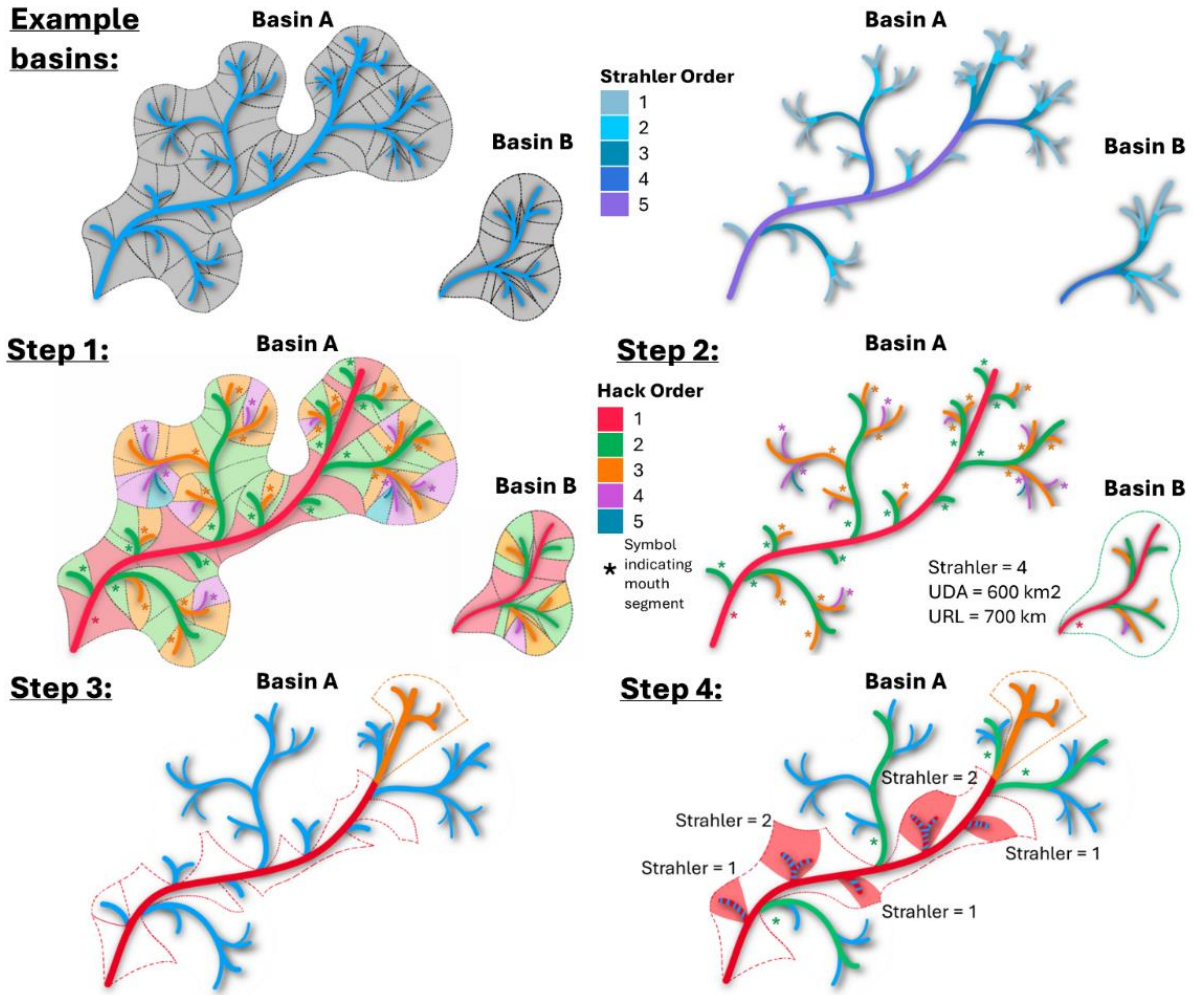


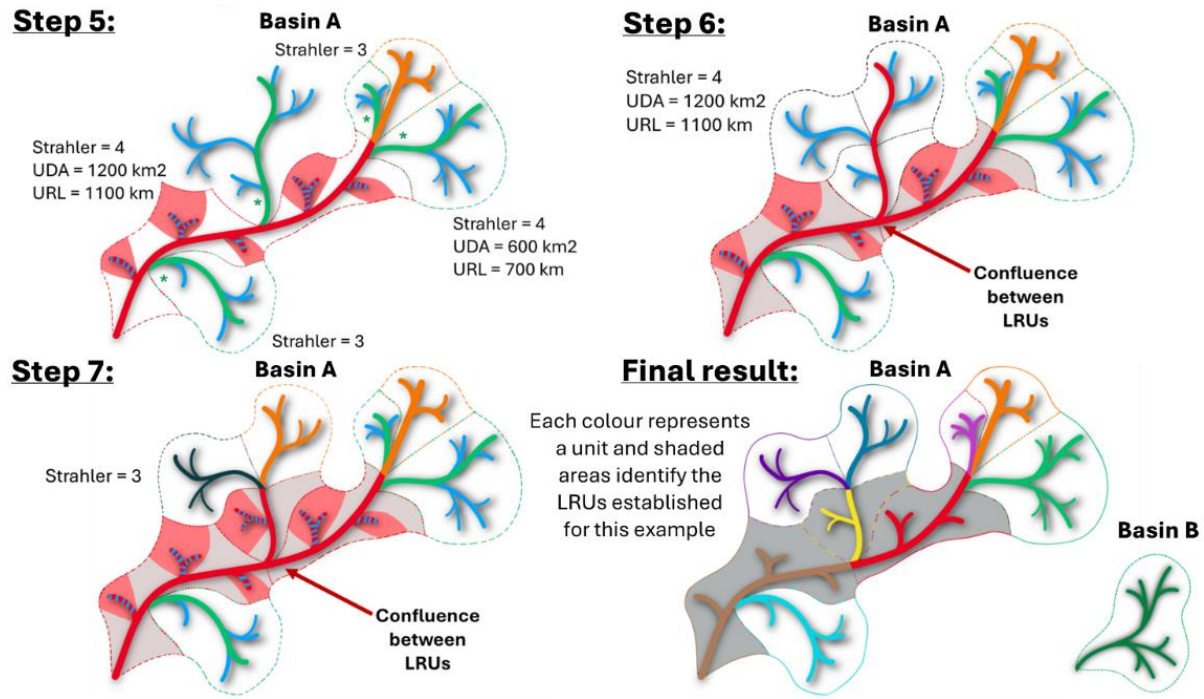









Example basins:
Basin A
Basin B
Strahler Order
1
2
3
4
5
Step 1:
Basin A
Basin B
Step 2:
Basin A
Hack Order
1
2
3
4
5
* Symbol indicating mouth segment
Basin B
Strahler = 4
UDA = 600 km2
URL = 700 km
Step 3:
Basin A
Step 4:
Basin A
Strahler = 2
Strahler = 2
Strahler = 1
Strahler = 1
Strahler = 1


Step 5:
Basin A
Strahler = 3
Strahler = 4
UDA = 1200 km2
URL = 1100 km
Strahler = 4
UDA = 600 km2
URL = 700 km
Strahler = 3
Step 6:
Basin A
Strahler = 4
UDA = 1200 km2
URL = 1100 km
Confluence between LRUs
Step 7:
Basin A
Strahler = 3
Confluence between LRUs
Final result:
Basin A
Each colour represents a unit and shaded areas identify the LRUs established for this example
Basin B

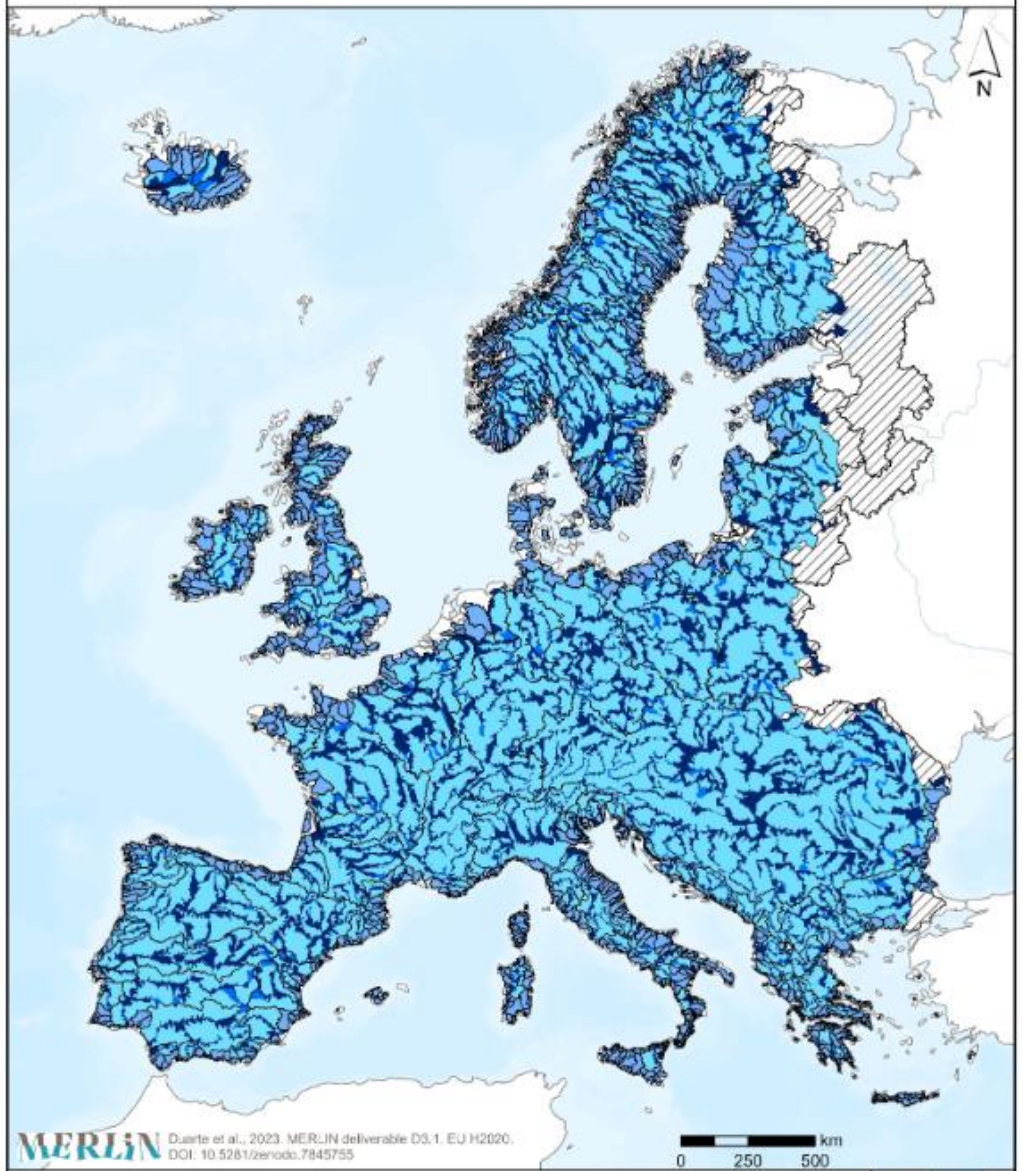
In Prep

R2U

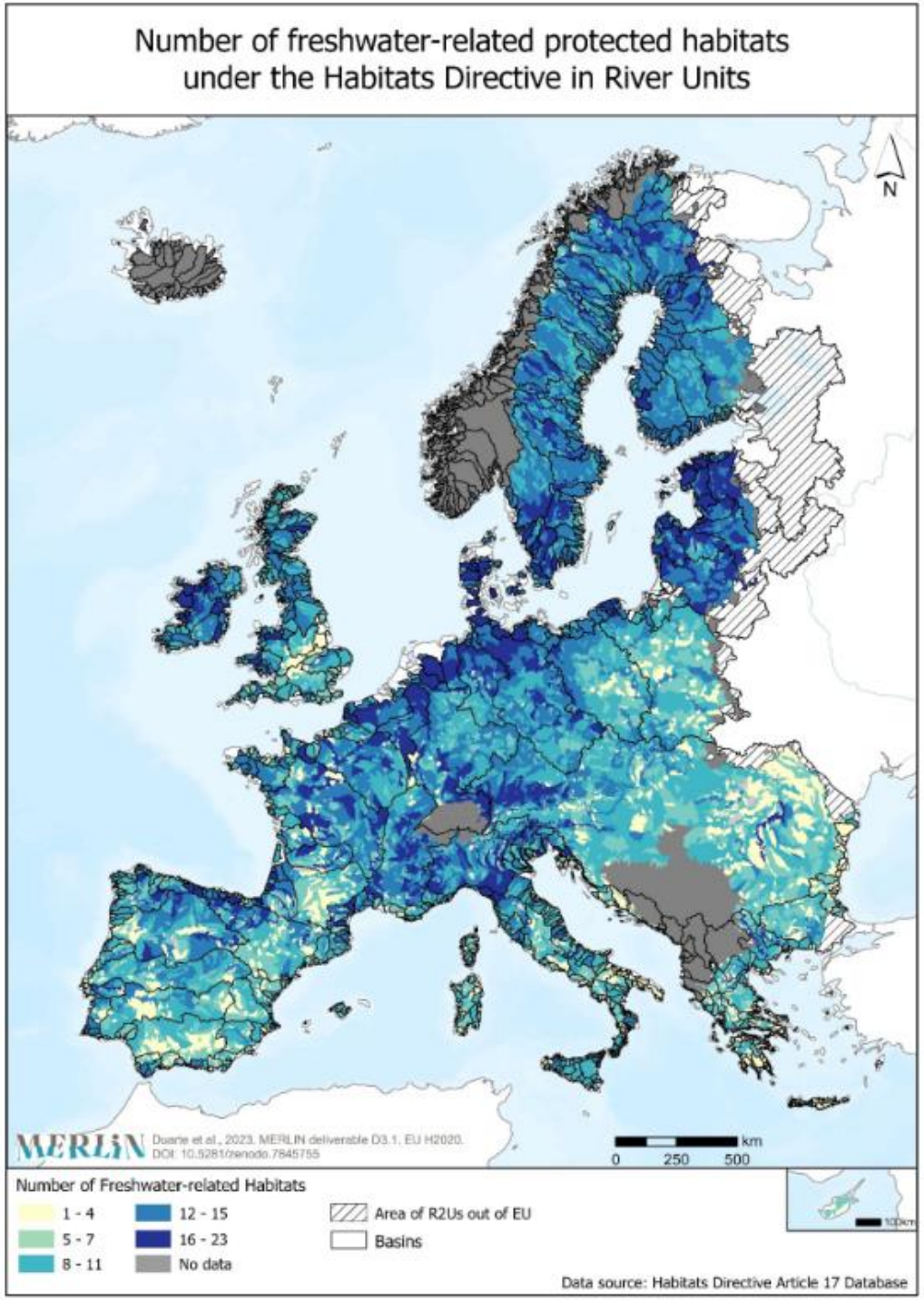
River
Restoration
Unit

Necessidades e potencial de restauro de sistemas de água doce na Europa

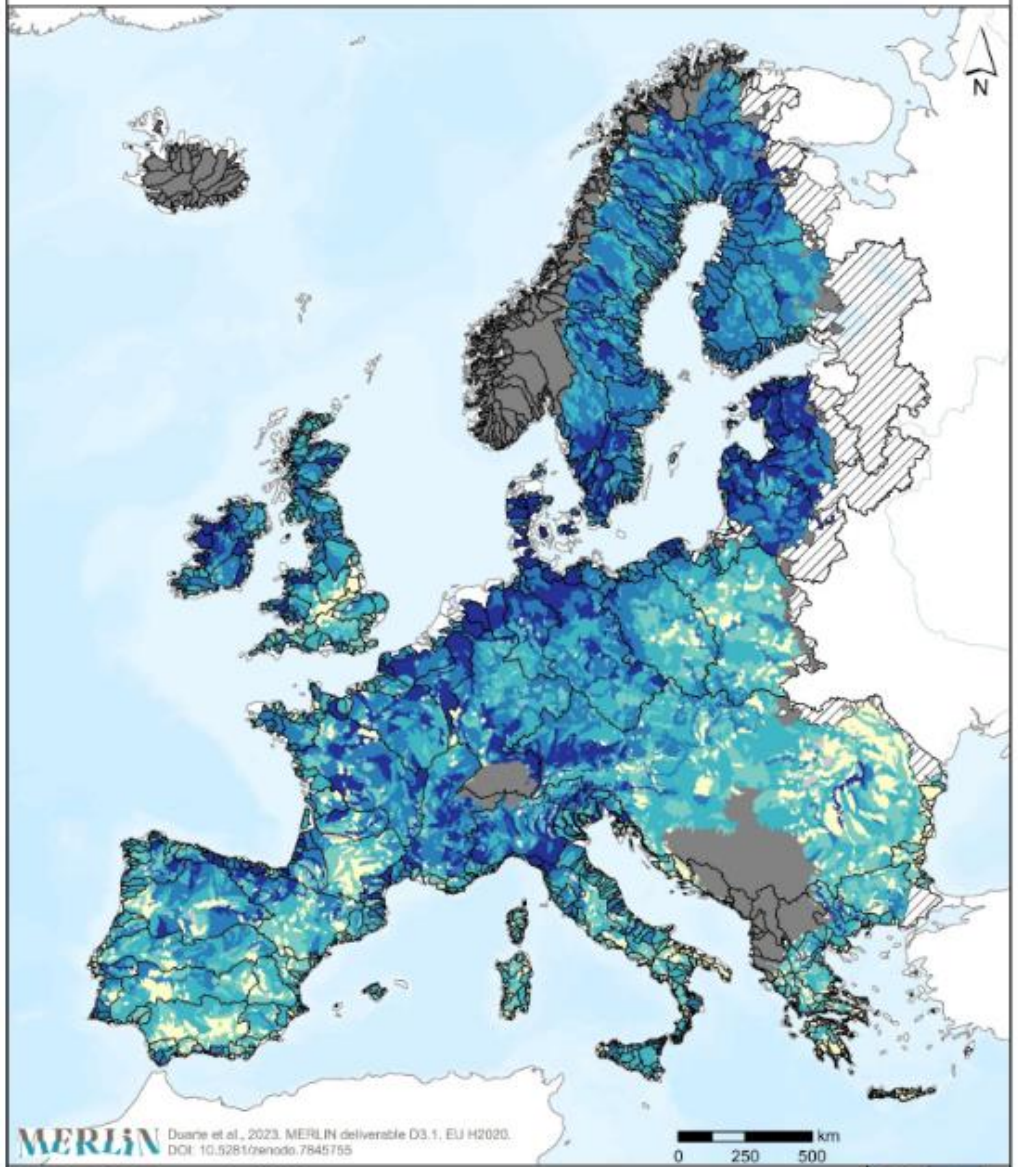
Typology of River Restoration Units



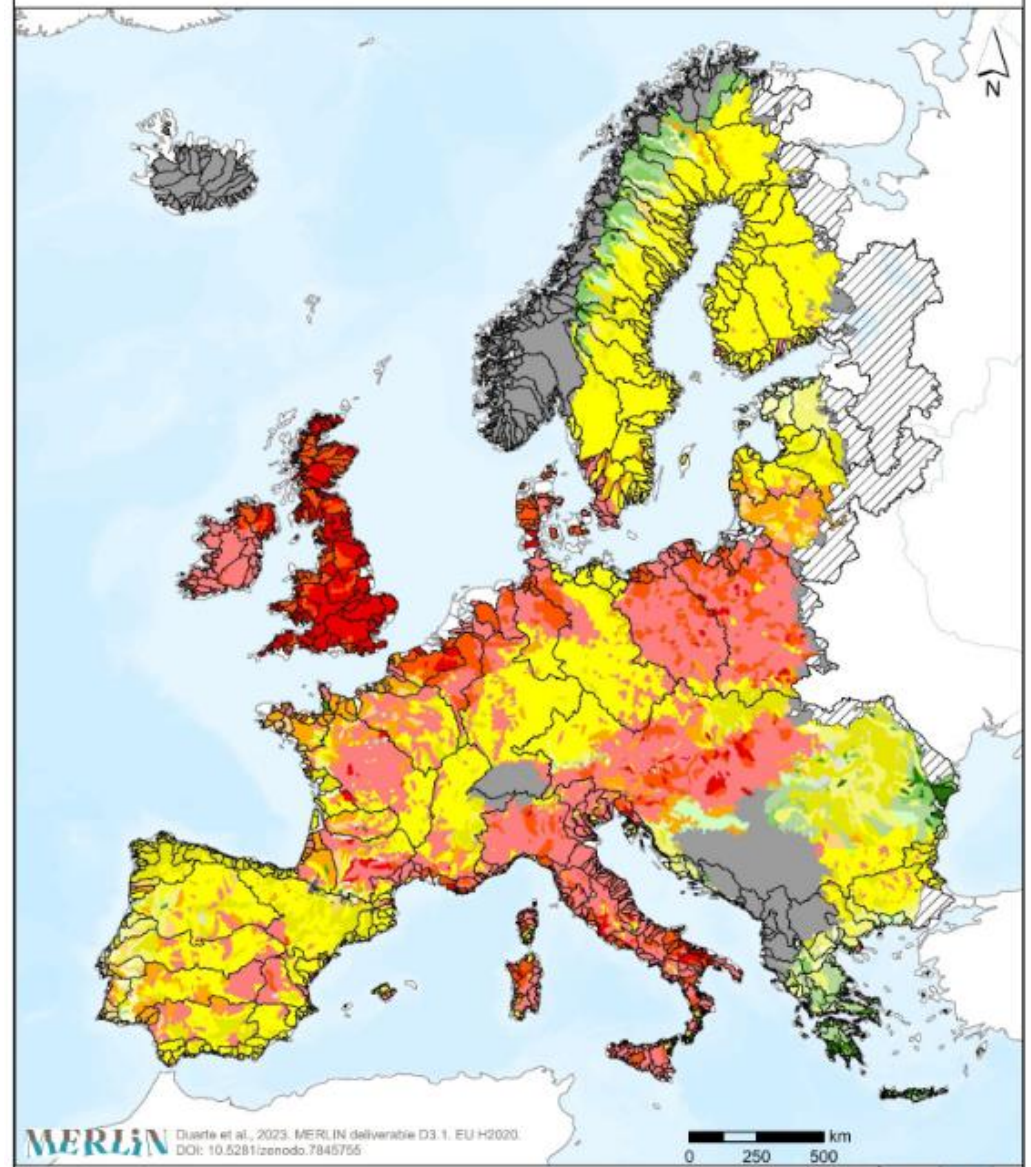
Data source: De Jager, Alfred; Vogt, Jürgen (2007): Rivers and Catchments of Europe - Catchment Characterisation Model (CCM). EC, JRC [Dataset]

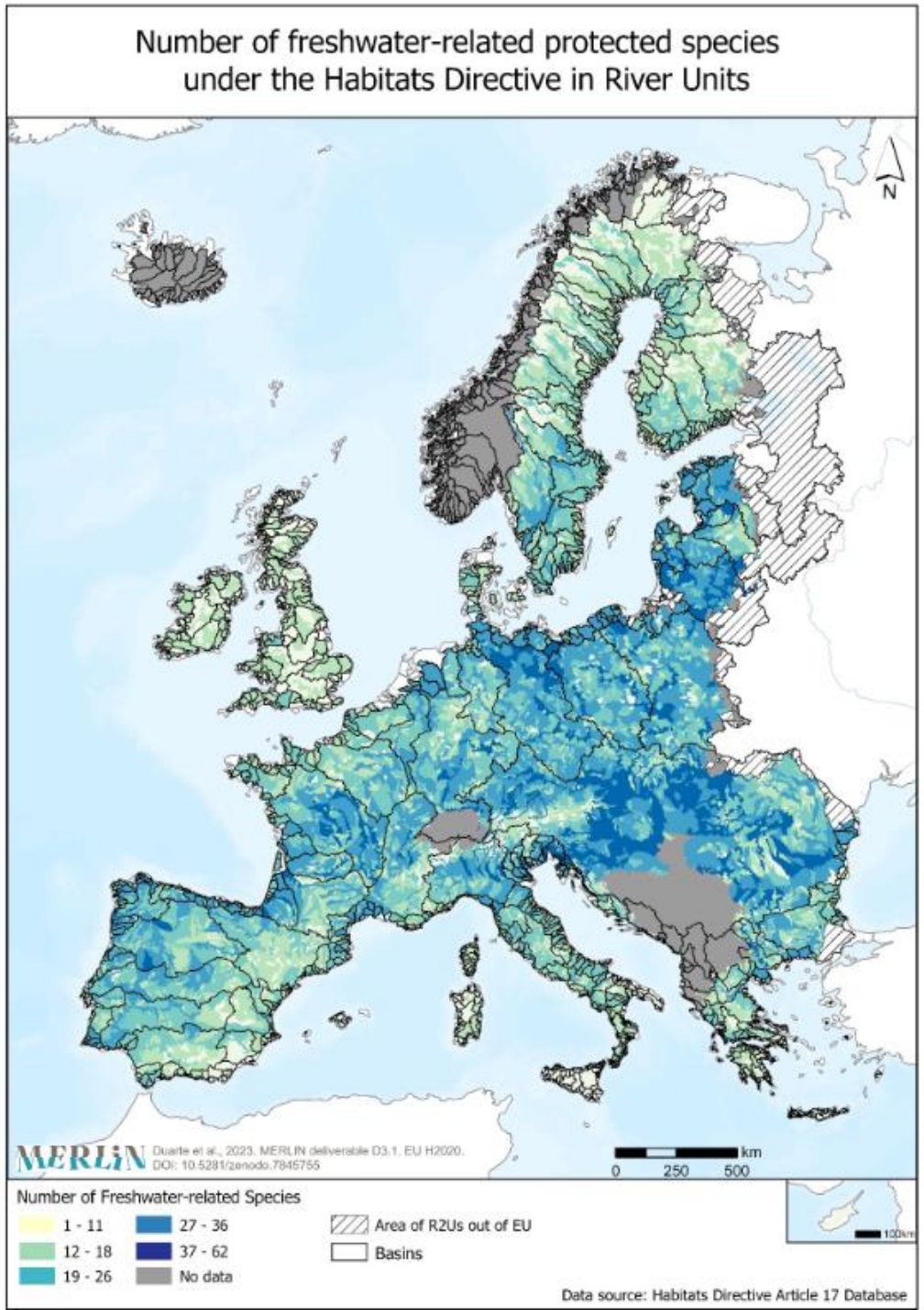

Number of freshwater-related protected habitats
under the Habitats Directive in River Units
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0
250
500
Number of Freshwater-related Habitats
1 - 4
5 - 7
8 - 11
12 - 15
16 - 23
No data
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database

Number of freshwater-related protected habitats under the Habitats Directive in River Units

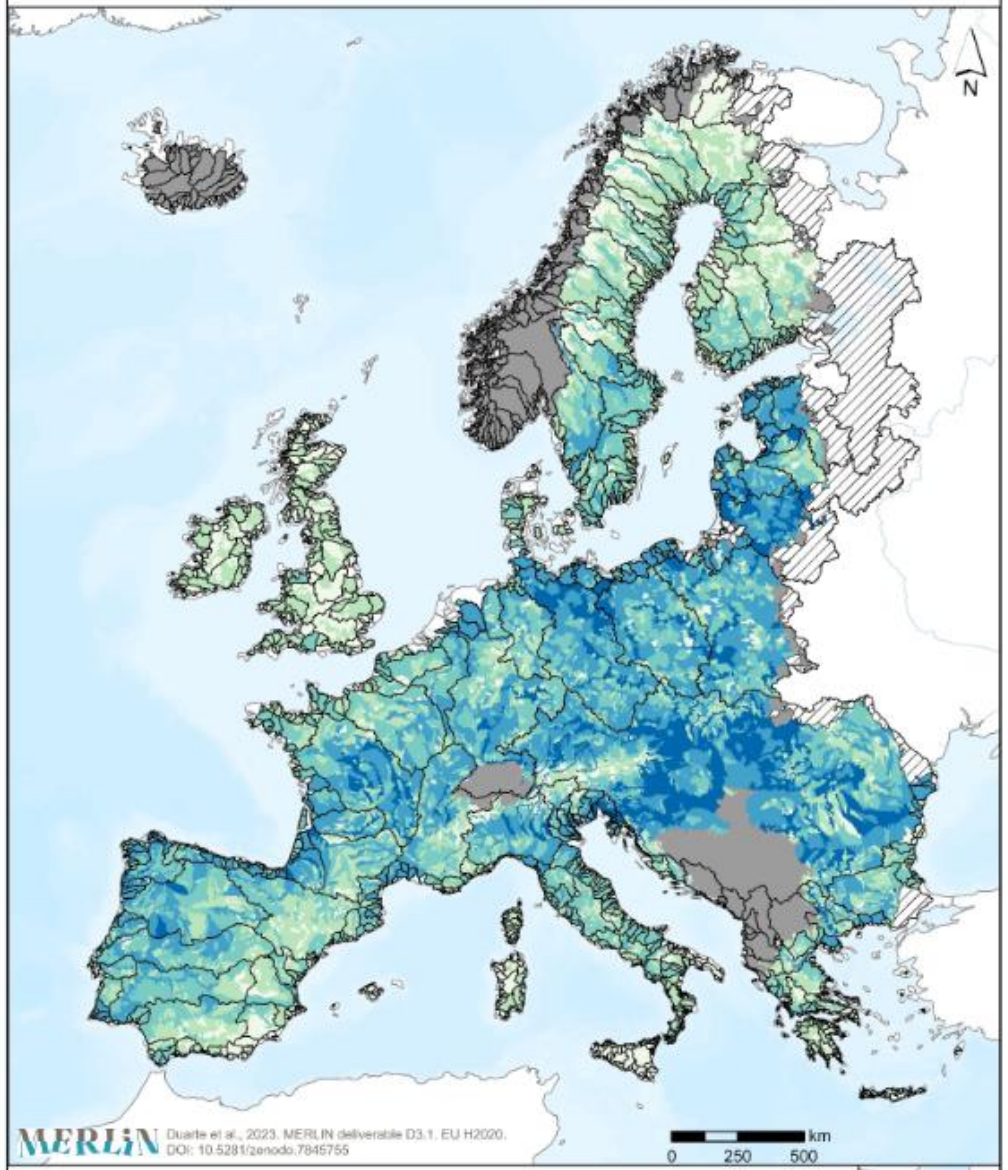


Detailed composite indicator of conservation status for freshwater-related habitats in River Units

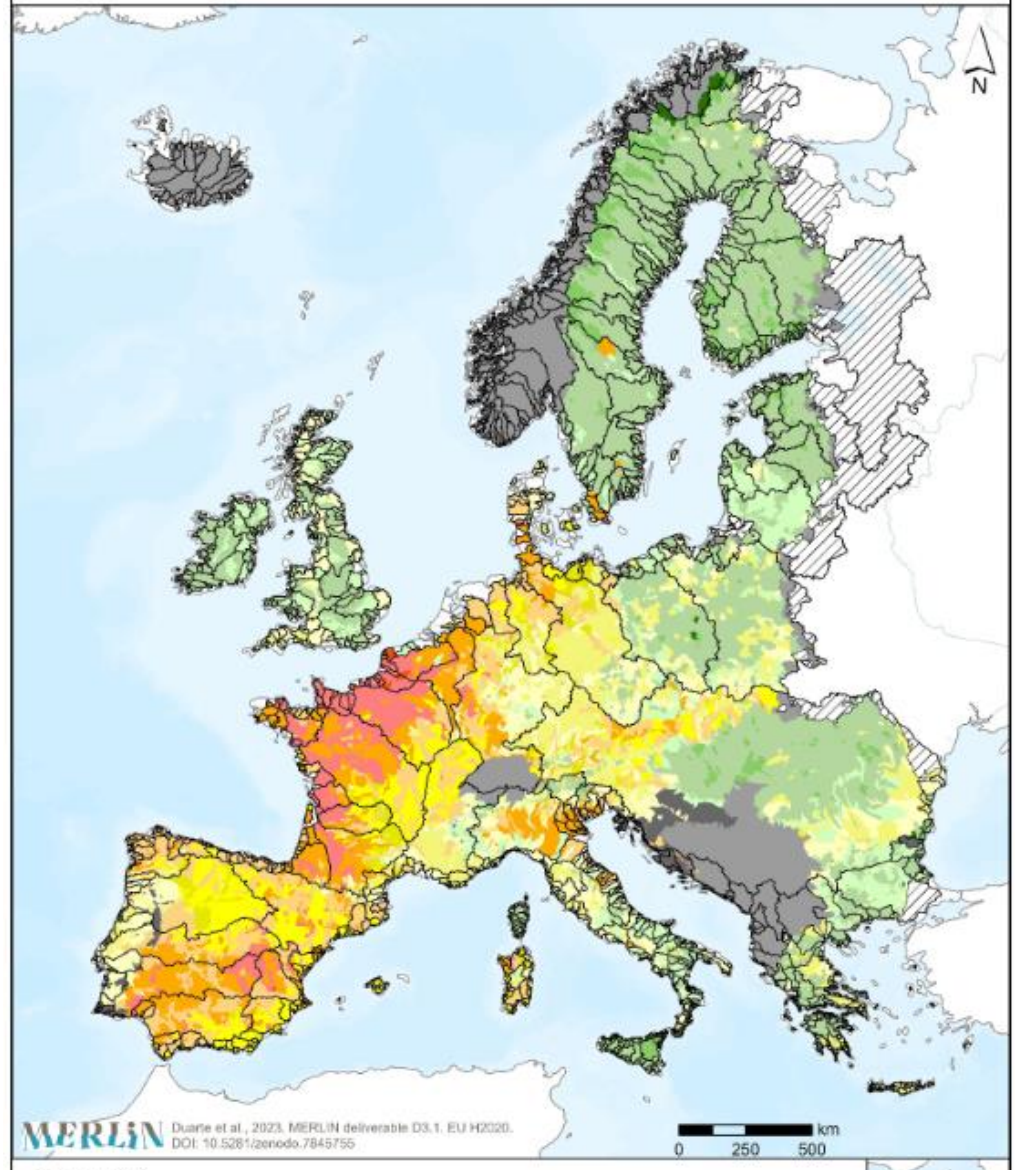


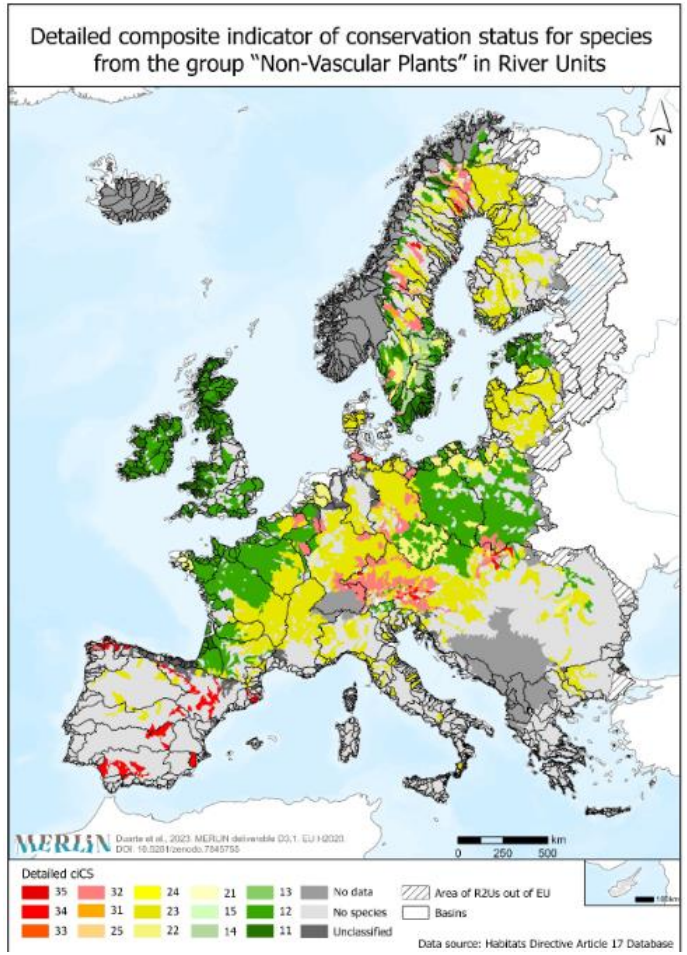

Number of freshwater-related protected species
under the Habitats Directive in River Units
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0
250
500
Number of Freshwater-related Species
1 - 11
12 - 18
19 - 26
27 - 36
37 - 62
No data
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database

Number of freshwater-related protected species under the Habitats Directive in River Units

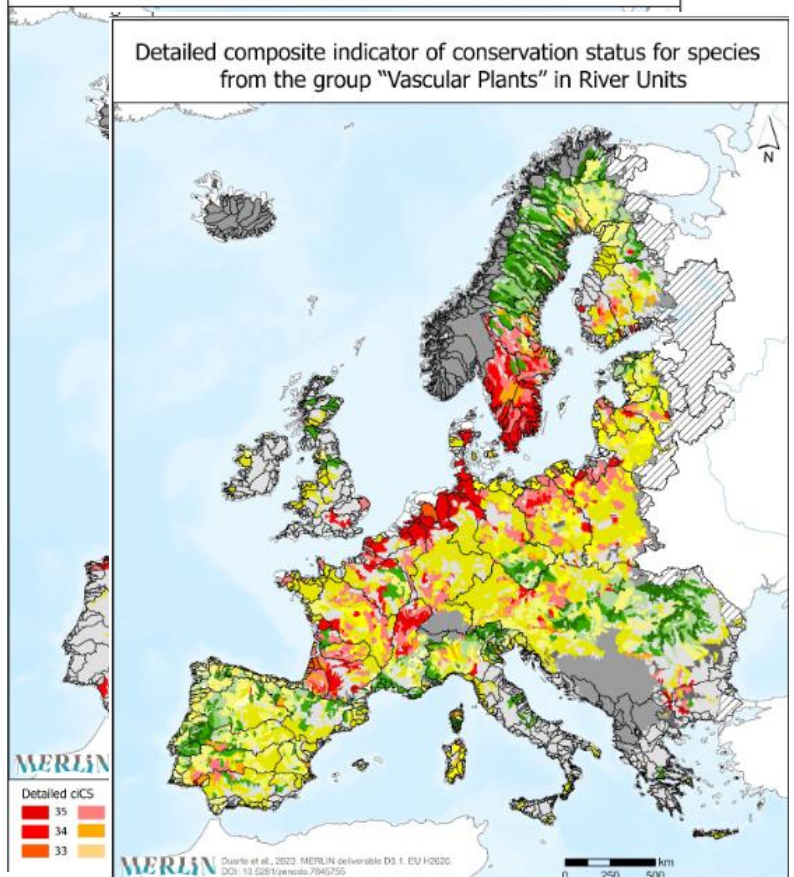


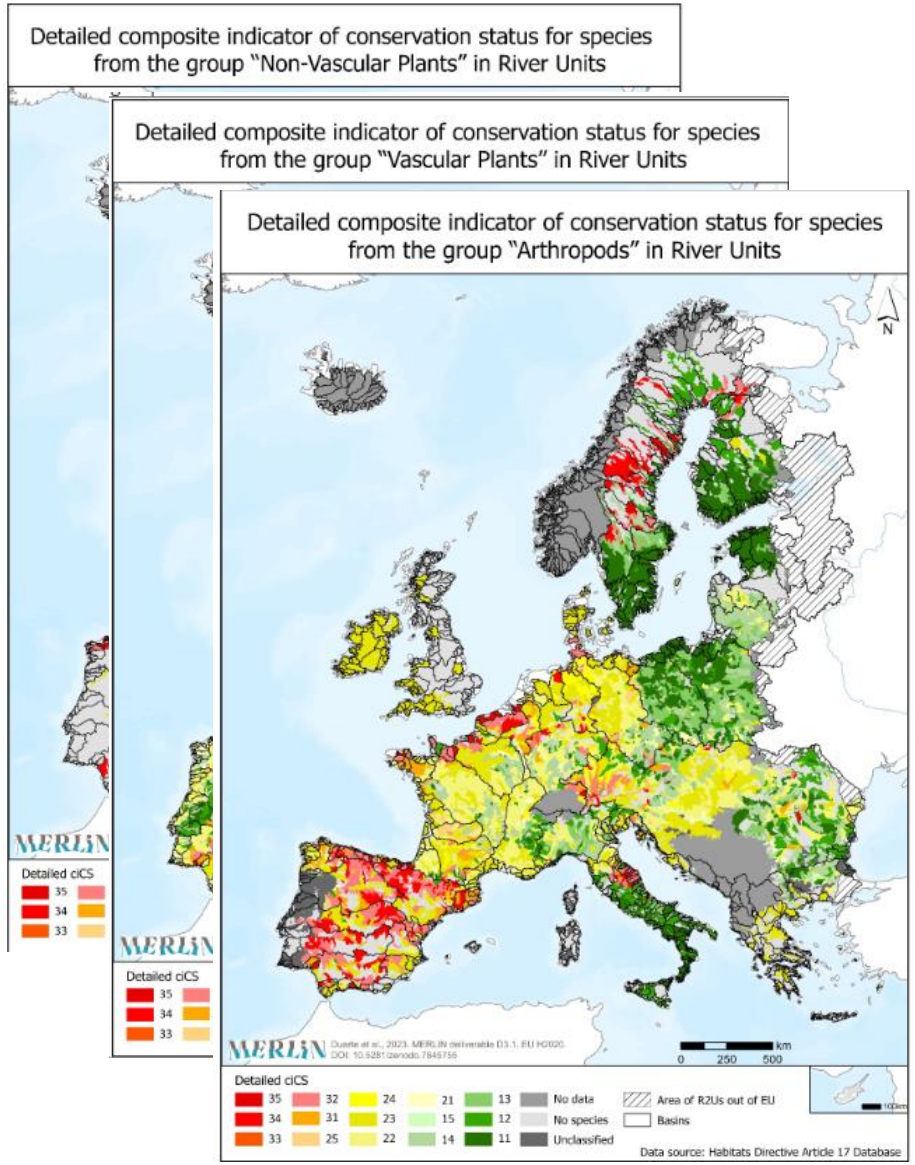
Detailed composite indicator of conservation status for freshwater-related species in River Units

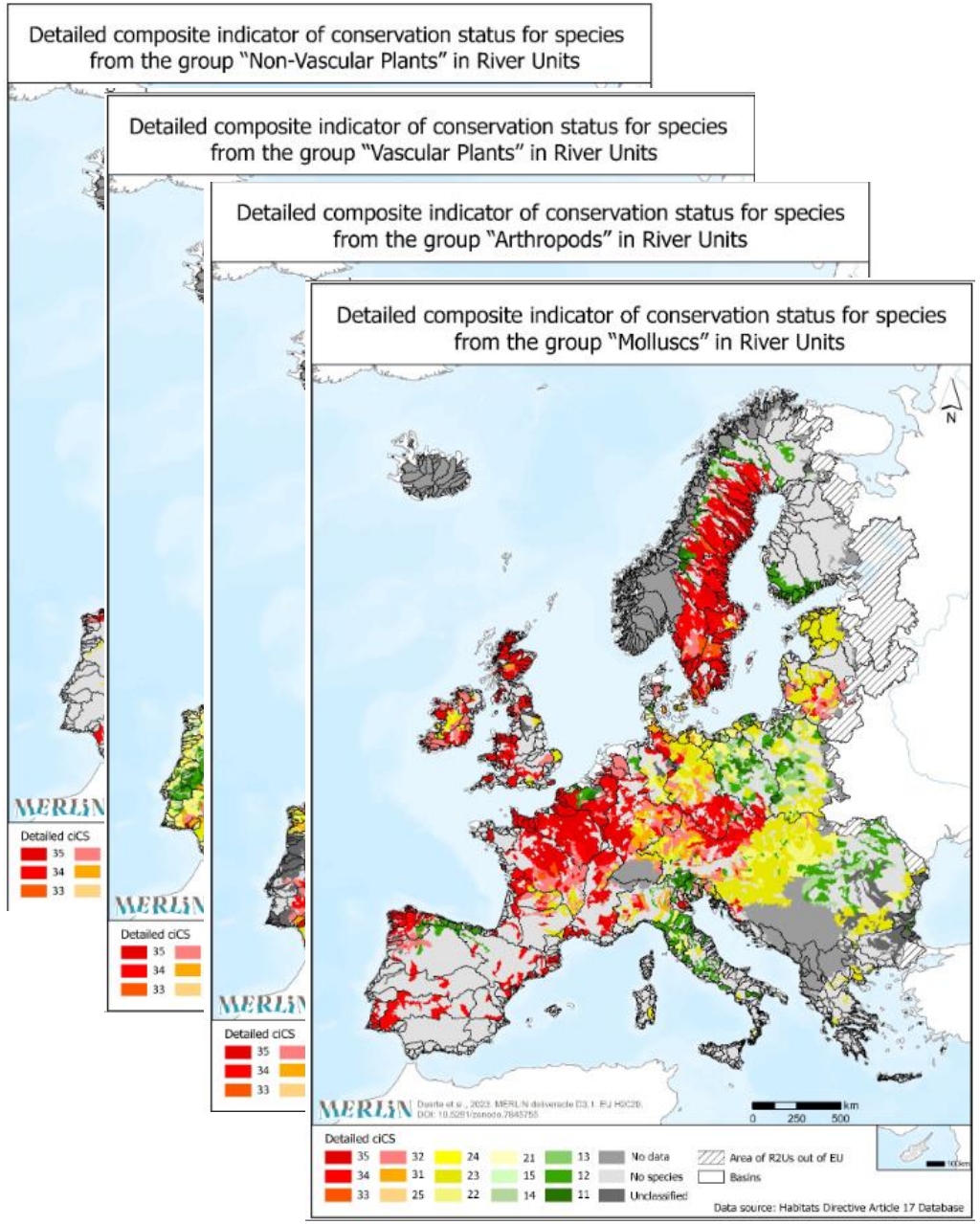


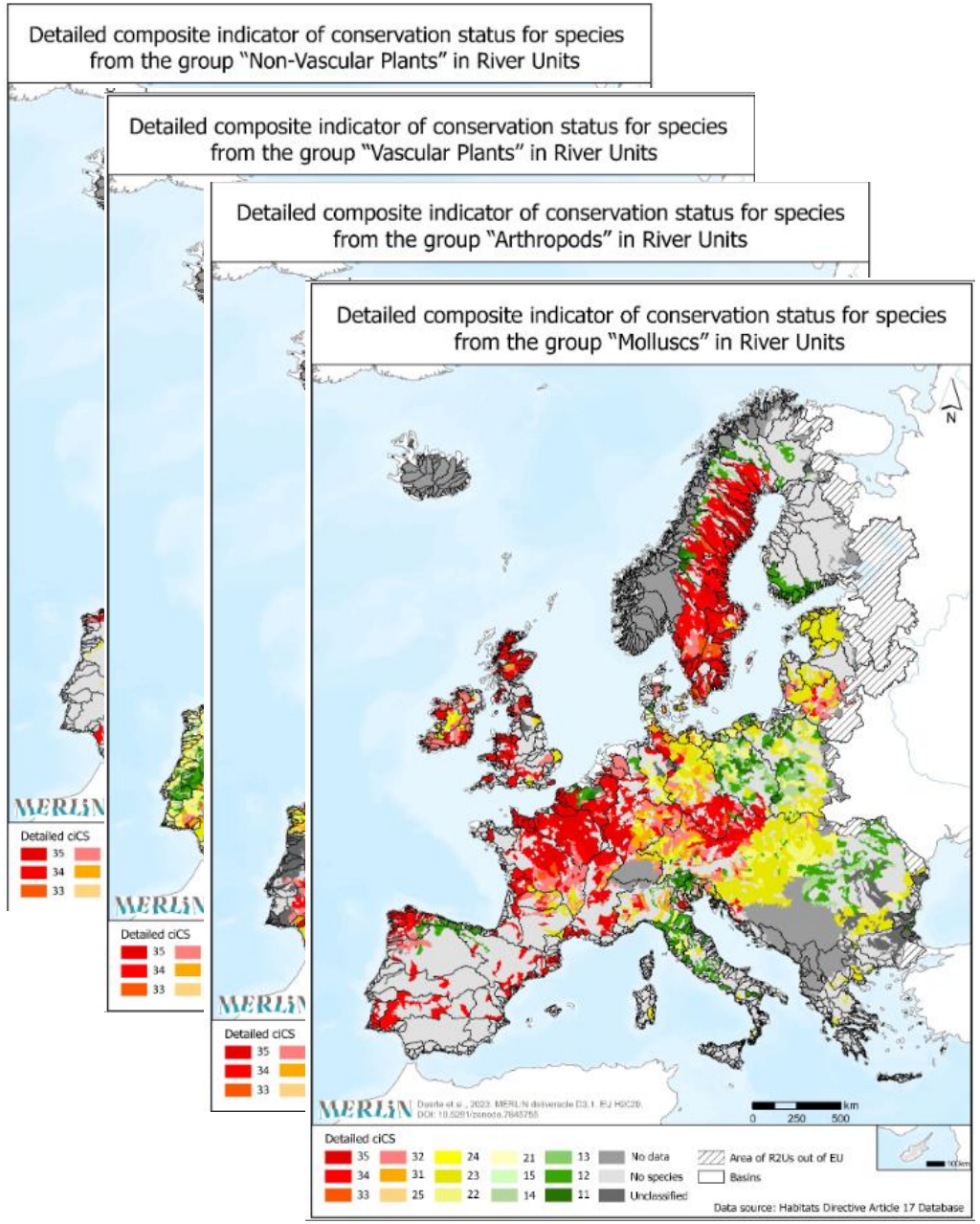

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
N
MERLIN
km
0 250 500
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database

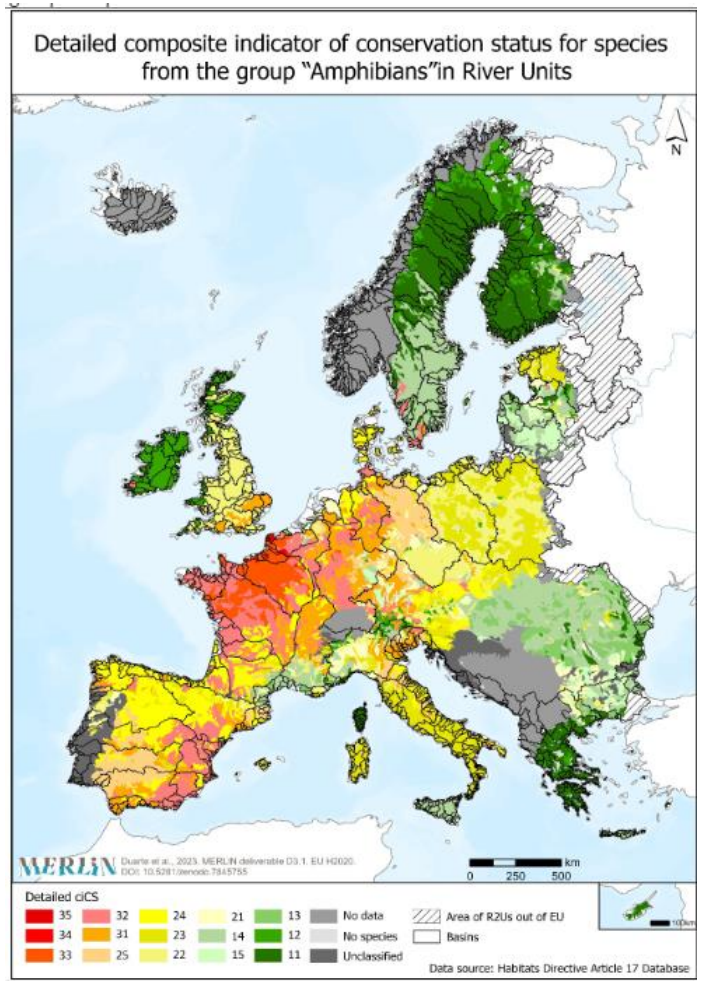
Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units

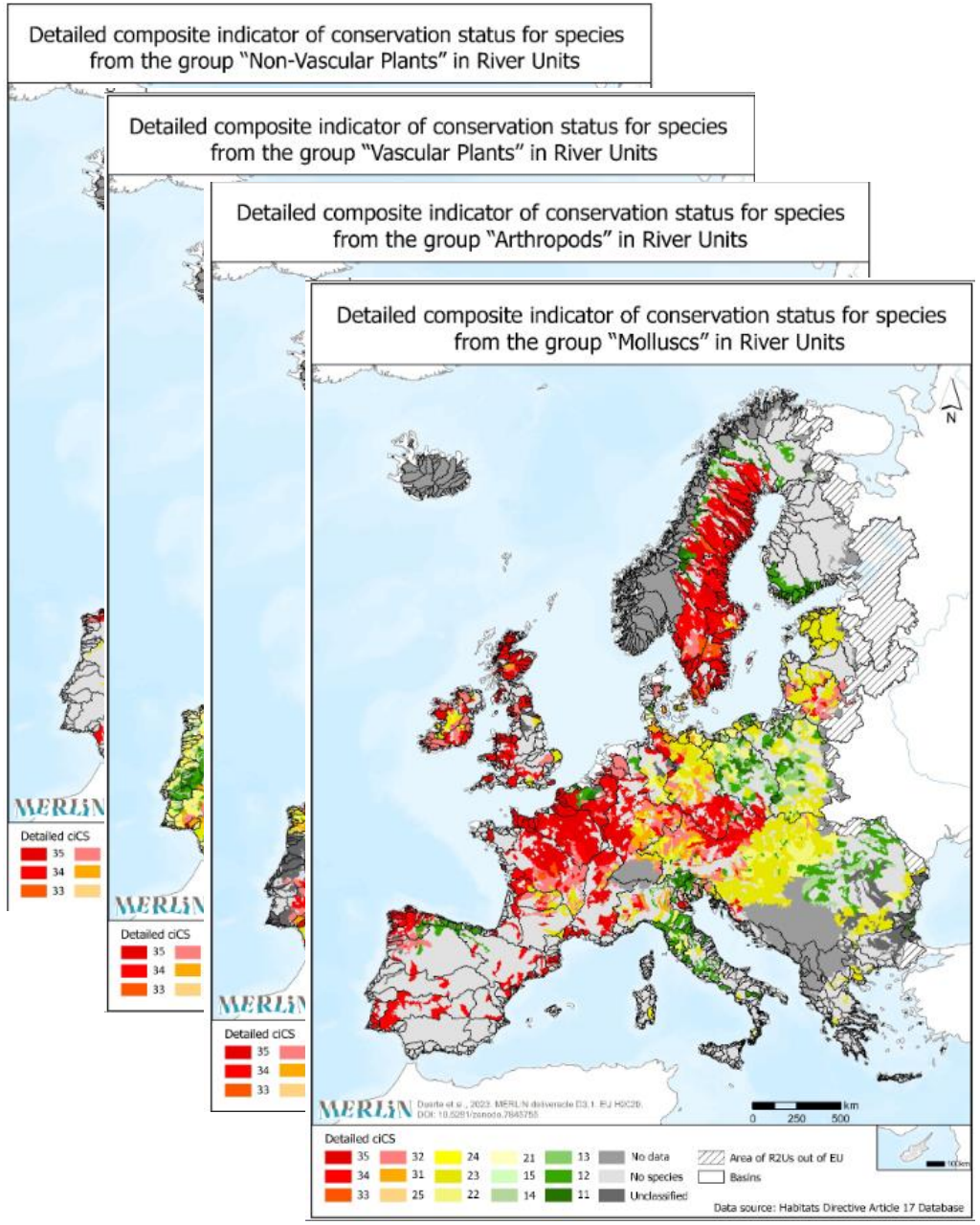


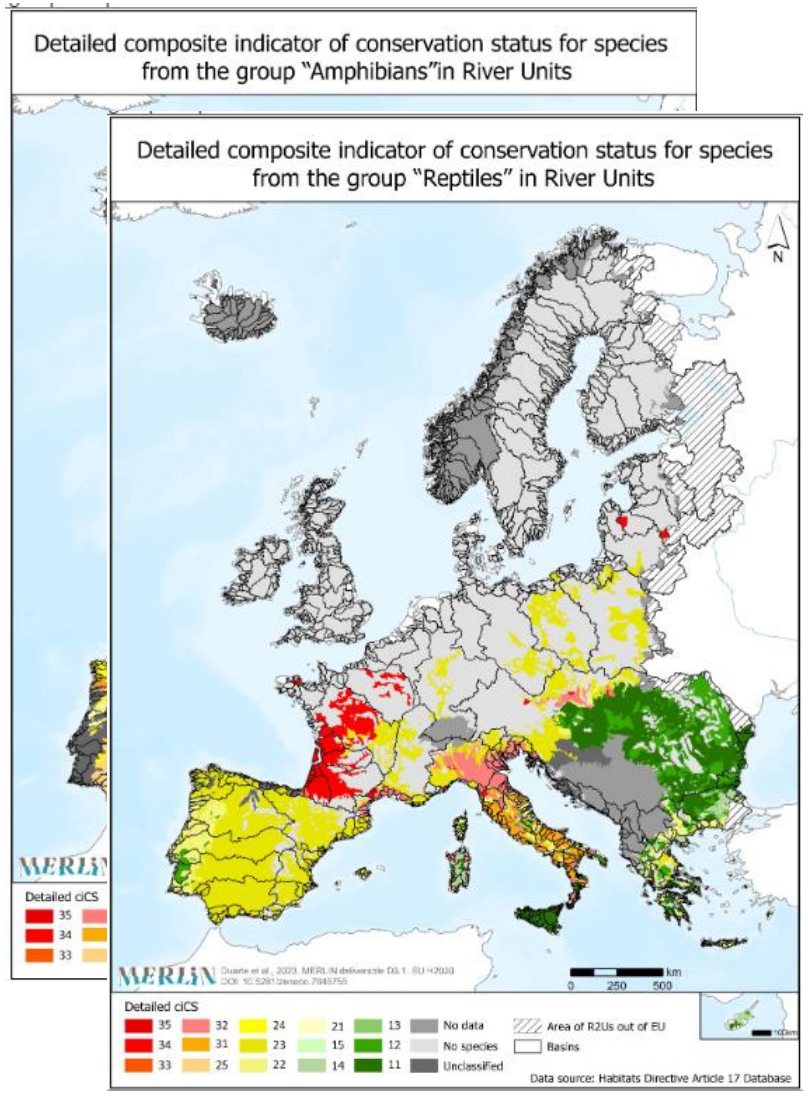

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Arthropods" in River Units
MERLIN
Detailed ciCS
35
34
33
32
31
25
24
23
22
21
15
14
13
12
11
No data
No species
Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0
250
500
km
N

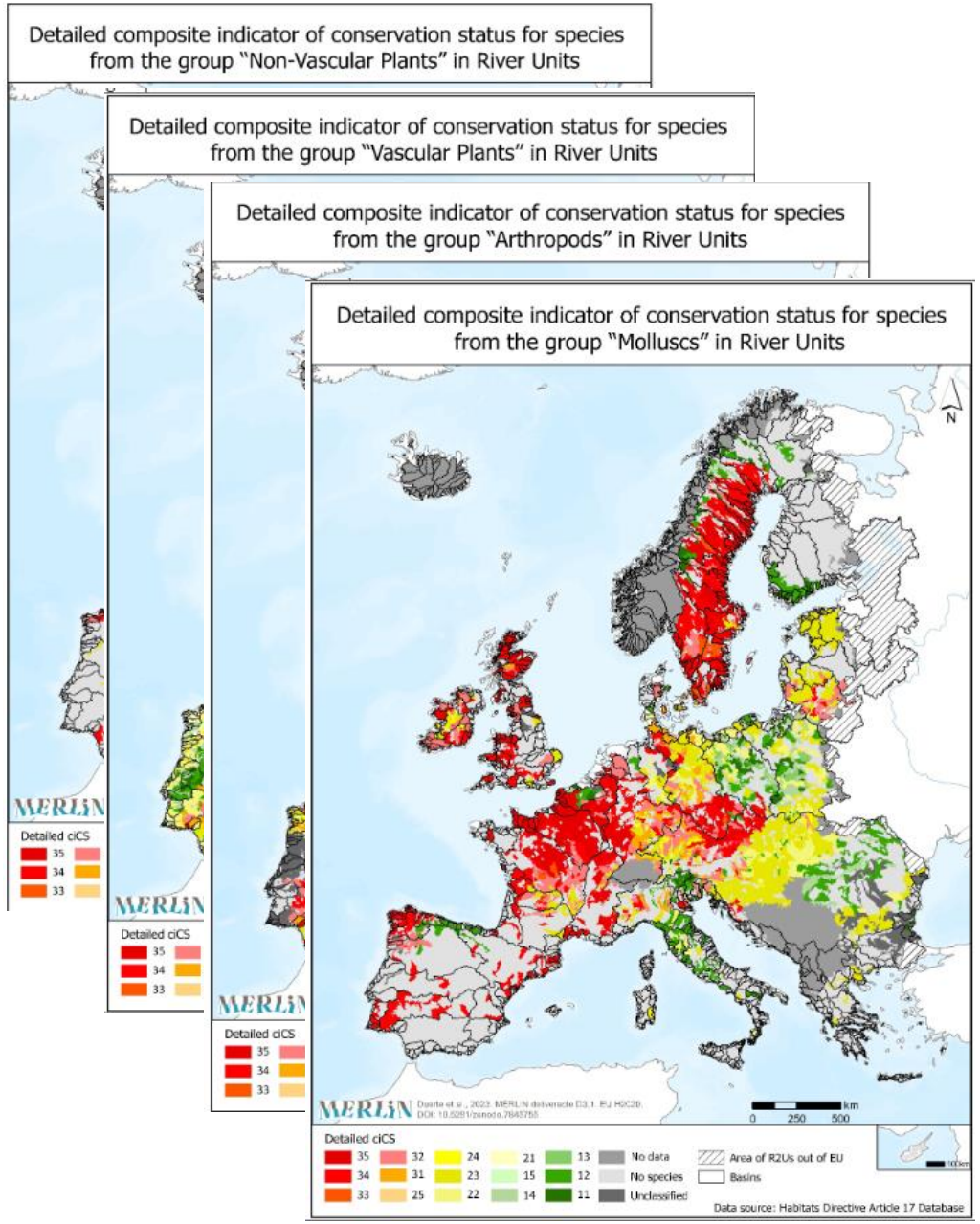

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Arthropods" in River Units
Detailed composite indicator of conservation status for species from the group "Molluscs" in River Units
N
MERLIN
Detailed ciCS
35
34
33
32
31
25
24
23
22
21
15
14
13
12
11
No data
No species
Unclassified
Area of R2Us out of EU
Basins
0
250
500
km
Data source: Habitats Directive Article 17 Database

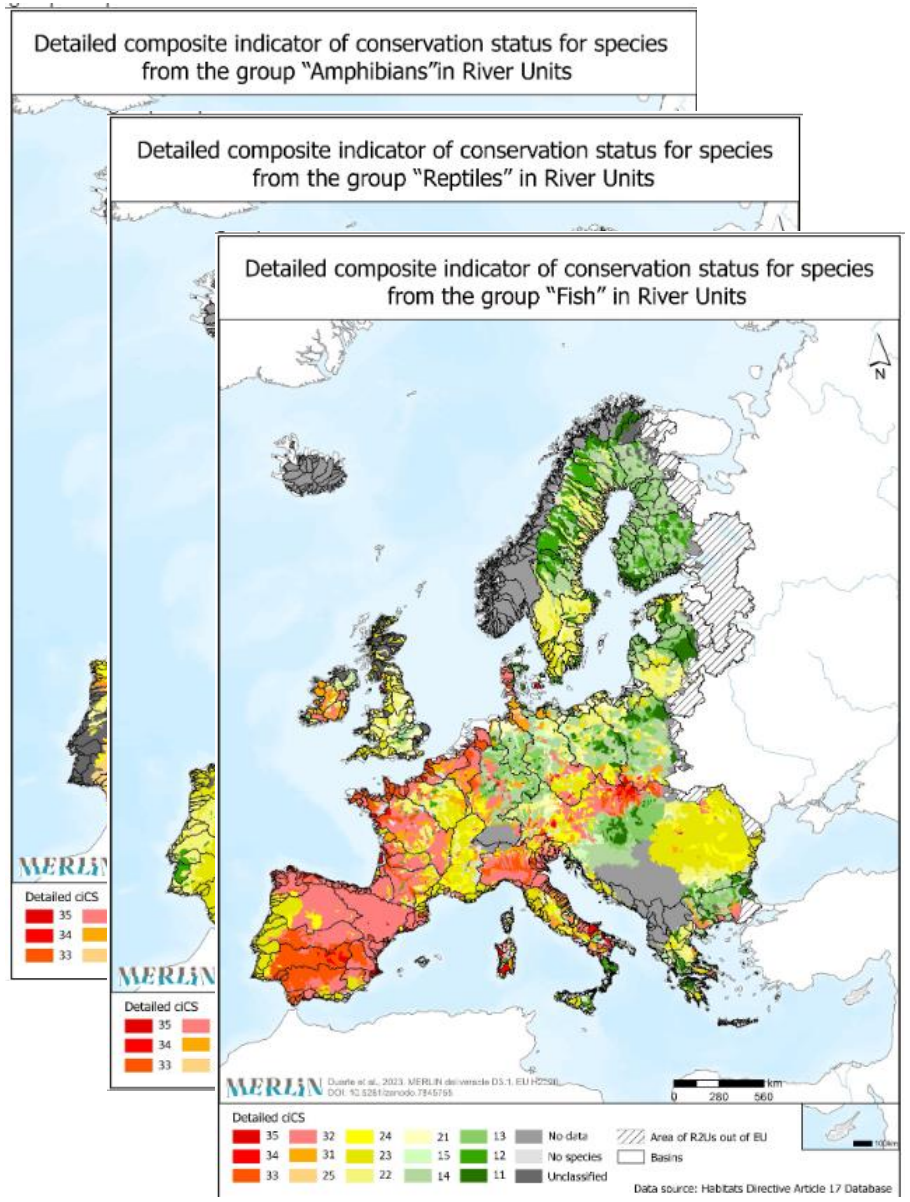

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Arthropods" in River Units
Detailed composite indicator of conservation status for species from the group "Molluscs" in River Units
N
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
0 250 500 km
Data source: Habitats Directive Article 17 Database

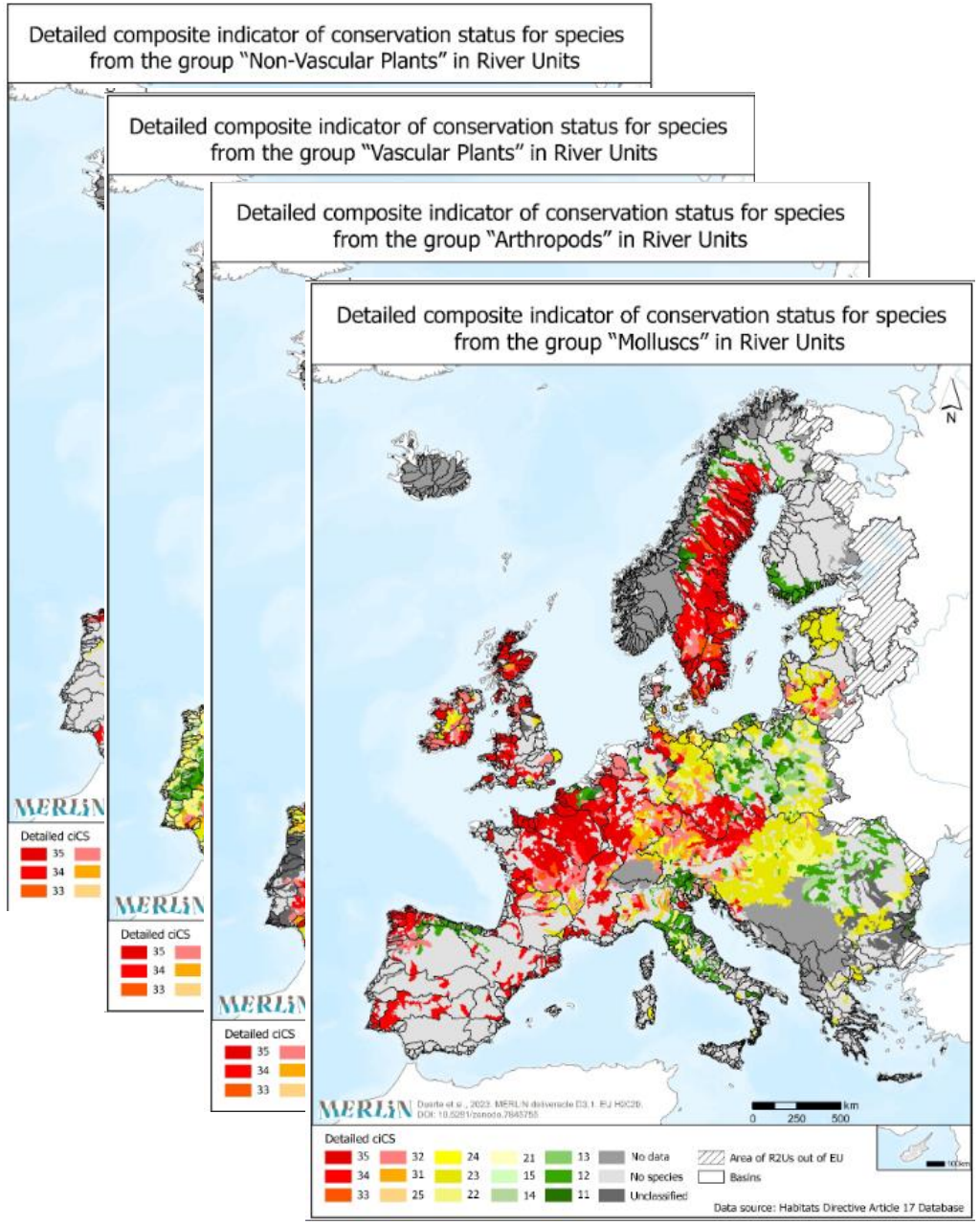

Detailed composite indicator of conservation status for species from the group "Amphibians"in River Units
N
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 14 12 No species
33 25 22 15 11 Unclassified
Area of R2Us out of EU
Basins
0 250 500 km
Data source: Habitats Directive Article 17 Database

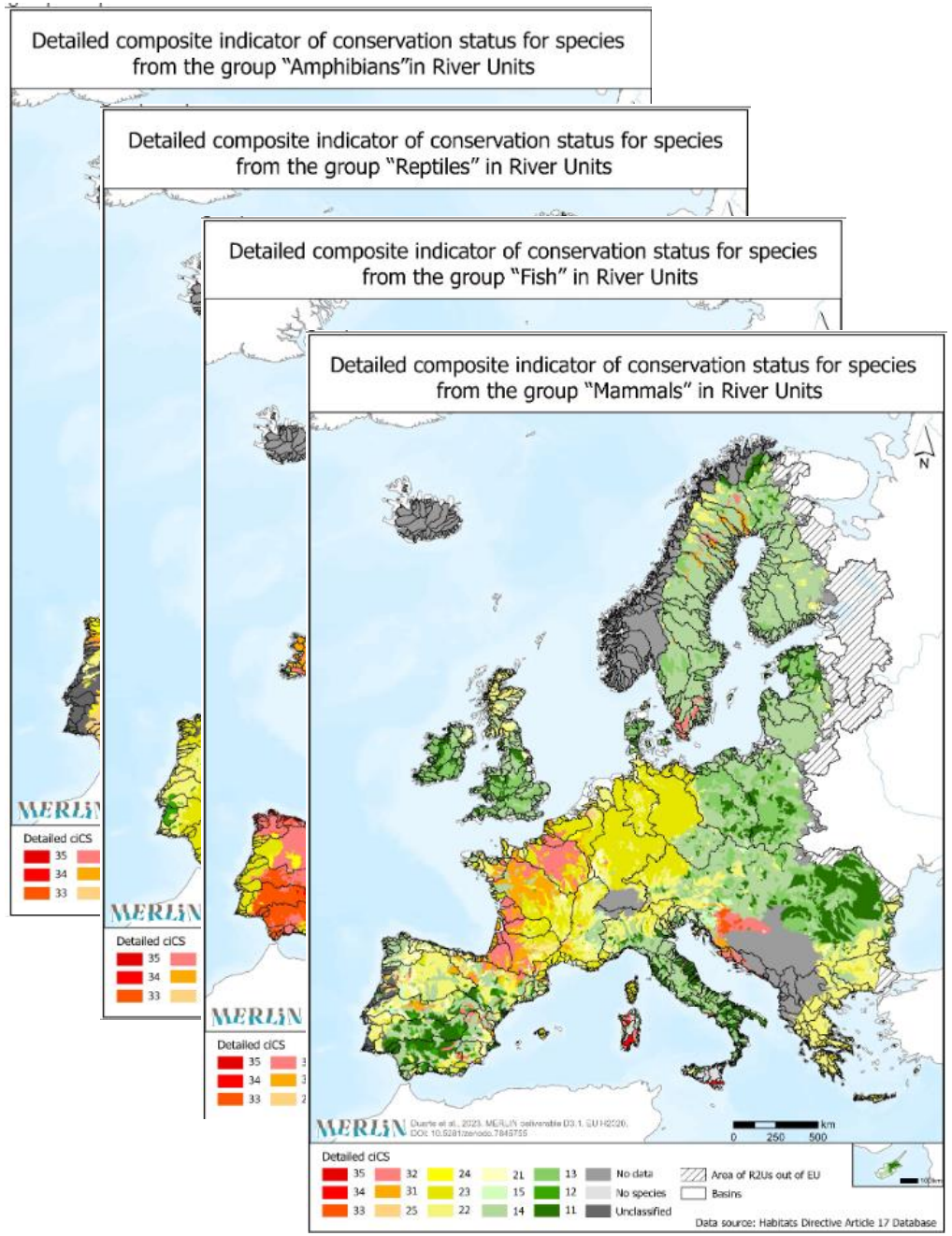

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Arthropods" in River Units
Detailed composite indicator of conservation status for species from the group "Molluscs" in River Units
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0 250 500 km
N


Detailed composite indicator of conservation status for species from the group "Amphibians"in River Units
Detailed composite indicator of conservation status for species from the group "Reptiles" in River Units
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0 250 500 km
N

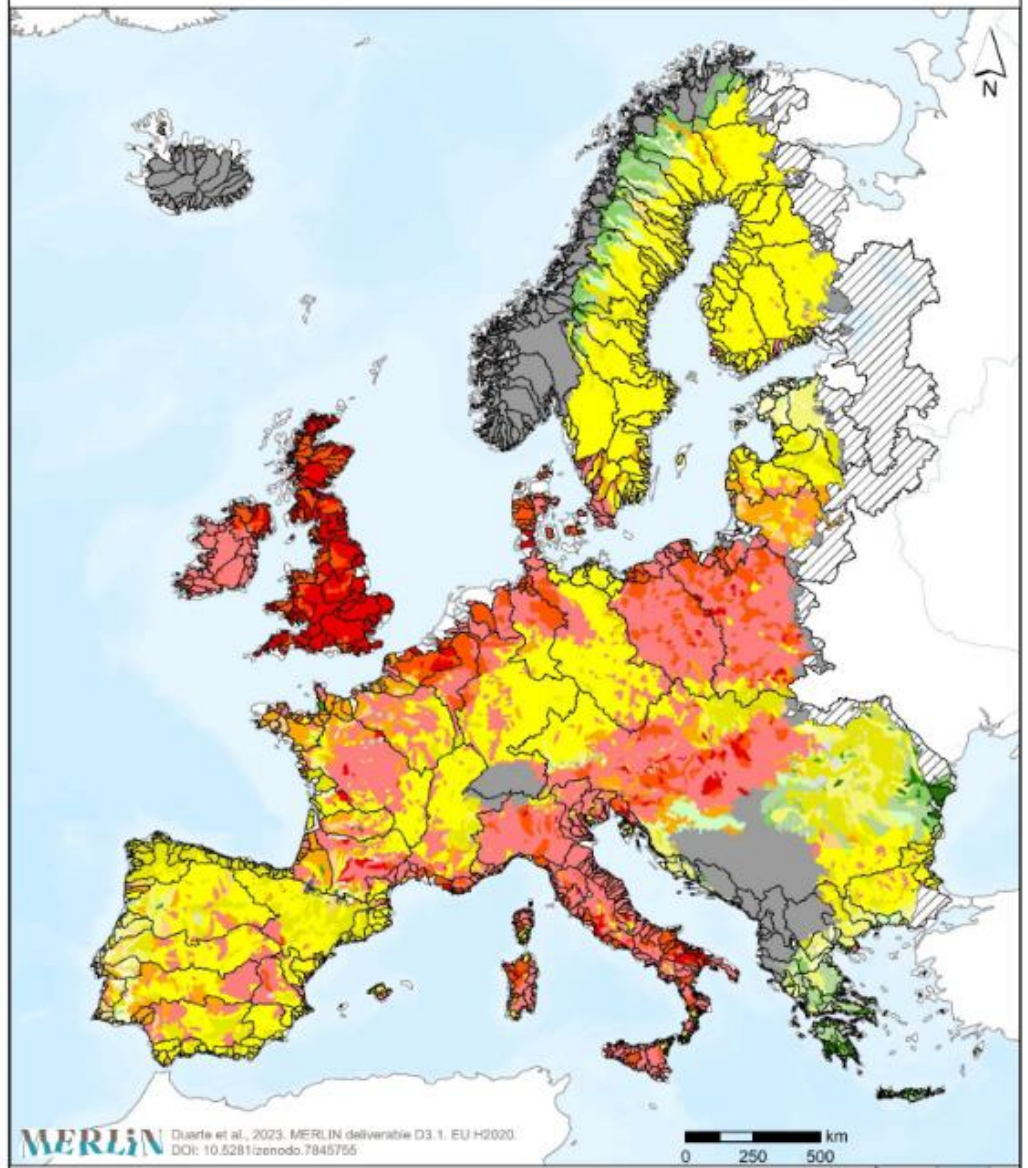

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Arthropods" in River Units
Detailed composite indicator of conservation status for species from the group "Molluscs" in River Units
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0 250 500 km
N


Detailed composite indicator of conservation status for species from the group "Amphibians"in River Units
Detailed composite indicator of conservation status for species from the group "Reptiles" in River Units
Detailed composite indicator of conservation status for species from the group "Fish" in River Units
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0 280 560 km
N

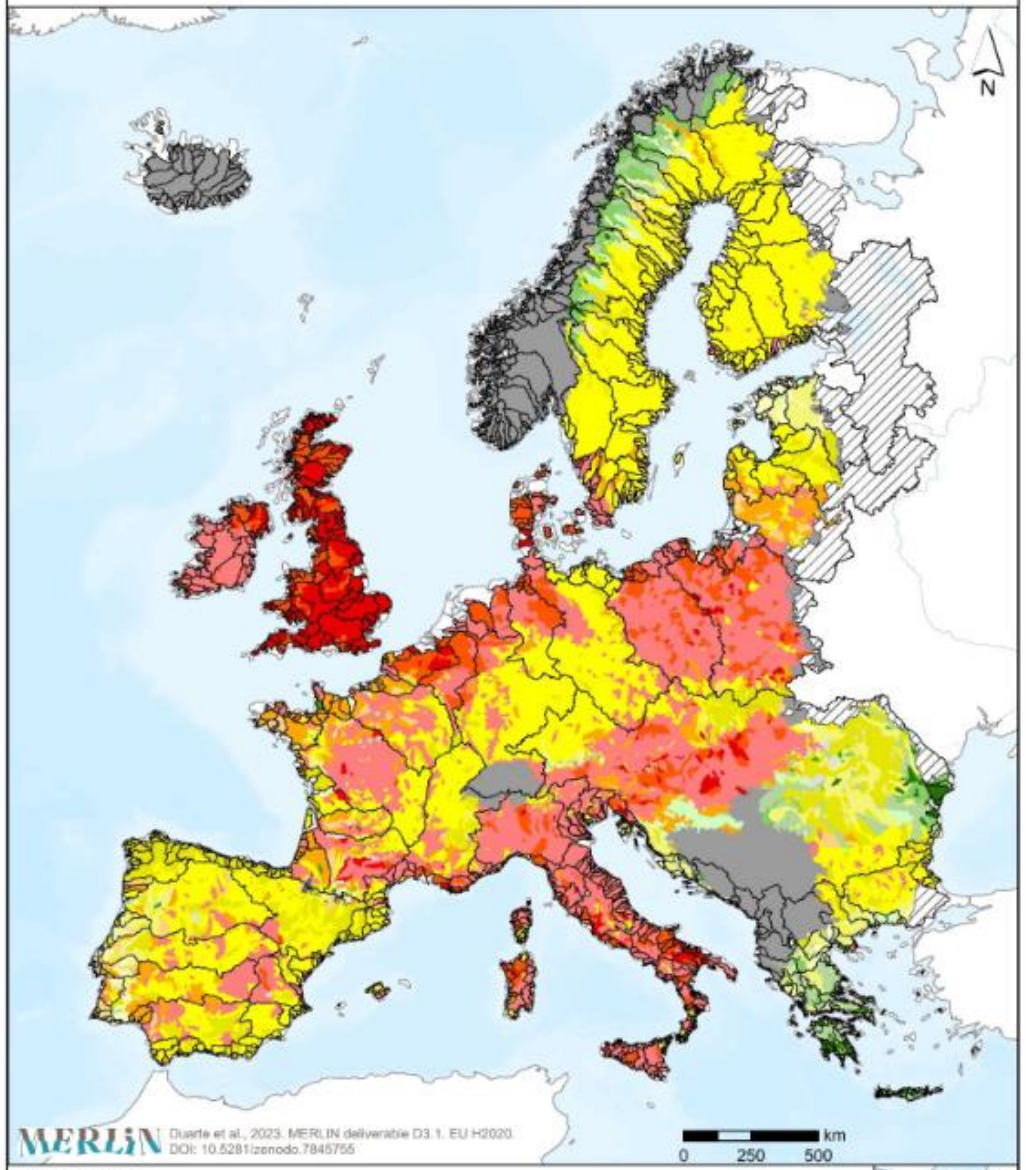

Detailed composite indicator of conservation status for species from the group "Non-Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Vascular Plants" in River Units
Detailed composite indicator of conservation status for species from the group "Arthropods" in River Units
Detailed composite indicator of conservation status for species from the group "Molluscs" in River Units
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0 250 500 km
N


Detailed composite indicator of conservation status for species from the group "Amphibians"in River Units
Detailed composite indicator of conservation status for species from the group "Reptiles" in River Units
Detailed composite indicator of conservation status for species from the group "Fish" in River Units
Detailed composite indicator of conservation status for species from the group "Mammals" in River Units
MERLIN
Detailed ciCS
35 32 24 21 13 No data
34 31 23 15 12 No species
33 25 22 14 11 Unclassified
Area of R2Us out of EU
Basins
Data source: Habitats Directive Article 17 Database
0 250 500 km
N

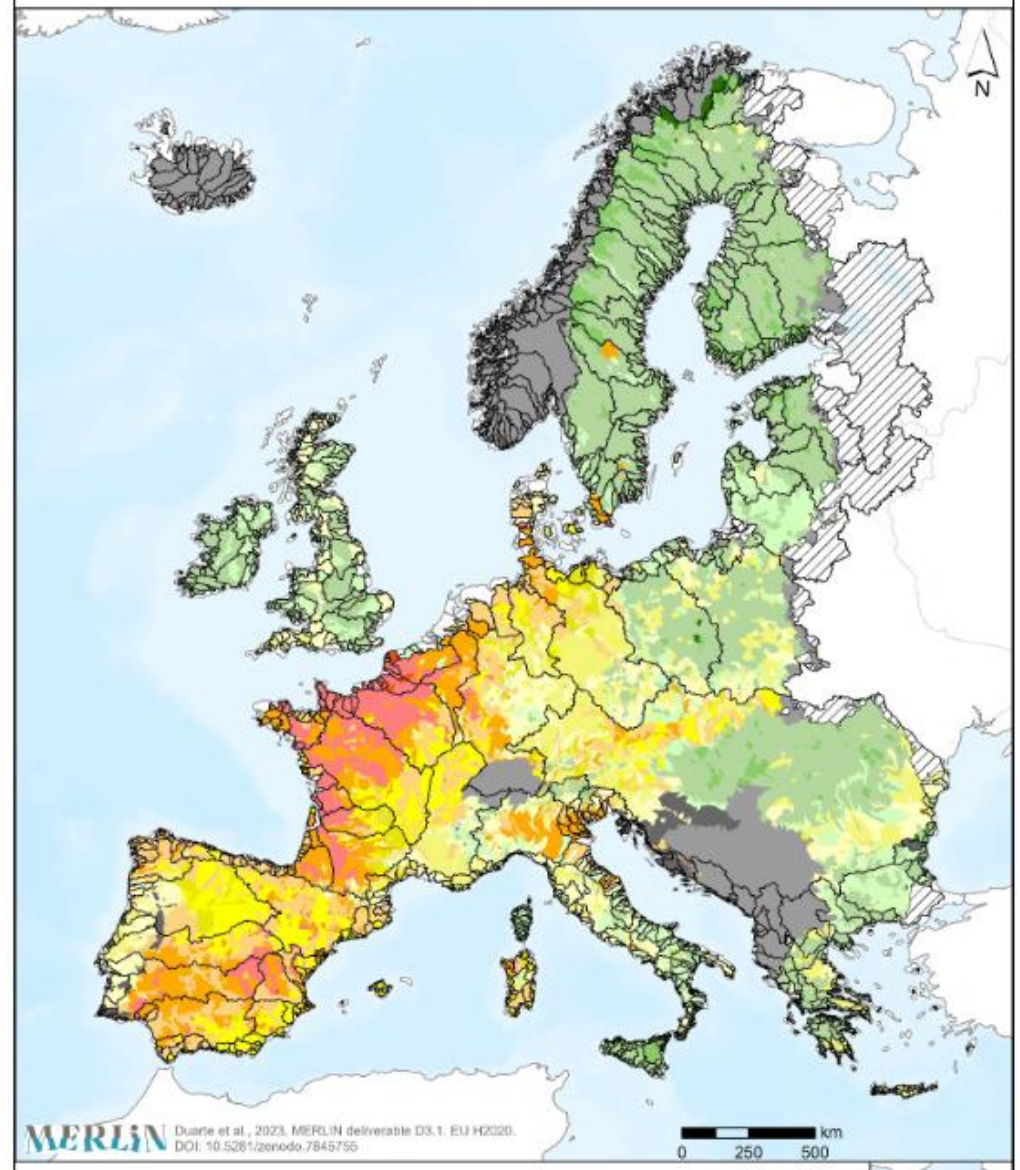
Detailed composite indicator of conservation status for freshwater-related habitats in River Units

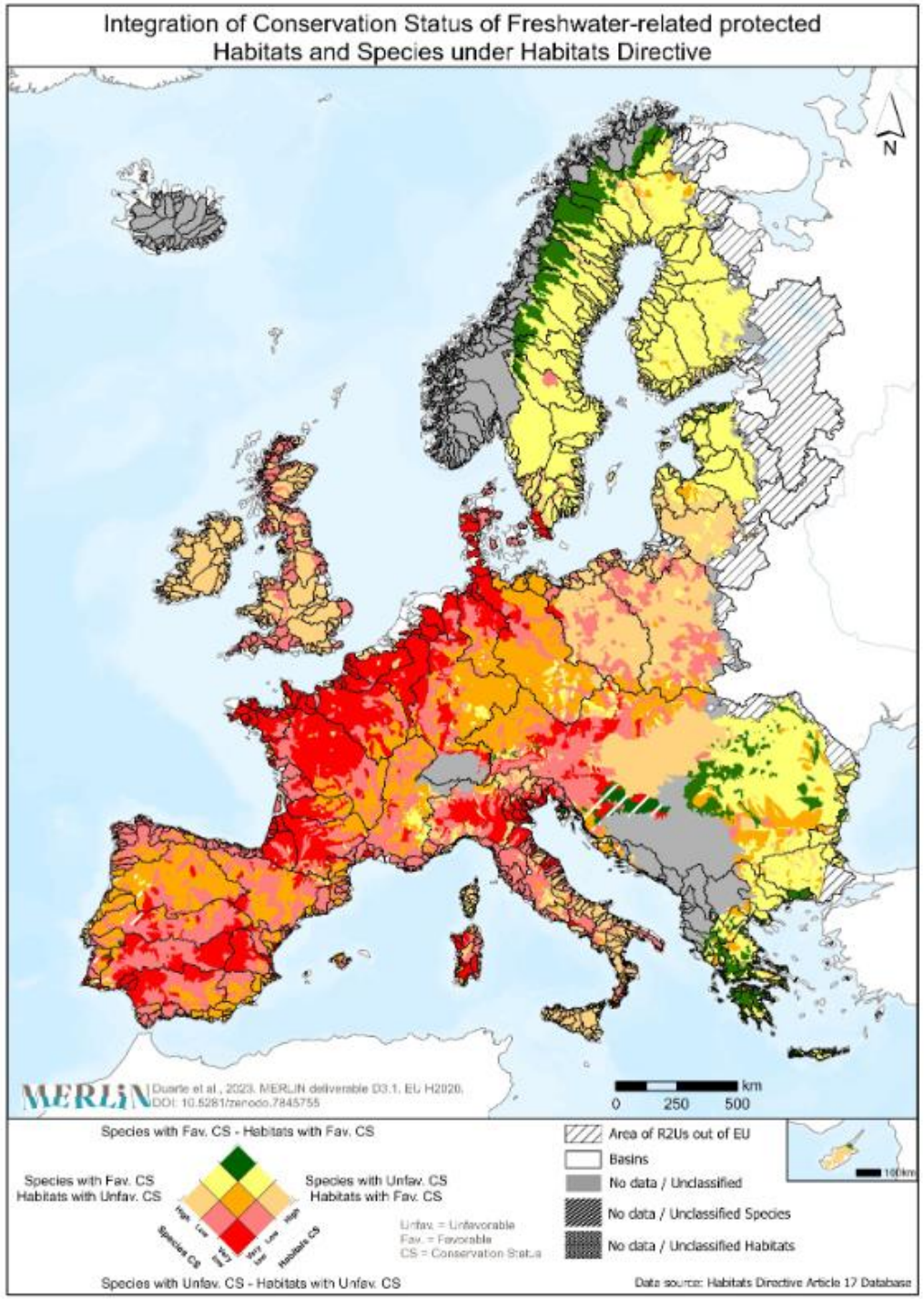


Detailed composite indicator of conservation status for freshwater-related habitats in River Units

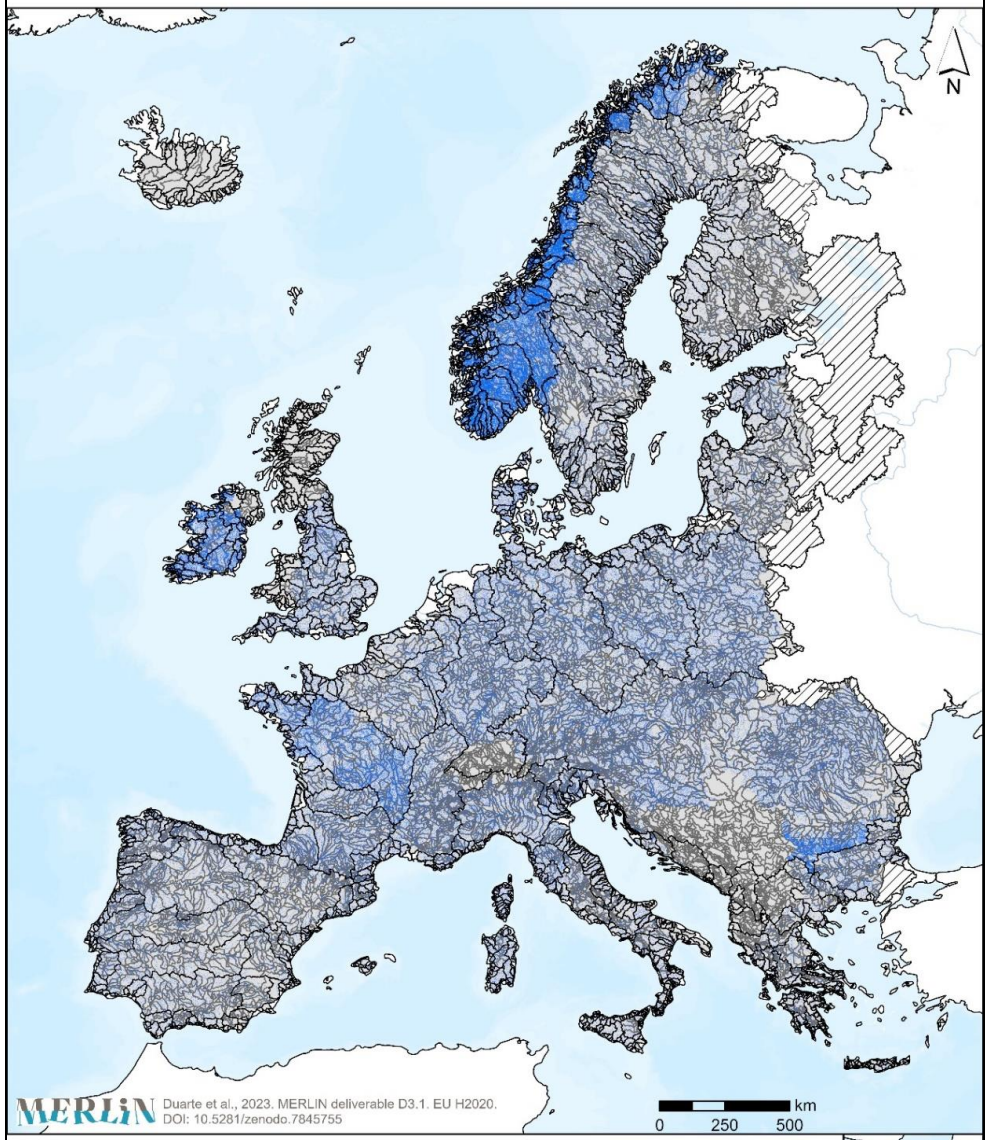


Detailed composite indicator of conservation status for freshwater-related species in River Units

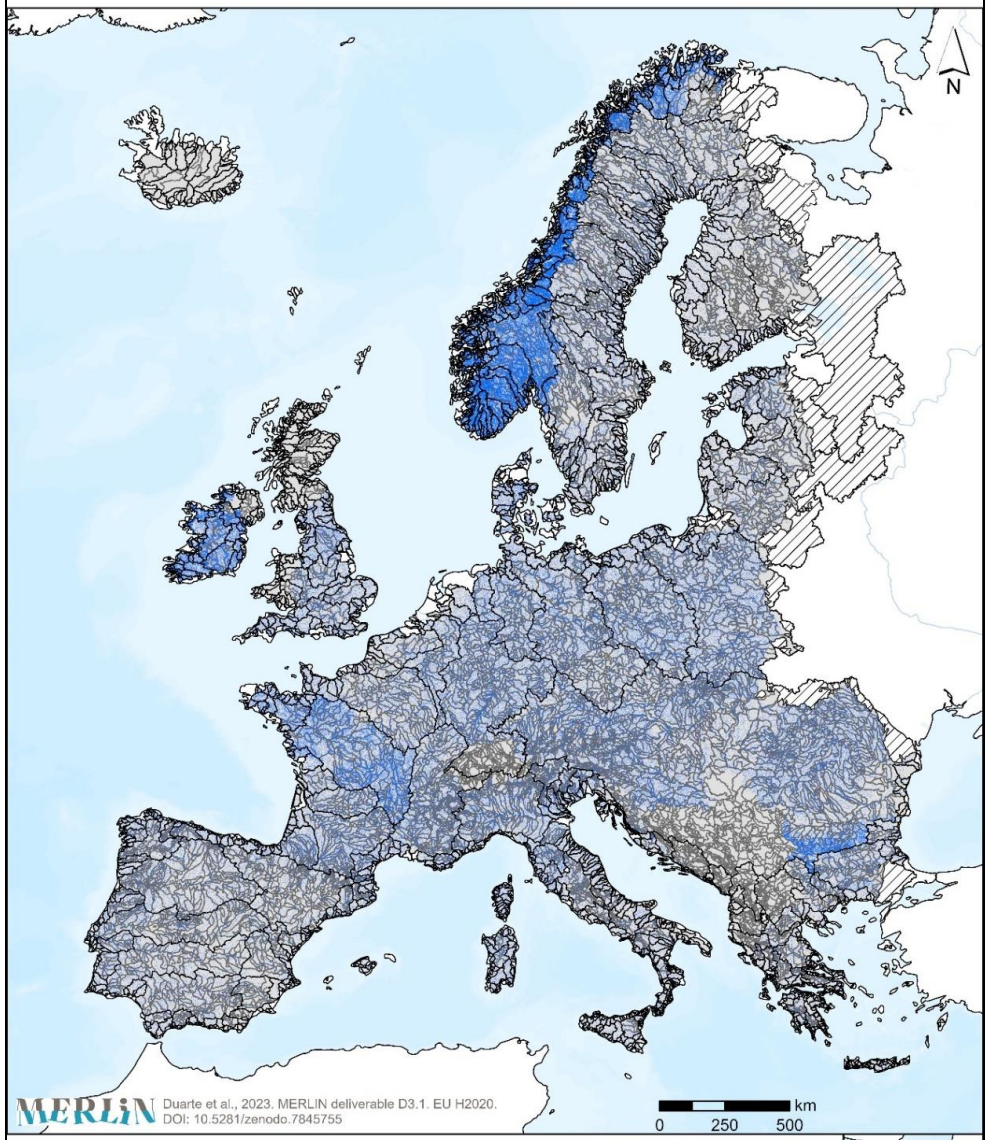



Integration of Conservation Status of Freshwater-related protected Habitats and Species under Habitats Directive
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Species with Fav. CS - Habitats with Fav. CS
Species with Fav. CS Habitats with Unfav. CS
Species with Unfav. CS Habitats with Fav. CS
Unfav. = Unfavorable
Fav. = Favorable
CS = Conservation Status
Species with Unfav. CS - Habitats with Unfav. CS
Area of R2Us out of EU
Basins
No data / Unclassified
No data / Unclassified Species
No data / Unclassified Habitats
100km
Data source: Habitats Directive Article 17 Database

Surface Water Bodies
Within River Restoration Units

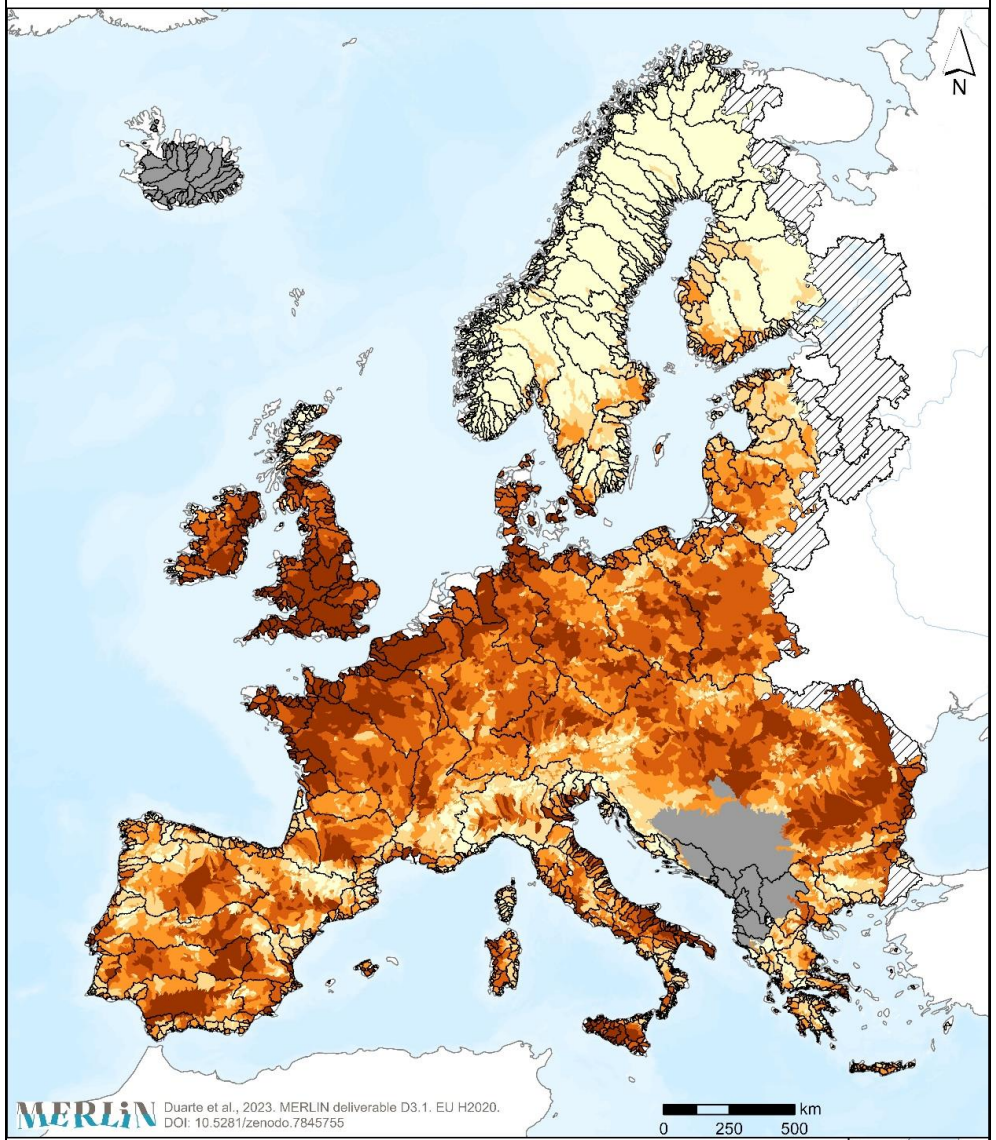


Surface Water Bodies Within River Restoration Units



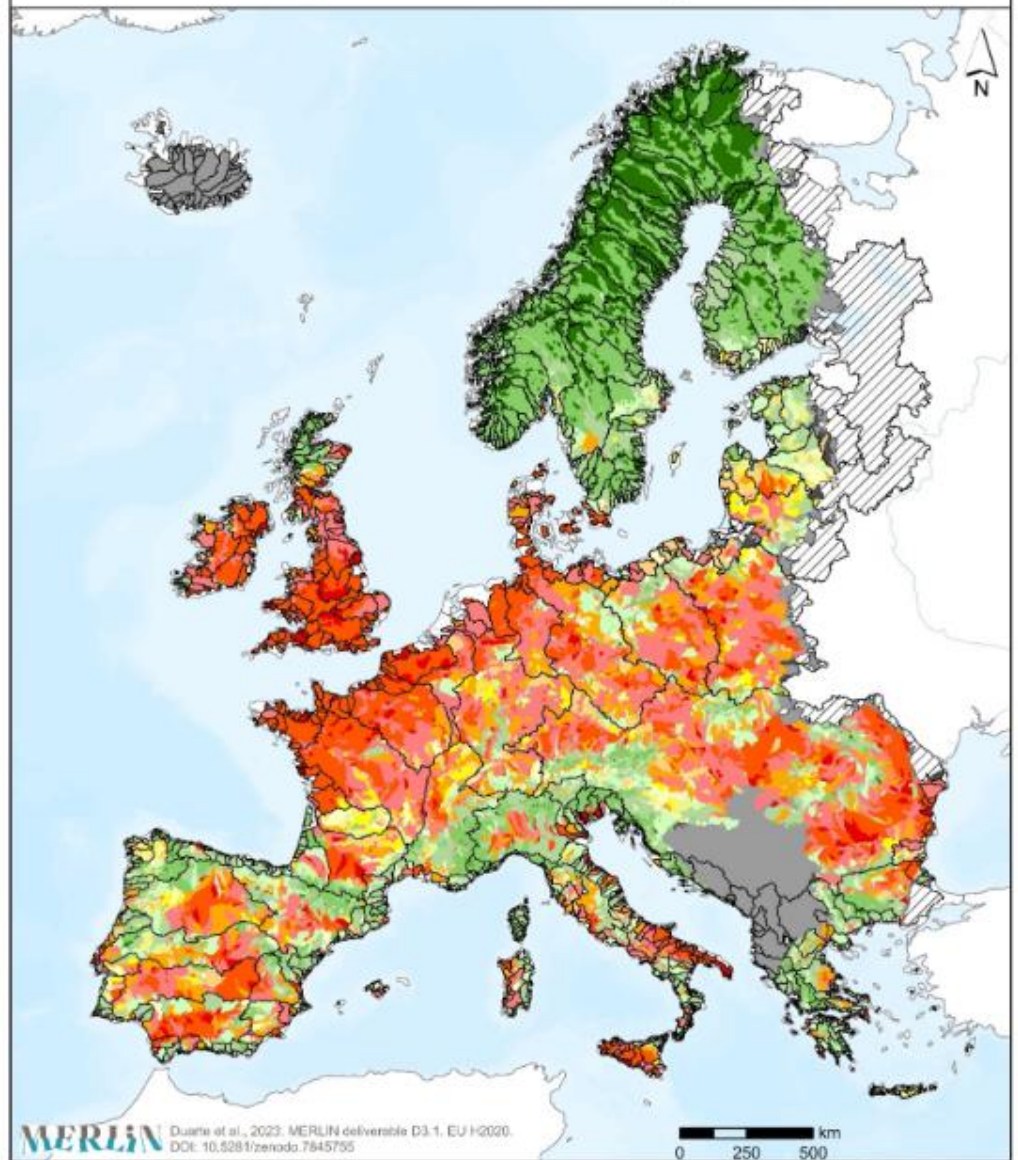
Data source: Vigiak et al., 2021. European Commission, JRC Dataset

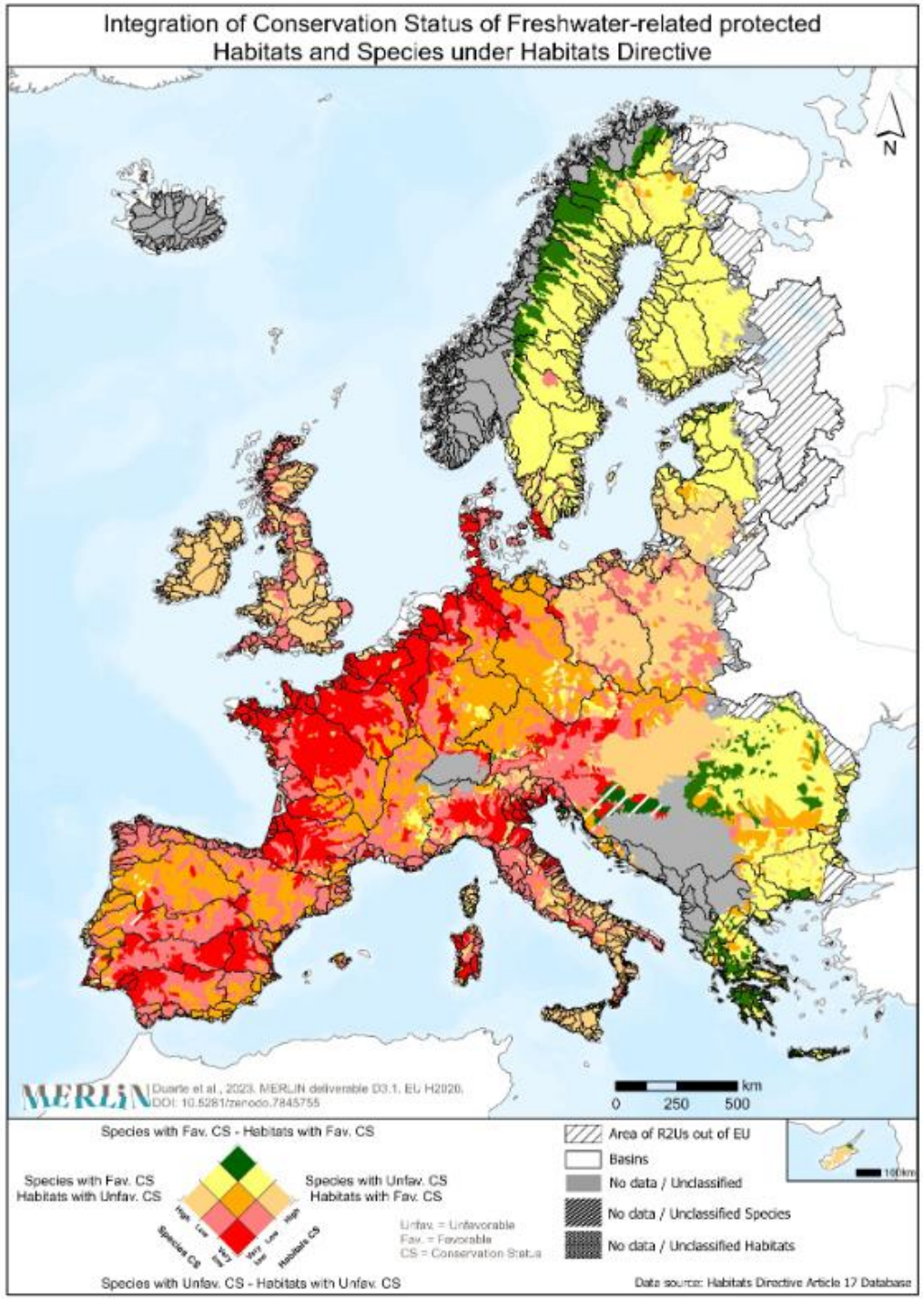
Modelled probability of failing Good Ecological Status in River Unit

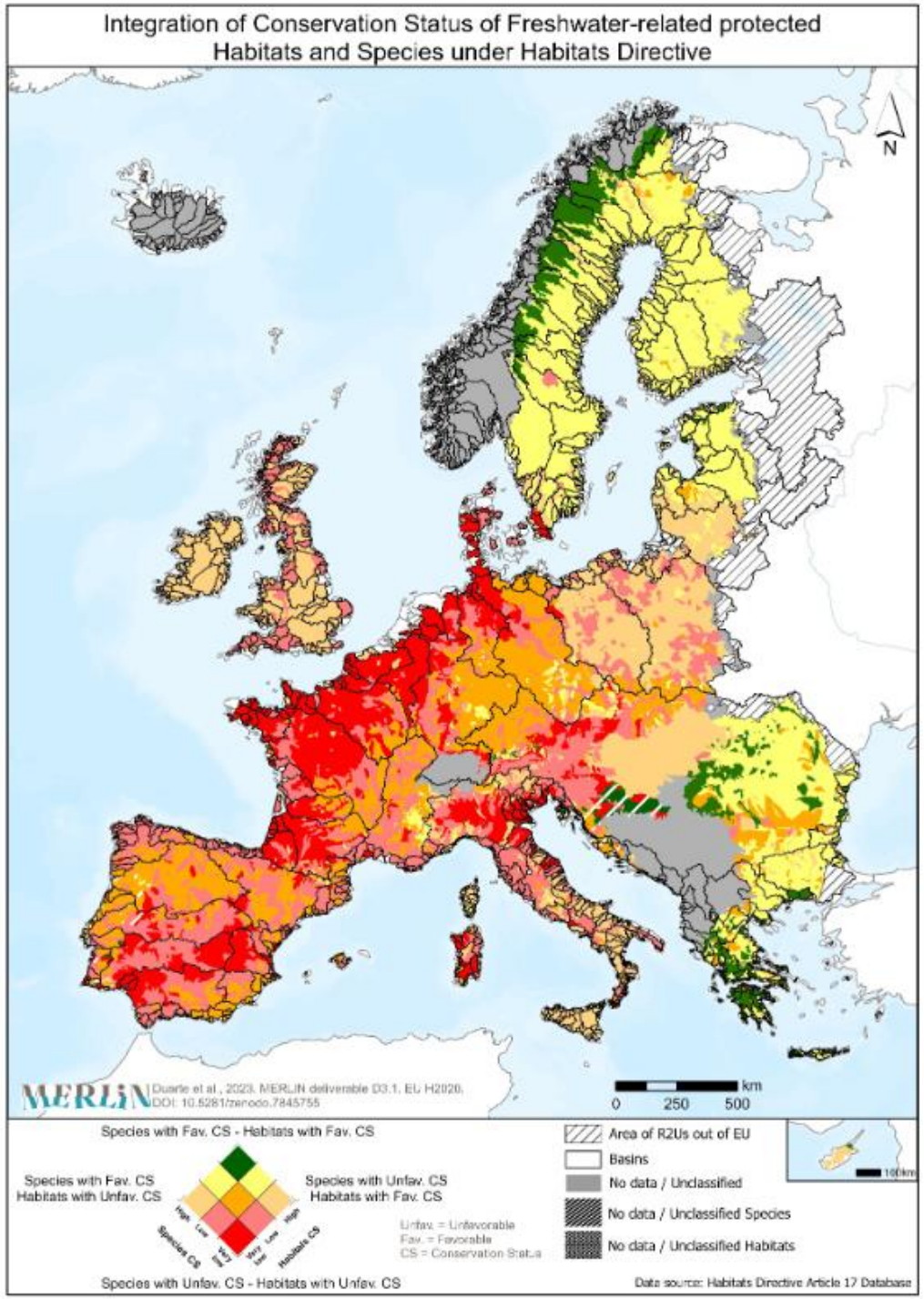


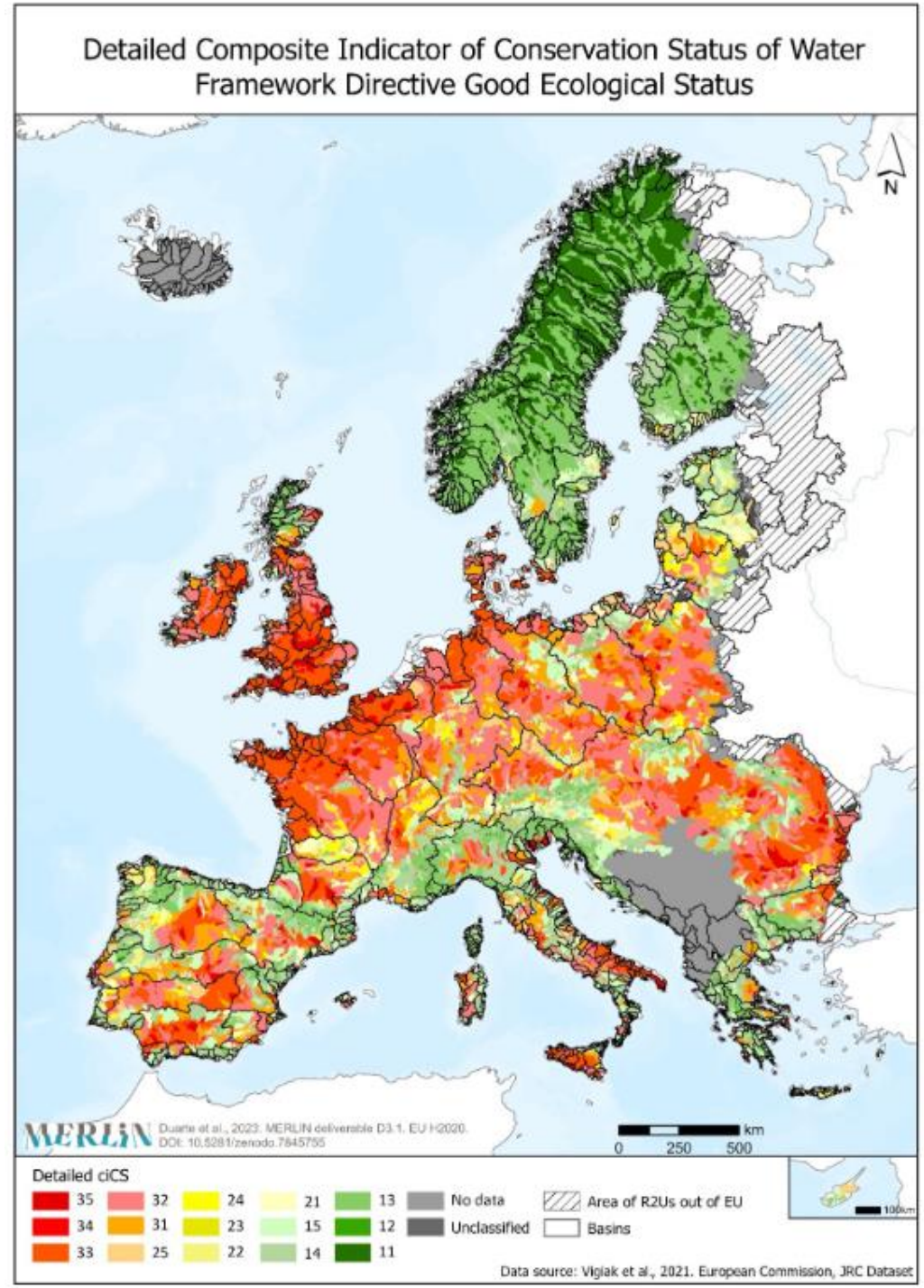
Data source: Vigiak et al., 2021. European Commission, Joint Research Centre (JRC)

Detailed Composite Indicator of Conservation Status of Water Framework Directive Good Ecological Status

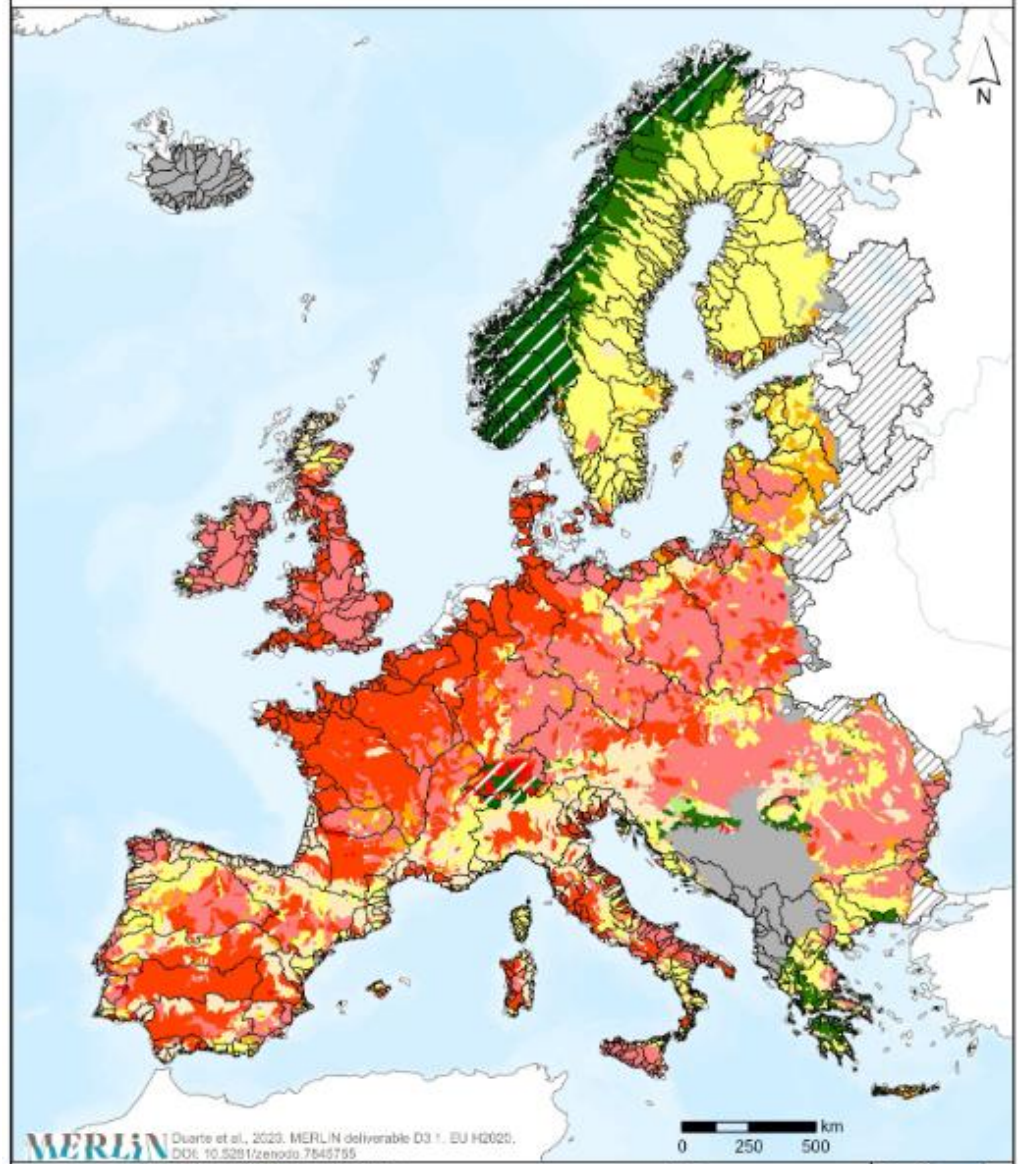


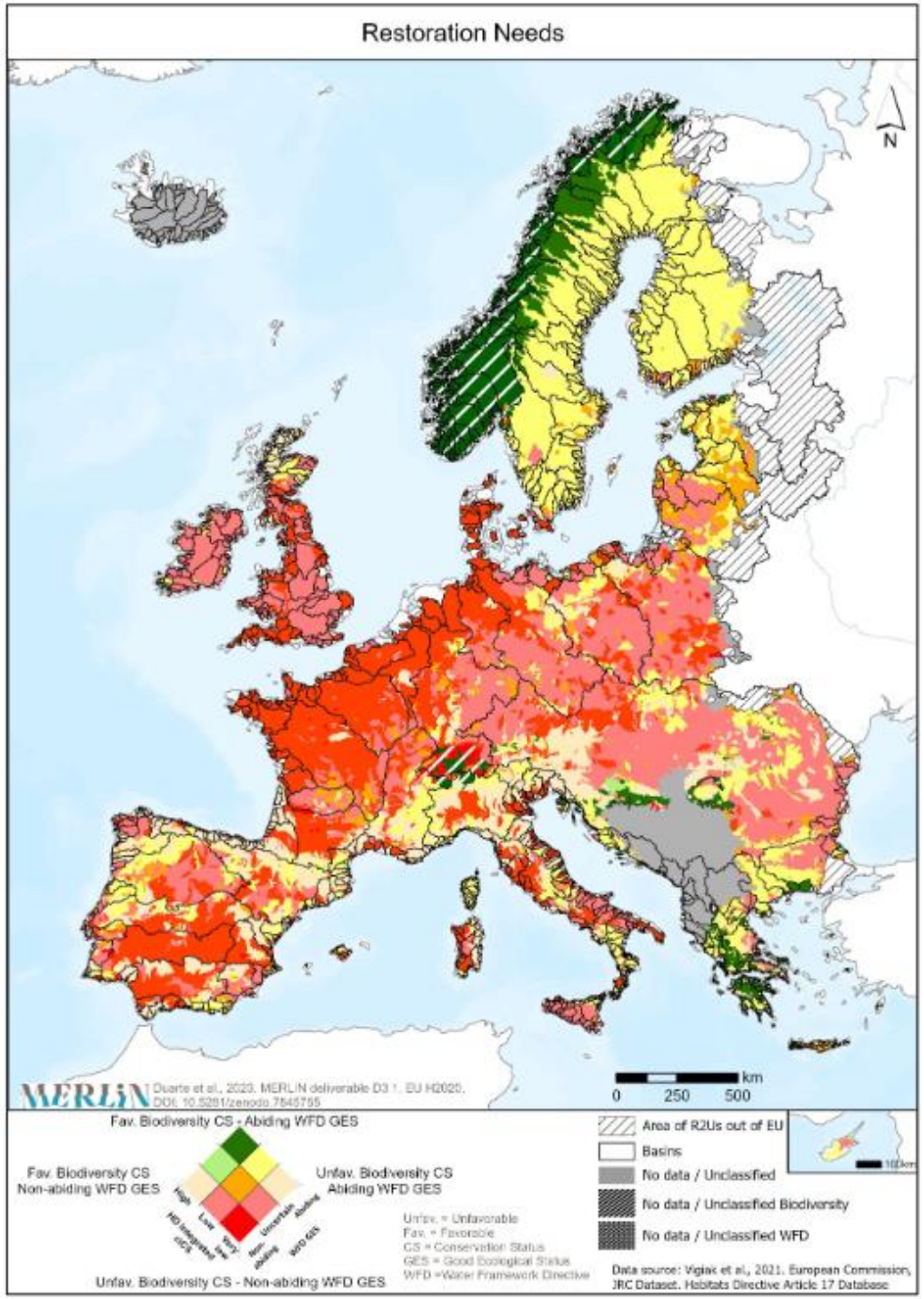

Integration of Conservation Status of Freshwater-related protected Habitats and Species under Habitats Directive
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Species with Fav. CS - Habitats with Fav. CS
Species with Fav. CS Habitats with Unfav. CS
Species with Unfav. CS Habitats with Fav. CS
Unfav. = Unfavorable
Fav. = Favorable
CS = Conservation Status
Species with Unfav. CS - Habitats with Unfav. CS
Area of R2Us out of EU
Basins
No data / Unclassified
No data / Unclassified Species
No data / Unclassified Habitats
100km
Data source: Habitats Directive Article 17 Database

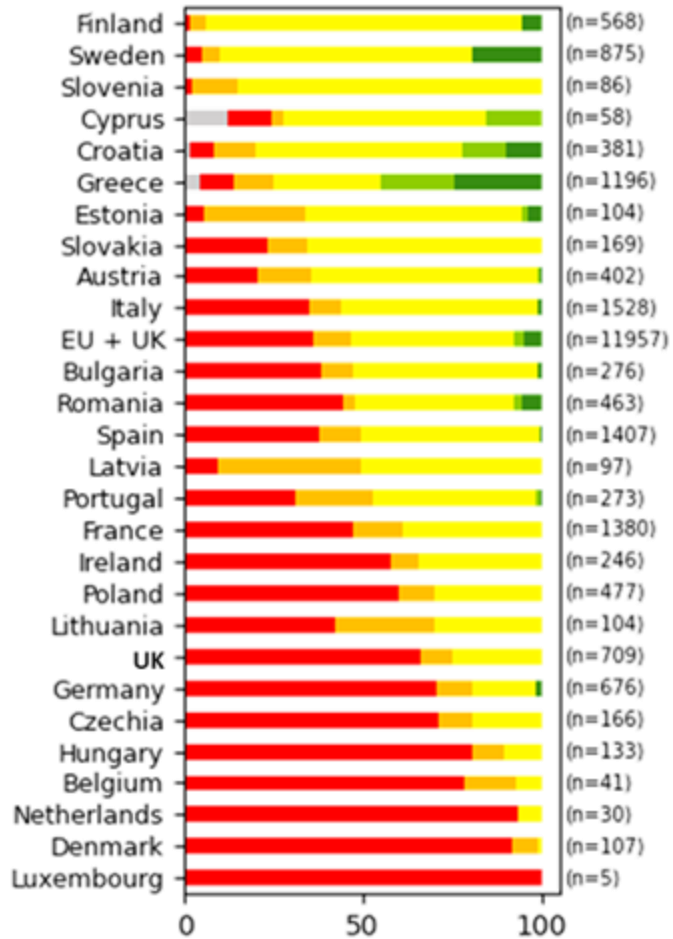

Integration of Conservation Status of Freshwater-related protected Habitats and Species under Habitats Directive
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Species with Fav. CS - Habitats with Fav. CS
Species with Fav. CS Habitats with Unfav. CS
Species with Unfav. CS Habitats with Fav. CS
Species with Unfav. CS - Habitats with Unfav. CS
Unfav. = Unfavorable
Fav. = Favorable
CS = Conservation Status
Area of R2Us out of EU
Basins
No data / Unclassified
No data / Unclassified Species
No data / Unclassified Habitats
Data source: Habitats Directive Article 17 Database


Detailed Composite Indicator of Conservation Status of Water Framework Directive Good Ecological Status
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Detailed ciCS
35 32 24 21 13
34 31 23 15 12
33 25 22 14 11
No data
Unclassified
Area of R2Us out of EU
Basins
Data source: Vigiak et al., 2021. European Commission, JRC Dataset

Restoration Needs

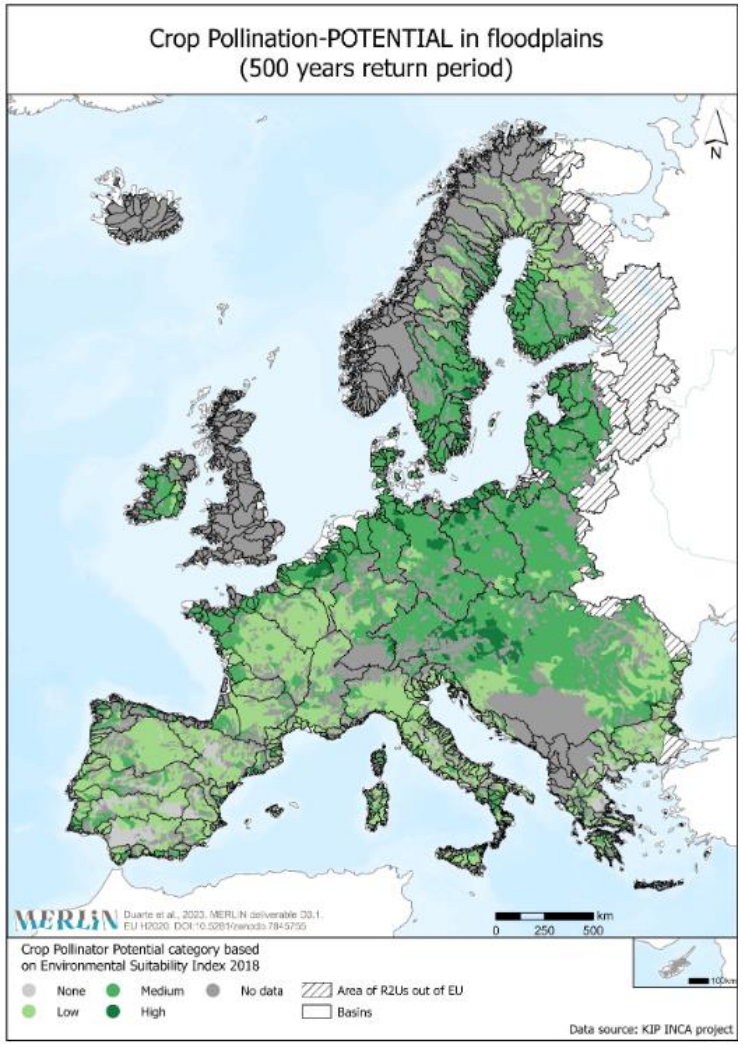


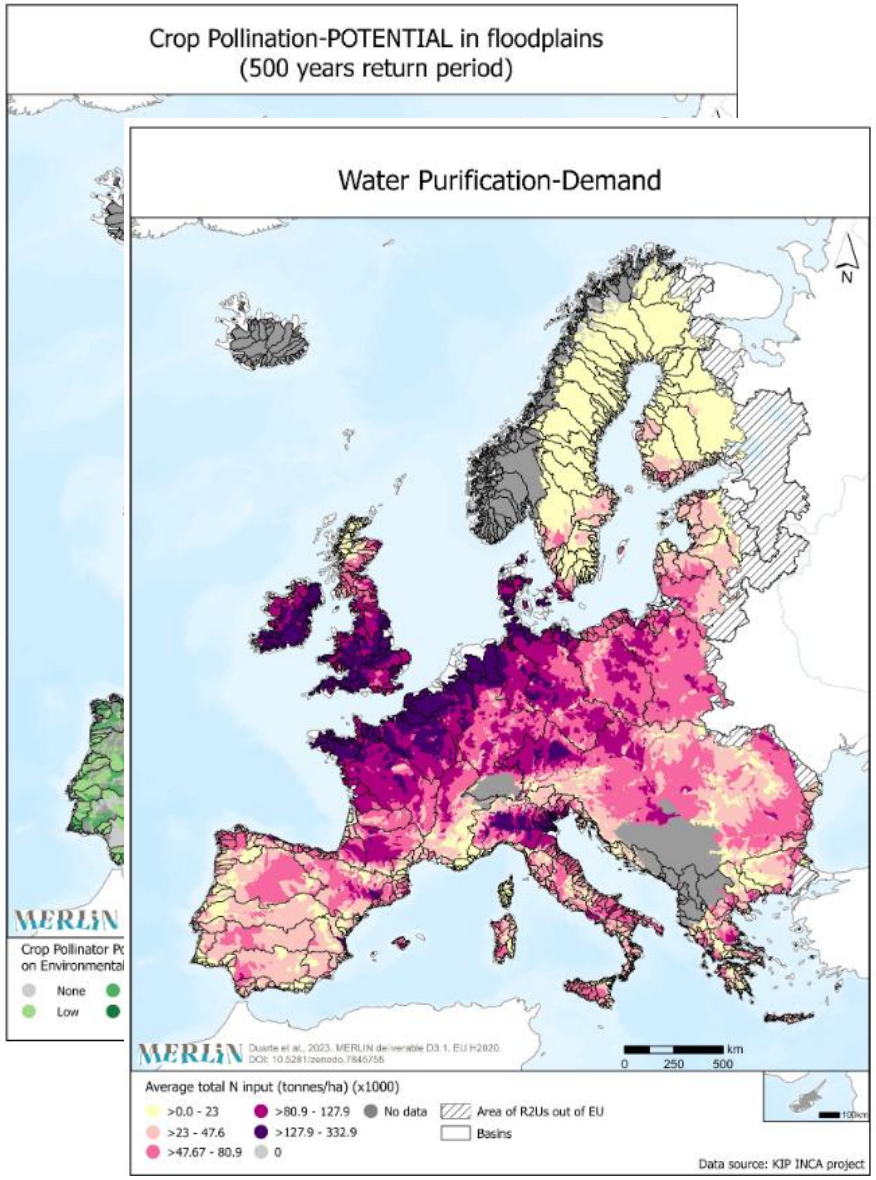

Restoration Needs
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
0 250 500 km
Fav. Biodiversity CS - Abiding WFD GES
Fav. Biodiversity CS Non-abiding WFD GES
Unfav. Biodiversity CS Abiding WFD GES
Unfav. Biodiversity CS - Non-abiding WFD GES
High
Low
Very low
Non-abiding
Uncertain
Abiding
WFD GES
HD Unassigned GES
Unfav. = Unfavorable
Fav. = Favorable
CS = Conservation Status
GES = Good Ecological Status
WFD = Water Framework Directive
Area of R2Us out of EU
Basins
No data / Unclassified
No data / Unclassified Biodiversity
No data / Unclassified WFD
100km
Data source: Vigiak et al., 2021. European Commission, JRC Dataset. Habitats Directive Article 17 Database


Finland (n=568)
Sweden (n=875)
Slovenia (n=86)
Cyprus (n=58)
Croatia (n=381)
Greece (n=1196)
Estonia (n=104)
Slovakia (n=169)
Austria (n=402)
Italy (n=1528)
EU + UK (n=11957)
Bulgaria (n=276)
Romania (n=463)
Spain (n=1407)
Latvia (n=97)
Portugal (n=273)
France (n=1380)
Ireland (n=246)
Poland (n=477)
Lithuania (n=104)
UK (n=709)
Germany (n=676)
Czechia (n=166)
Hungary (n=133)
Belgium (n=41)
Netherlands (n=30)
Denmark (n=107)
Luxembourg (n=5)
0
50
100

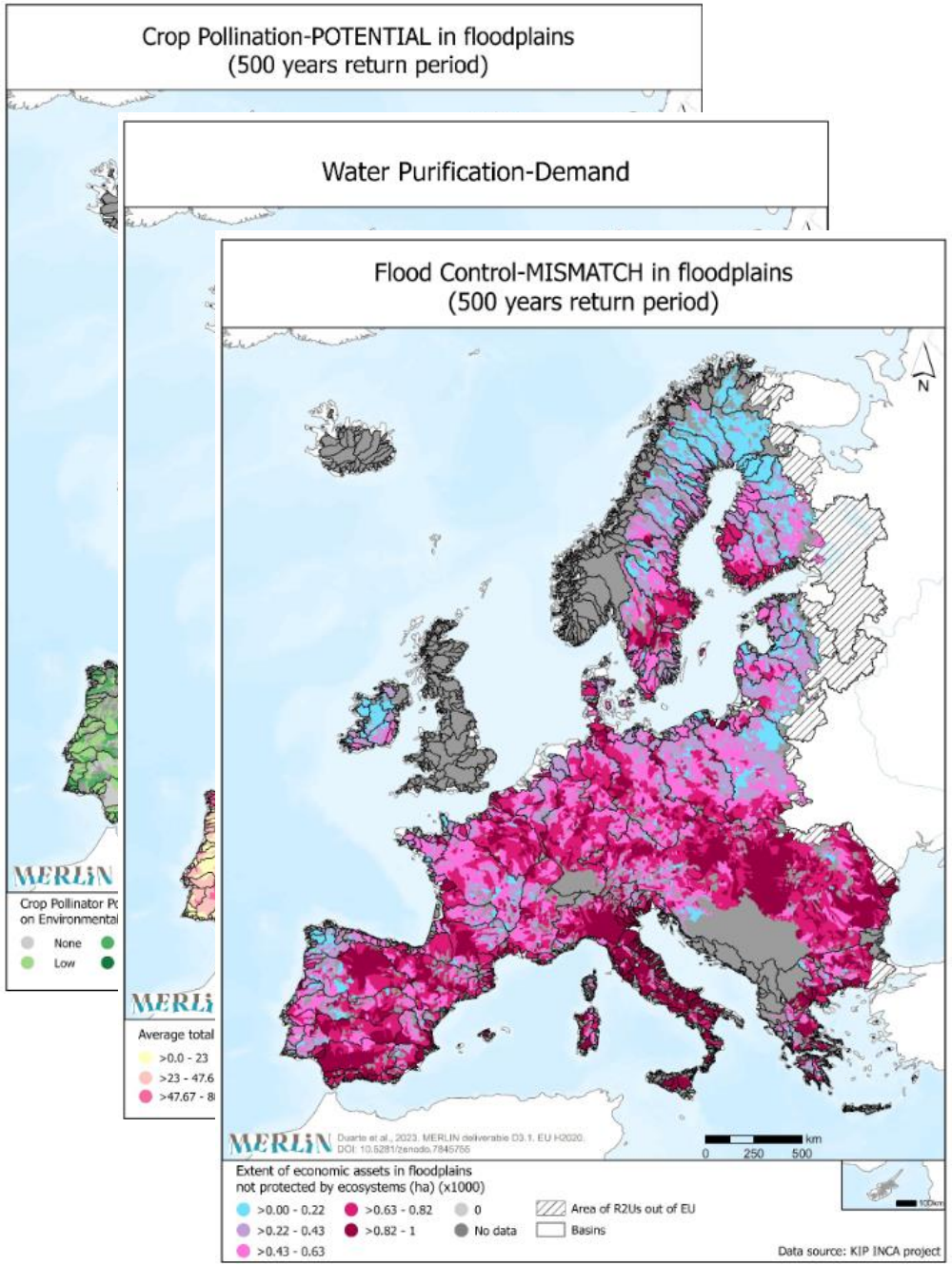
Necessidades e potencial de restauro de sistemas de água doce na Europa

Necessidades e potencial de restauro de sistemas de água doce na Europa


Crop Pollination-POTENTIAL in floodplains
(500 years return period)
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1.
EU H2020. DOI:10.5281/zenodo.7845755
0
250
500
km
Crop Pollinator Potential category based
on Environmental Suitability Index 2018
None
Low
Medium
High
No data
Area of R2Us out of EU
Basins
Data source: KIP INCA project


Crop Pollination-POTENTIAL in floodplains
(500 years return period)
MERLIN
Crop Pollinator P
on Environmental
None
Low

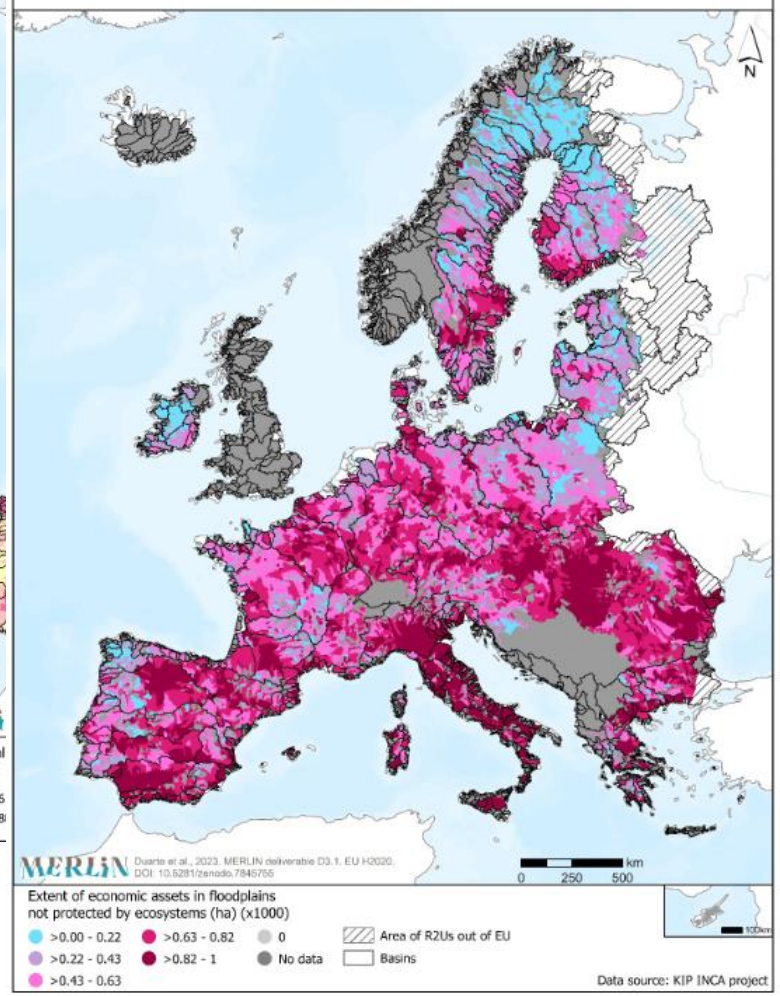
Water Purification-Demand
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Average total N input (tonnes/ha) (x1000)
>0.0 - 23
>23 - 47.6
>47.67 - 80.9
>80.9 - 127.9
>127.9 - 332.9
0
No data
Area of R2Us out of EU
Basins
Data source: KIP INCA project


Crop Pollination-POTENTIAL in floodplains
(500 years return period)
Water Purification-Demand
Flood Control-MISMATCH in floodplains
(500 years return period)
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845765
km
0 250 500
Extent of economic assets in floodplains
not protected by ecosystems (ha) (x1000)
>0.00 - 0.22
>0.22 - 0.43
>0.43 - 0.63
>0.63 - 0.82
>0.82 - 1
0
No data
Area of R2Us out of EU
Basins
Data source: KIP INCA project

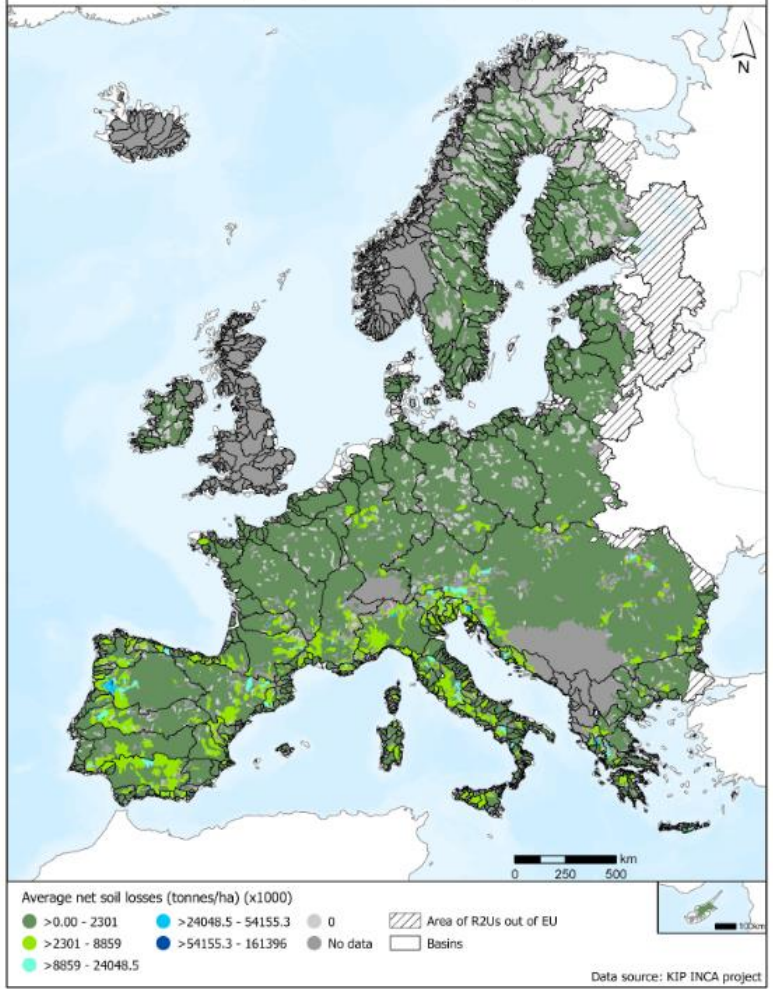
Crop Pollination-POTENTIAL in floodplains
(500 years return period)

Water Purification-Demand

Flood Control-MISMATCH in floodplains
(500 years return period)



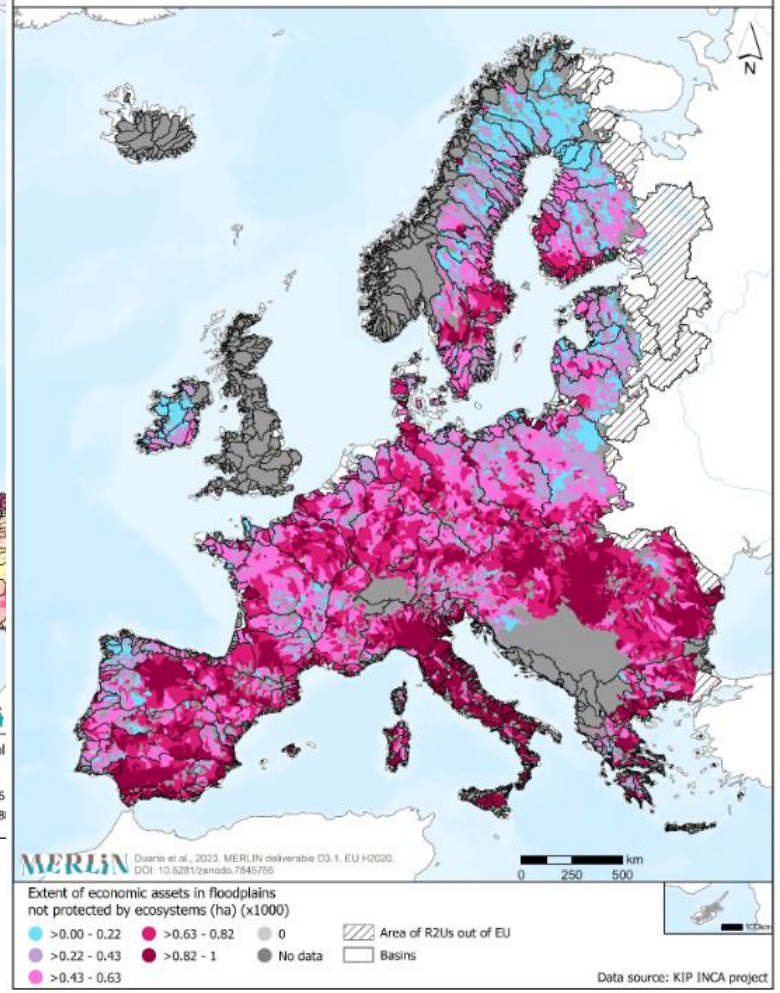
Soil Retention -MISMATCH in floodplains
(500 years return period)



Crop Pollination-POTENTIAL in floodplains
(500 years return period)

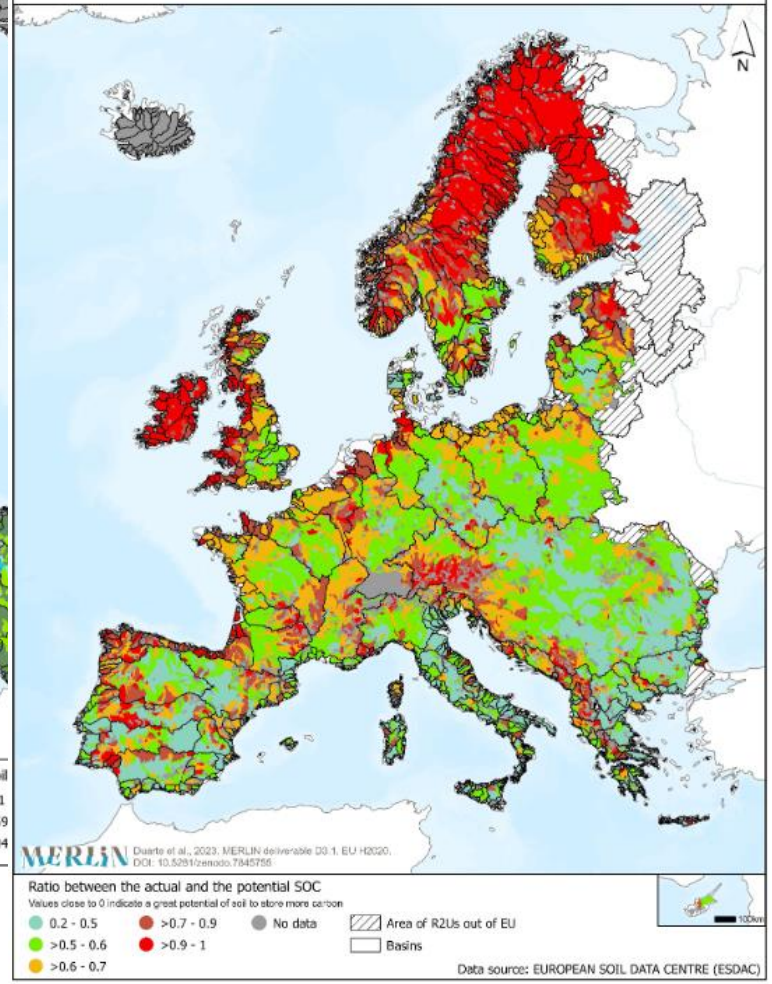
Water Purification-Demand

Flood Control-MISMATCH in floodplains
(500 years return period)



Soil Retention -MISMATCH in floodplains
(500 years return period)

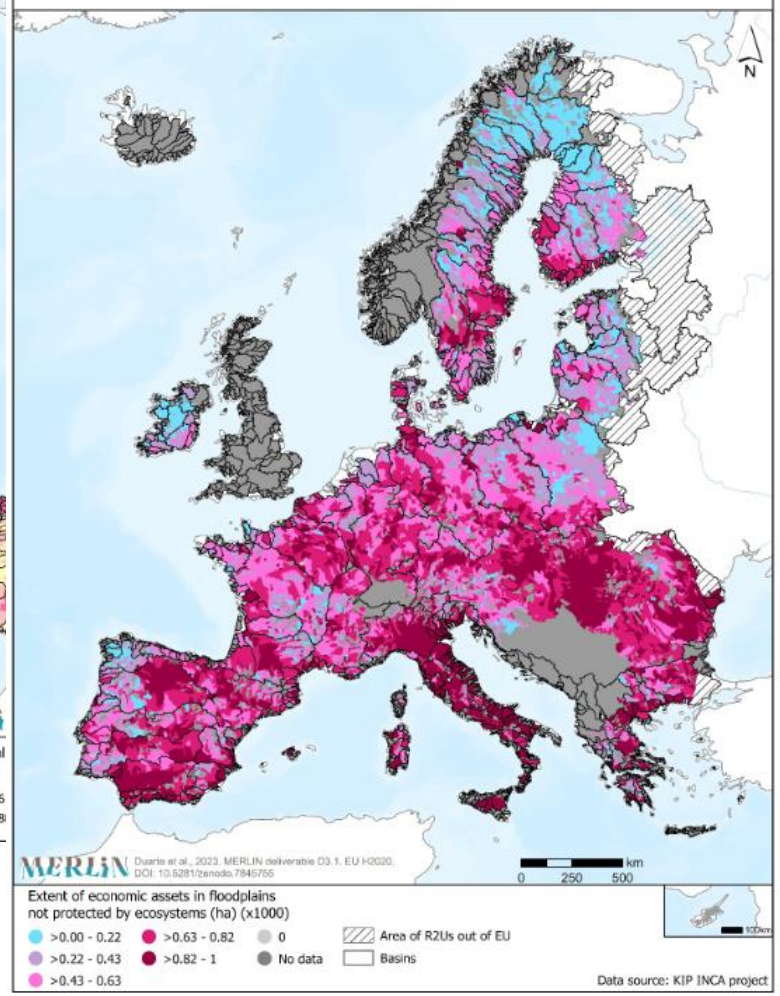
Soil Organic Carbon (SOC)-Saturation Capacity
in floodplains (500 years return period)



Crop Pollination-POTENTIAL in floodplains
(500 years return period)

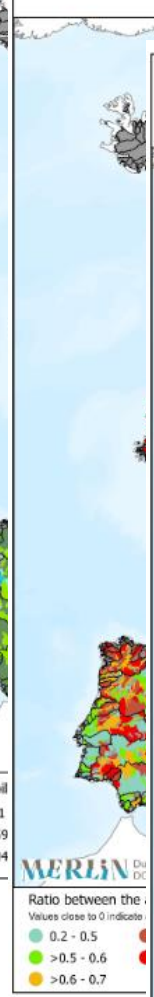
Water Purification-Demand

Flood Control-MISMATCH in floodplains
(500 years return period)

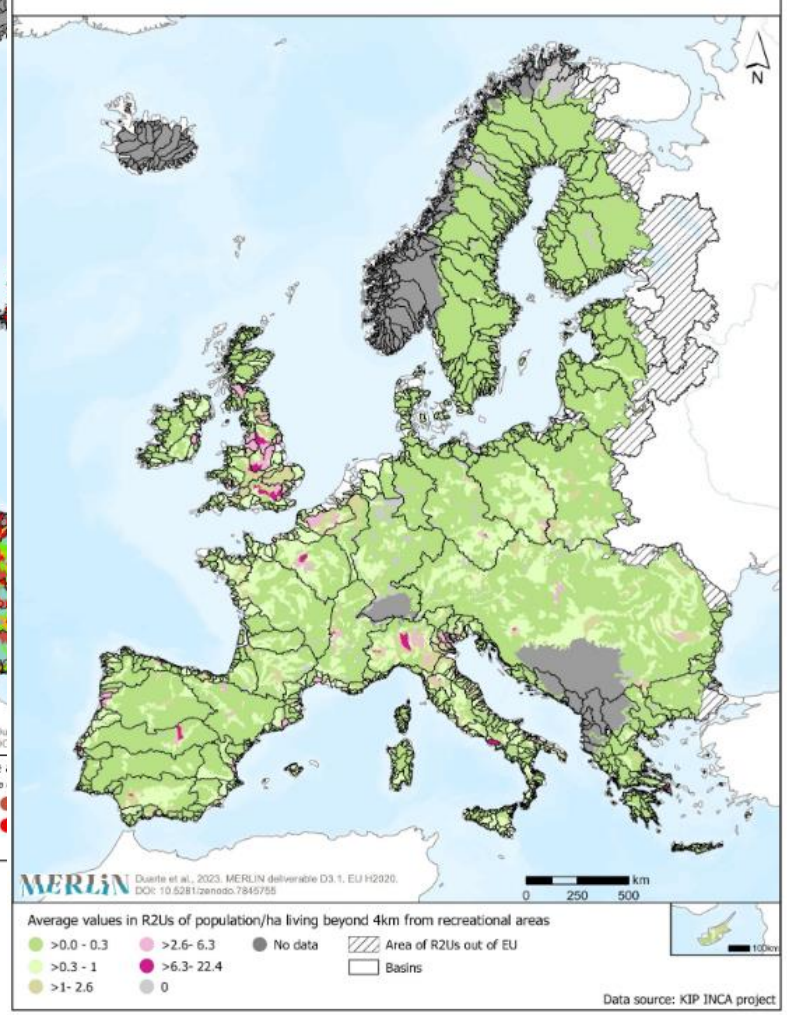


Soil Retention -MISMATCH in floodplains
(500 years return period)

Soil Organic Carbon (SOC)-Saturation Capacity
in floodplains (500 years return period)

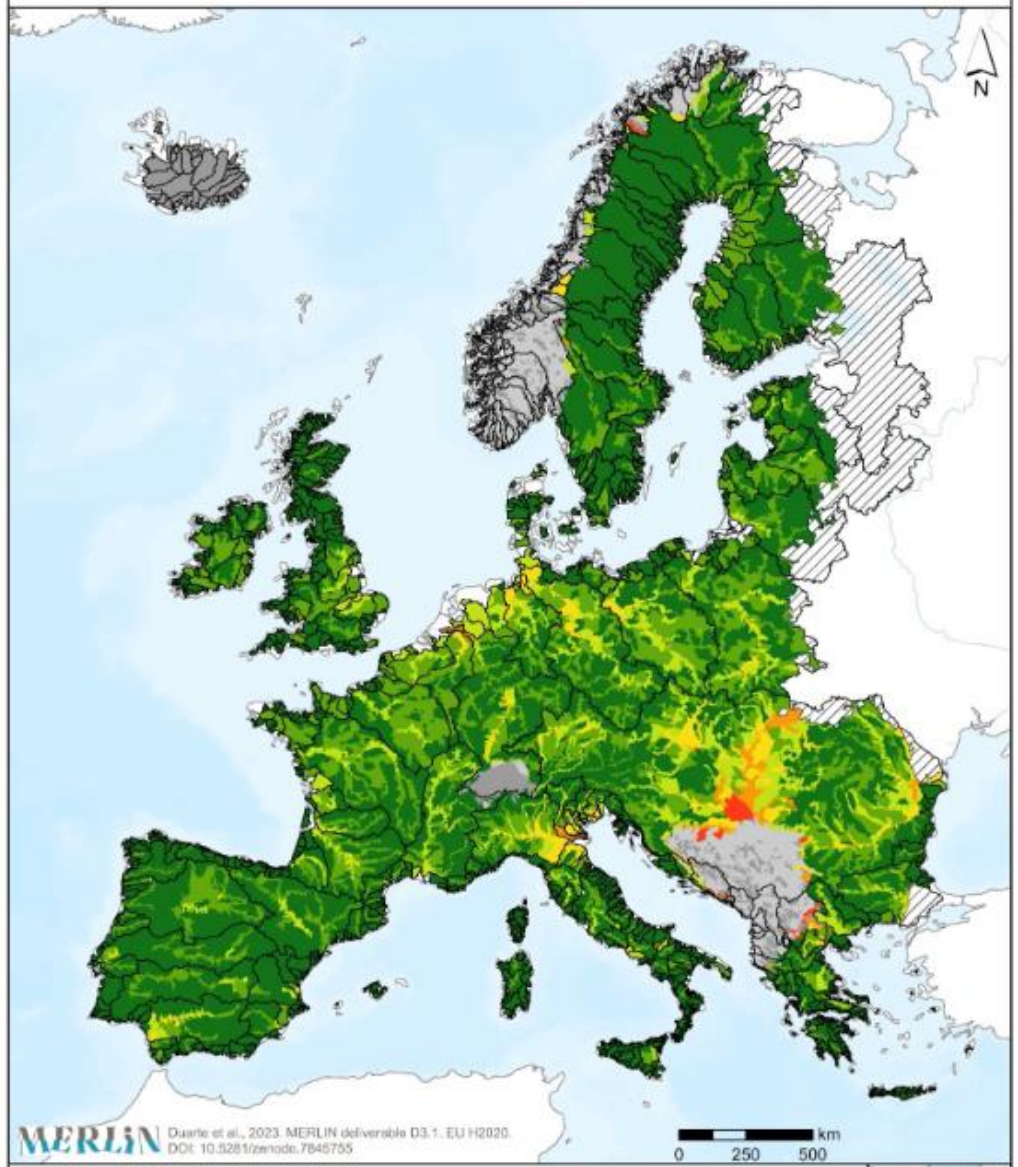


Nature-Based Recreation - Unmet Demand

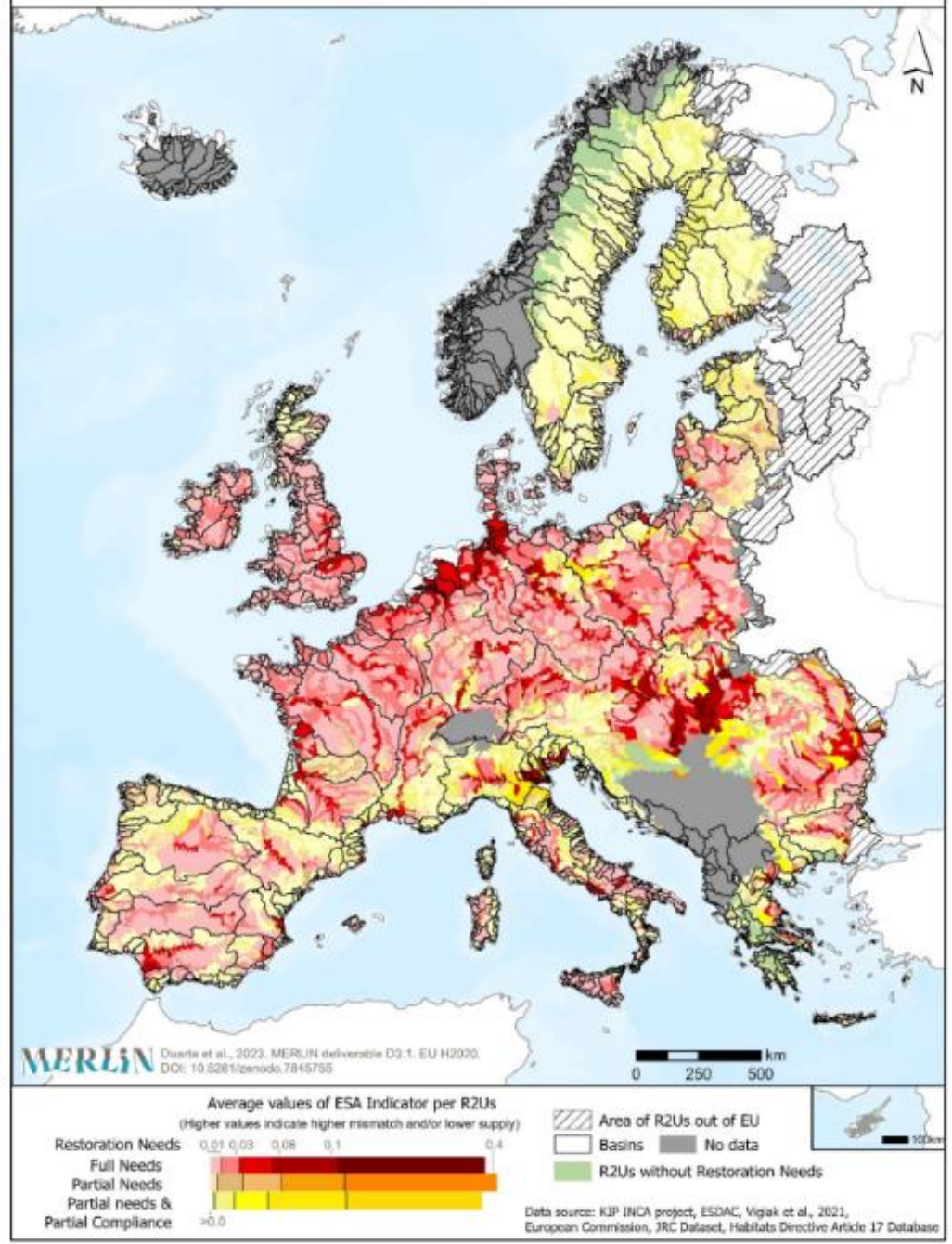


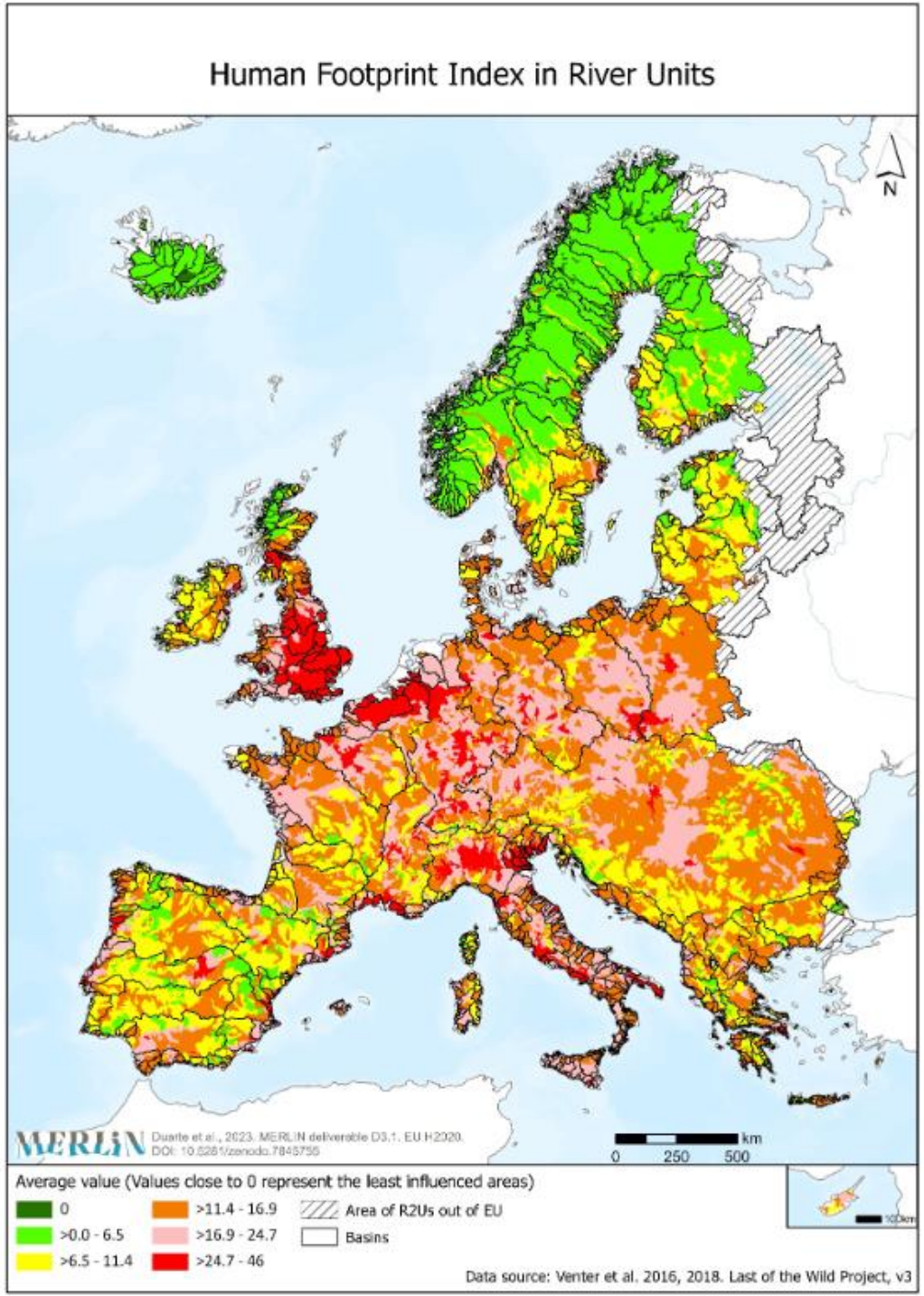

Ecosystem Services Assessment Indicator
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Average values per R2U
Higher values indicate higher mismatch and or lower the supply
>0.00 - 0.011
>0.011 - 0.036
>0.036 - 0.083
>0.083- 0.173
>0.173- 0.338
>0.338 - 0.693
No data
1 ES
Area of R2Us out of EU
Basins
Data source: KIP INCA project, ESDAC

Ecosystem Services Assessment Indicator

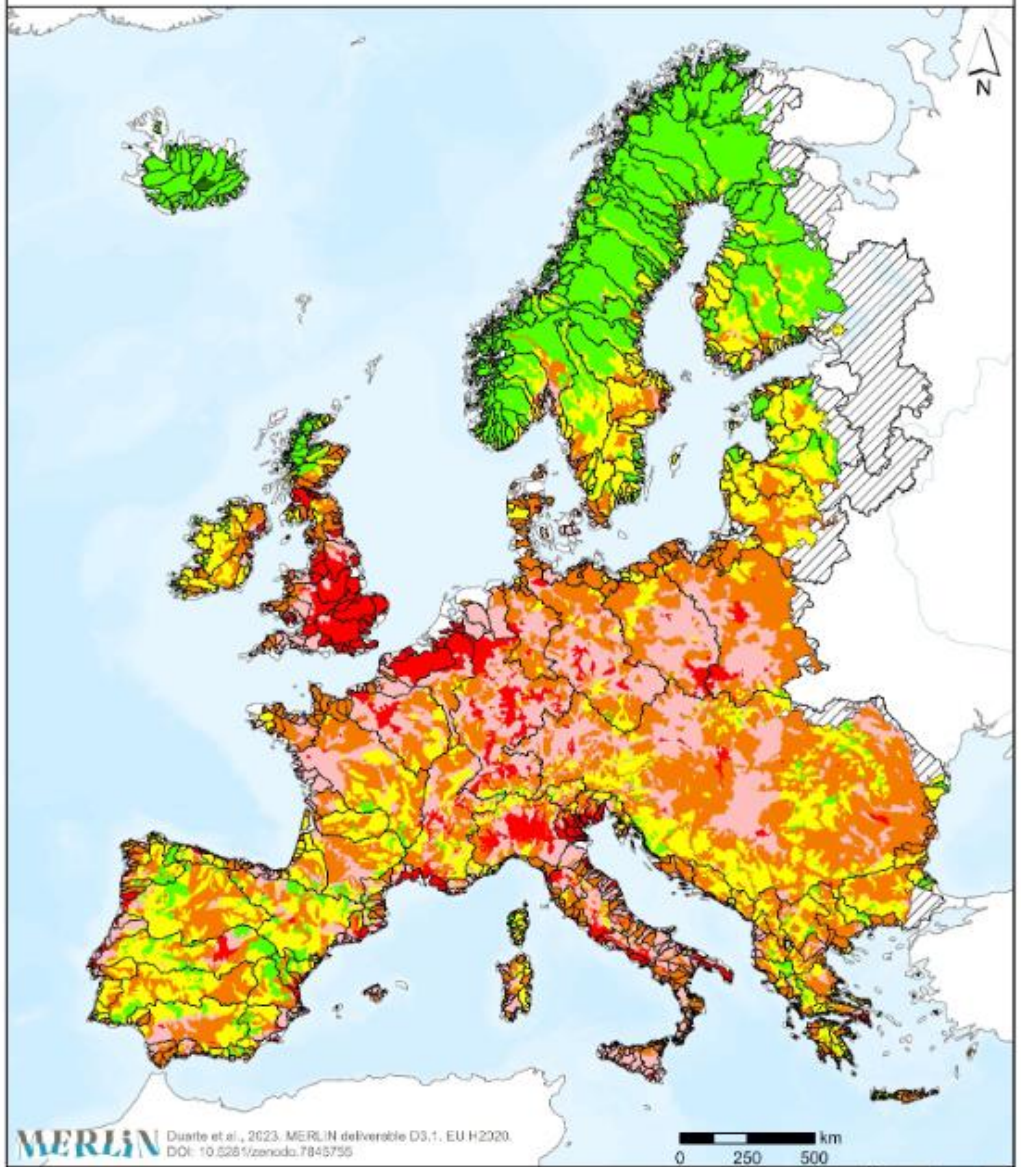


Ecosystem Services Assessment Indicator - Restoration Needs

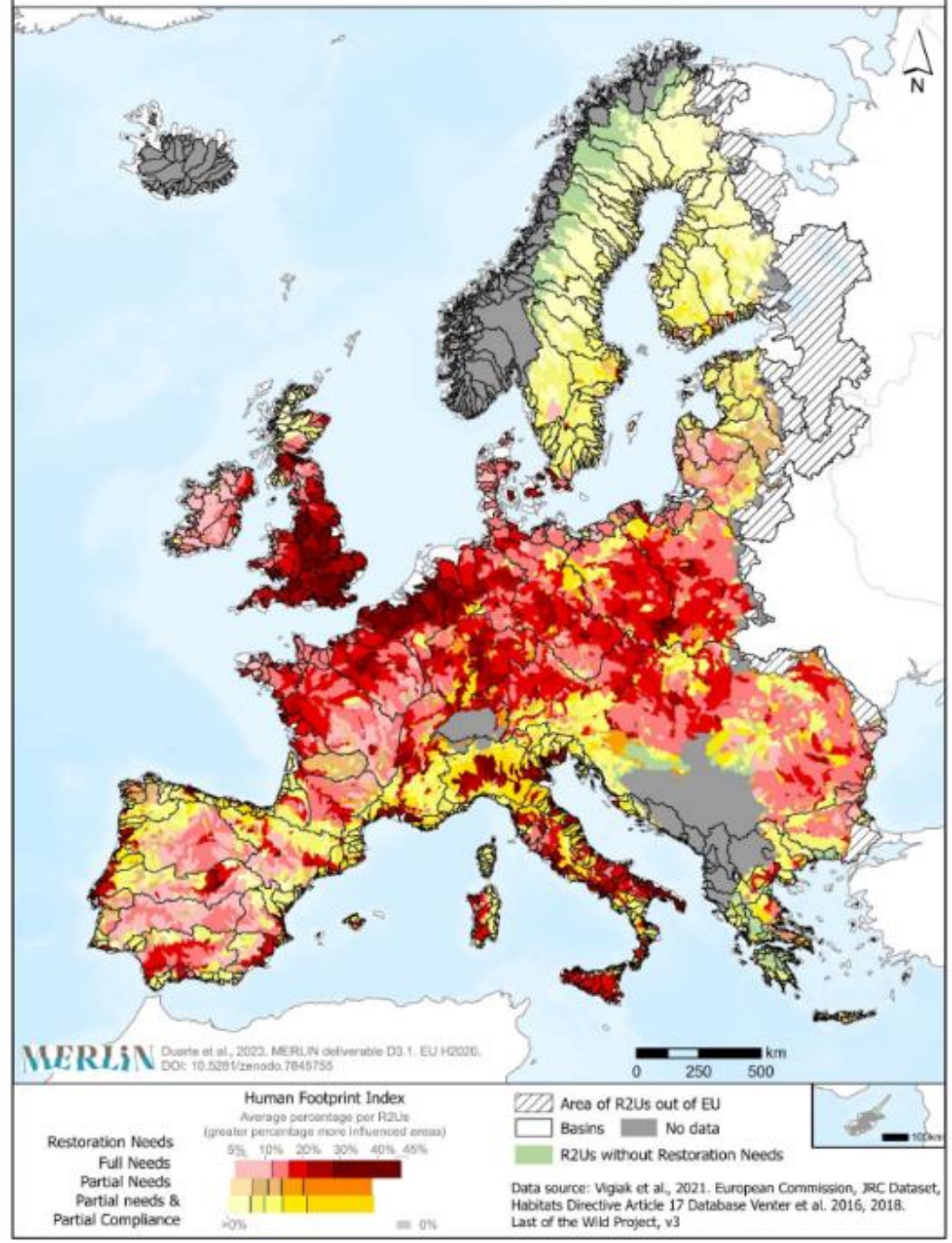



Human Footprint Index in River Units
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0
250
500
Average value (Values close to 0 represent the least influenced areas)
0
>0.0 - 6.5
>6.5 - 11.4
>11.4 - 16.9
>16.9 - 24.7
>24.7 - 46
Area of R2Us out of EU
Basins
Data source: Venter et al. 2016, 2018. Last of the Wild Project, v3

Human Footprint Index in River Units

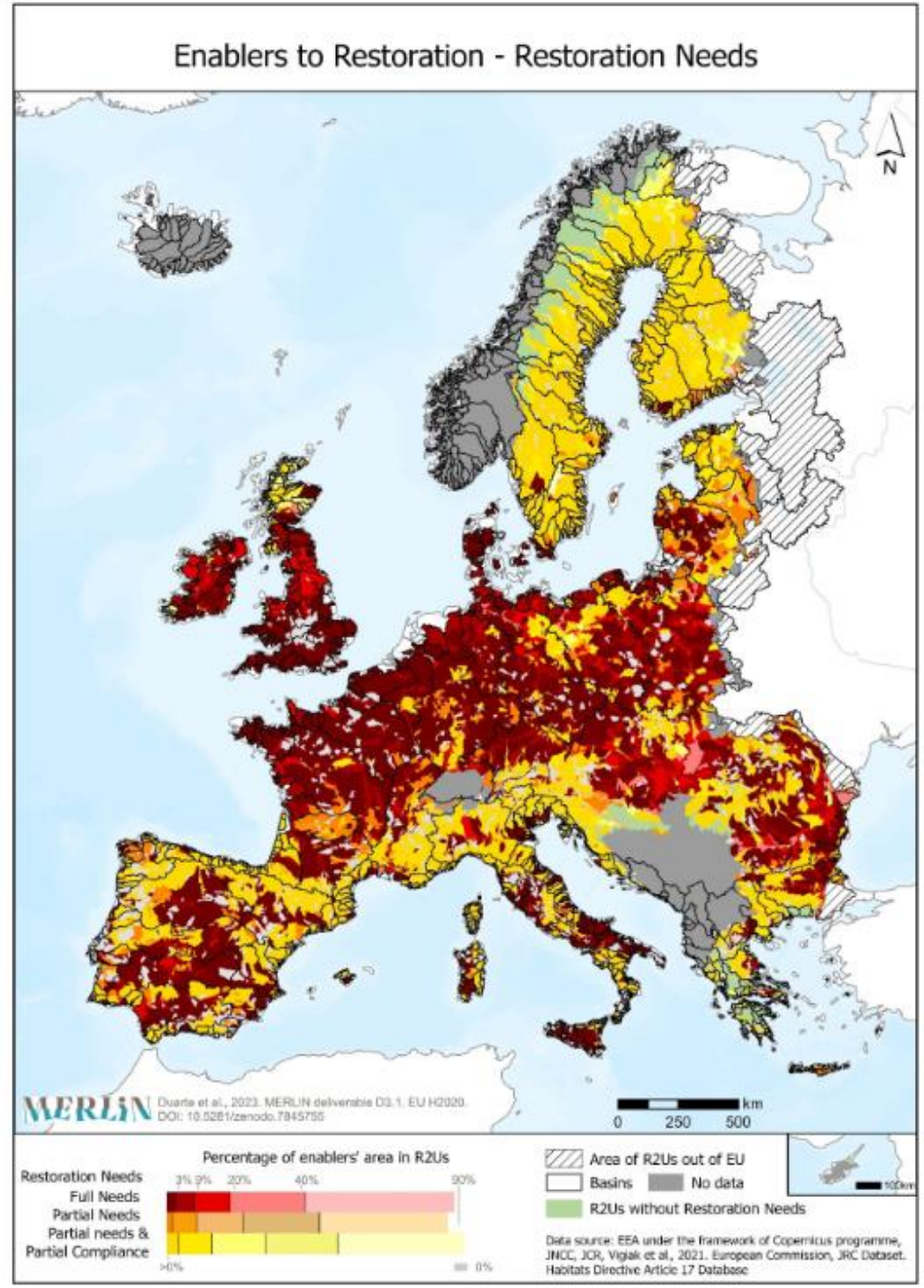


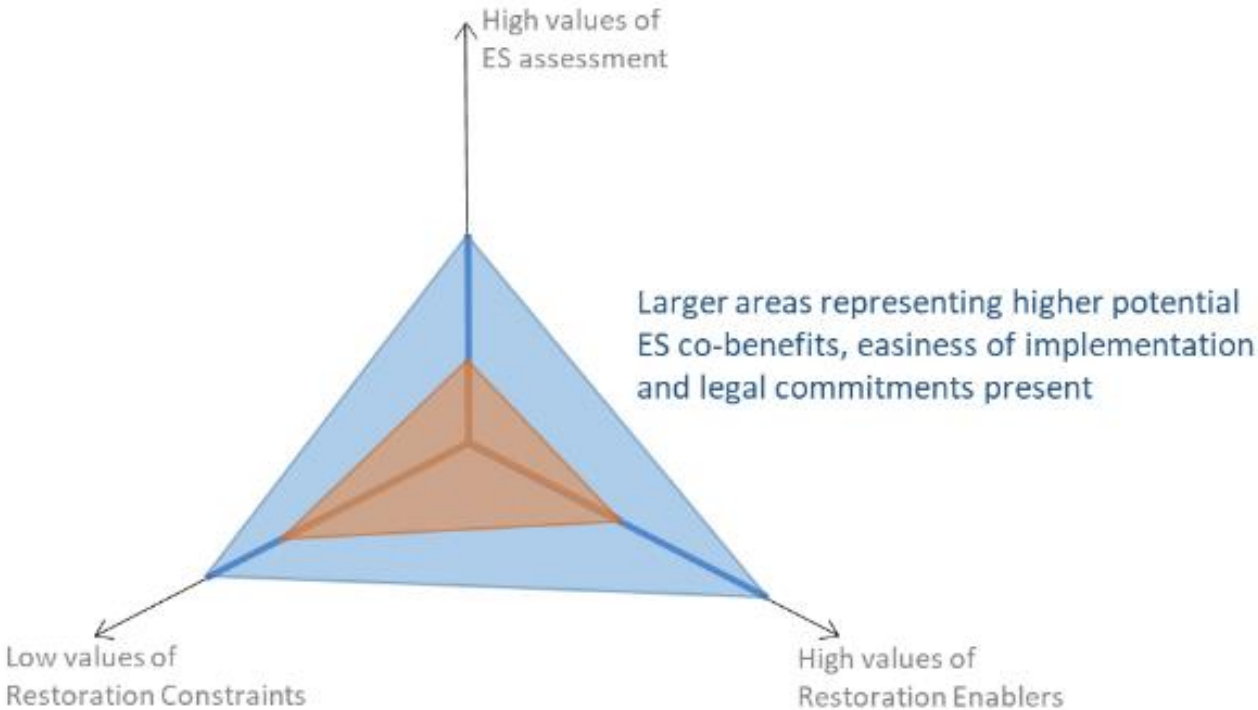
Human Footprint Index - Restoration Needs

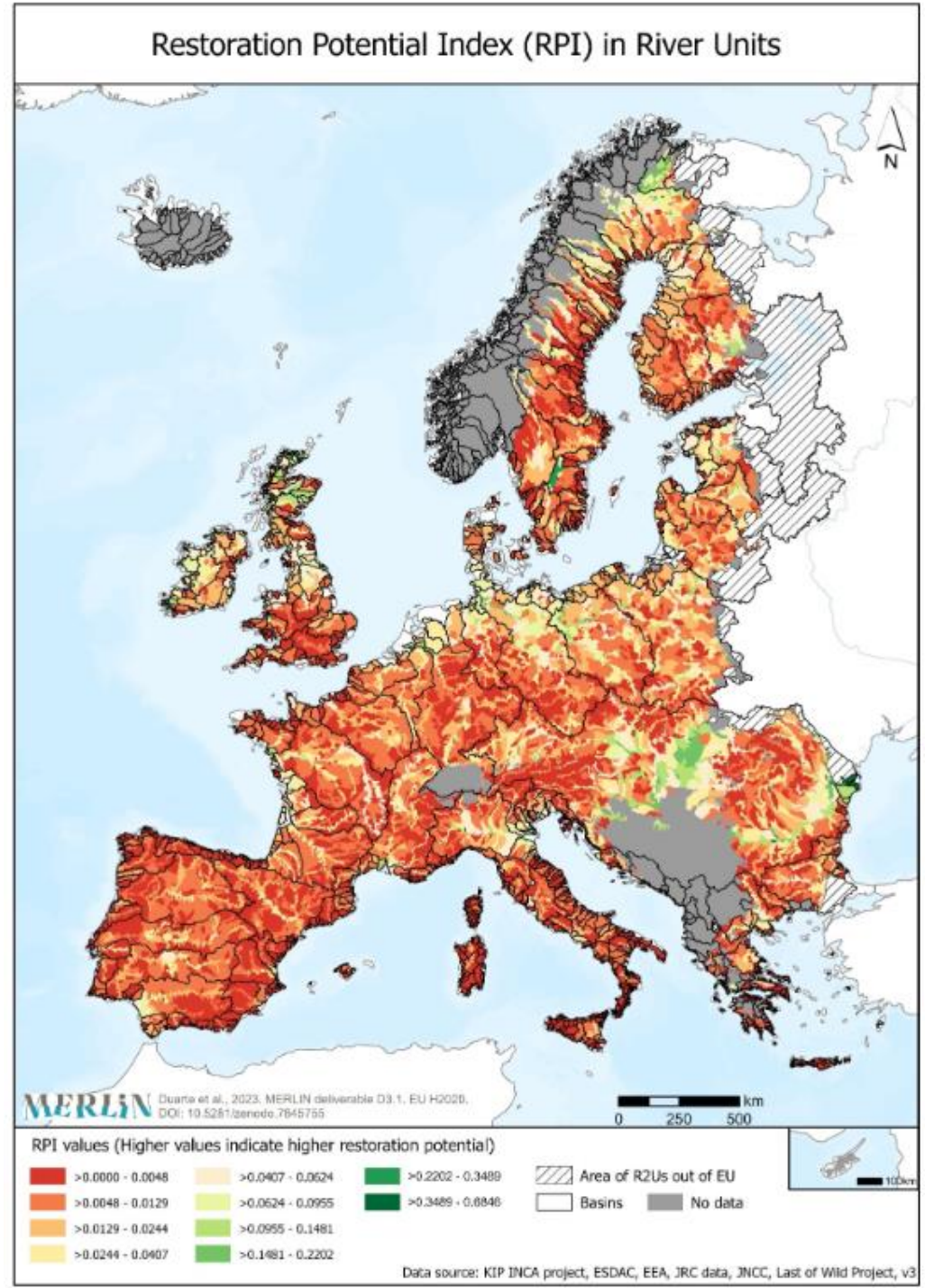



Percent area covered by enablers in River Units
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0
250
500
Percentage of enablers area
>0.00 - 4
>4 - 13.4
>13.4 - 30.5
>30.5 - 56.7
>56.7 - 96.5
0
No data
Area of R2Us out of EU
Basins
Data source: EEA under the framework of Copernicus programme, JNCC, JCR


Percent area covered by enablers in River Units
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Percentage of enablers area
>0.00 - 4
>4 - 13.4
>13.4 - 30.5
>30.5 - 56.7
>56.7 - 96.5
0
No data
Area of R2Us out of EU
Basins
Data source: EEA under the framework of Copernicus programme, JNCC, JCR

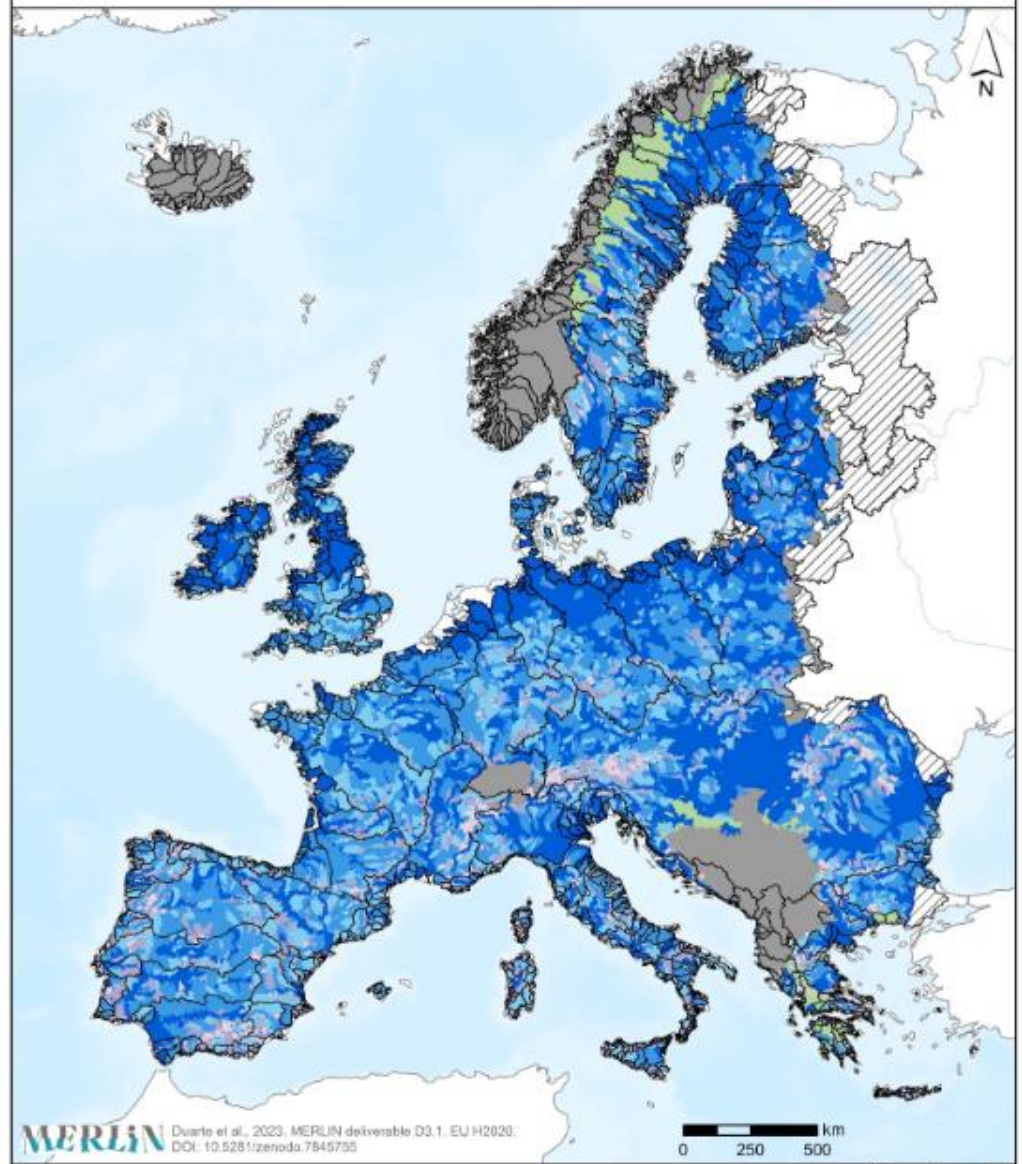

Enablers to Restoration - Restoration Needs
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
Percentage of enablers' area in R2Us
Restoration Needs
Full Needs
Partial Needs
Partial needs & Partial Compliance
3% 9% 20% 40% 90%
>0%
0%
Area of R2Us out of EU
Basins
No data
R2Us without Restoration Needs
Data source: EEA under the framework of Copernicus programme, JNCC, JCR, Vigiak et al., 2021. European Commission, JRC Dataset. Habitats Directive Article 17 Database


High values of
ES assessment
Larger areas representing higher potential
ES co-benefits, easiness of implementation
and legal commitments present
Low values of
Restoration Constraints
High values of
Restoration Enablers


Restoration Potential Index (RPI) in River Units
N
MERLIN
Duarte et al., 2023. MERLIN deliverable D3.1. EU H2020.
DOI: 10.5281/zenodo.7845755
km
0 250 500
RPI values (Higher values indicate higher restoration potential)
>0.0000 - 0.0048
>0.0048 - 0.0129
>0.0129 - 0.0244
>0.0244 - 0.0407
>0.0407 - 0.0624
>0.0624 - 0.0955
>0.0955 - 0.1481
>0.1481 - 0.2202
>0.2202 - 0.3489
>0.3489 - 0.6846
Area of R2Us out of EU
Basins
No data
Data source: KIP INCA project, ESDAC, EEA, JRC data, JNCC, Last of Wild Project, v3

Necessidades e potencial de restauro de sistemas de água doce na Europa

Ranked Restoration Potential in River Units with Restoration Needs



- As necessidades de restauro são constantes em toda a EU

- As mudanças climáticas futuras, incluindo mudanças hidrológicas, vão agravar as diferenças observadas

- A fragmentação imposta por barreiras transversais pode afetar os esforços de restauro

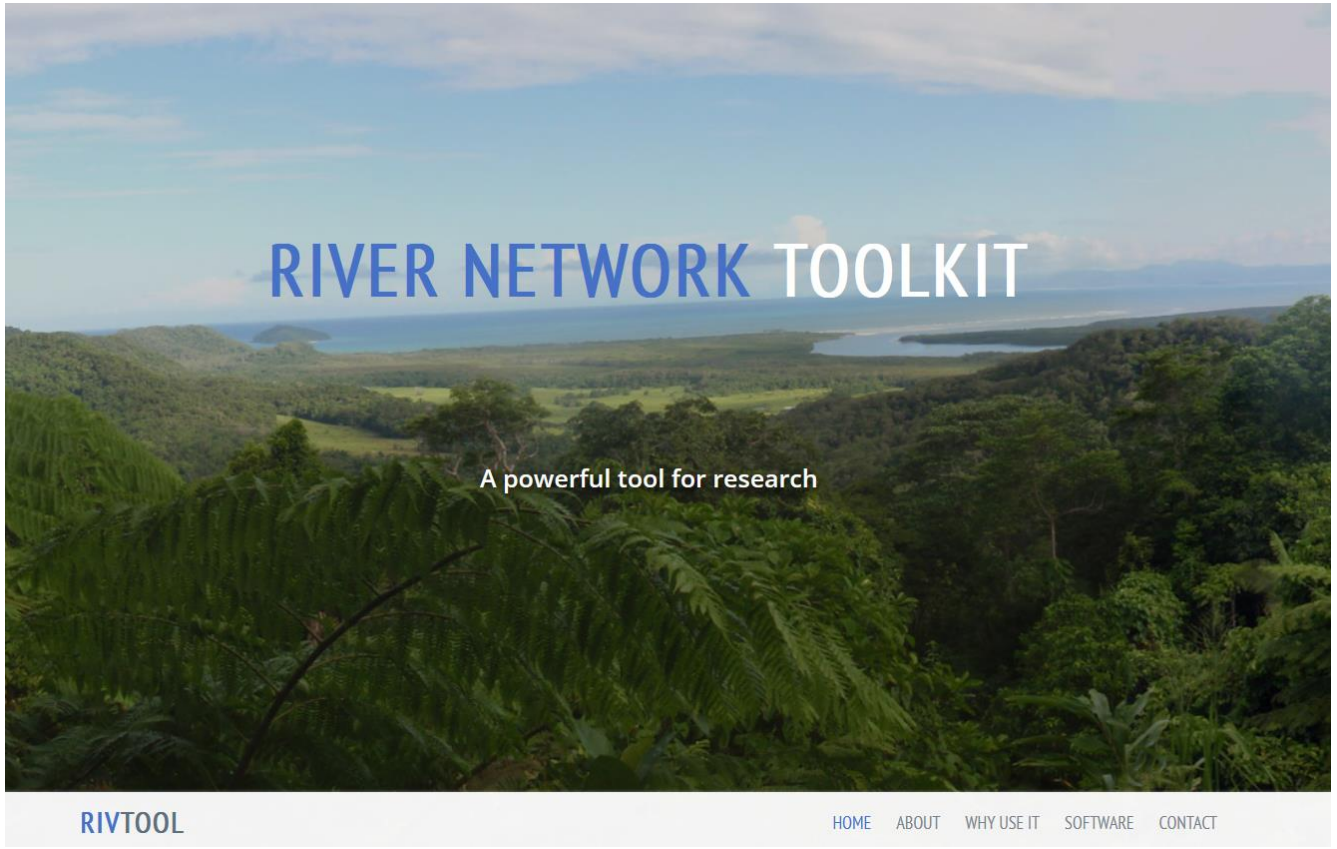
- As áreas altamente urbanizadas, com baixo missmatch de ES e menos áreas N2K terão um menor potencial de restauro.

- As áreas de necessidade de restauro com disponibilidade de água e localizadas fora de áreas altamente urbanizadas tendem a ter um maior potencial.

- As mudanças climáticas previstas terão um impacto nos recursos hídricos, que são críticos para os habitats de água doce e o status favorável das espécies e a boa qualidade ecológica.

pjbranco@isa.ulisboa.pt

Duarte G., Peponi, A., Leite, T., Faro, A., Moreno, D., Anjinho P., Segurado, P., Borgwardt, F., Baattrup-Pedersen, A., Hering, D., Birk, S., Ferreira, M.T, Branco, P., 2023. MERLIN deliverable D3.1 Screening maps: Europe-wide maps of the needs and potentials to restore floodplains, rivers, and wetlands with a range of restoration measures. EU H2020 research and innovation project MERLIN deliverable. 348 pp. https://project-merlin.eu/outcomes/deliverables.html



Duarte, G., Segurado, P., Oliveira, T., Haidvogl, G., Pont, D., Ferreira, M. T., & Branco, P. (2019). The river network toolkit–RivTool. *Ecography*, *42*(3), 549-557.

RivConnect

Duarte, G., Leite, T., Mameri, D., Segurado, P., Ferreira, M. T., & Branco, P. (2024). RivConnect. OSF. DOI 10.17605/OSF.IO/7EF9V

RivFISH Maps – Presence of freshwater fish species in European river basins

RivFish

Dammed Fish

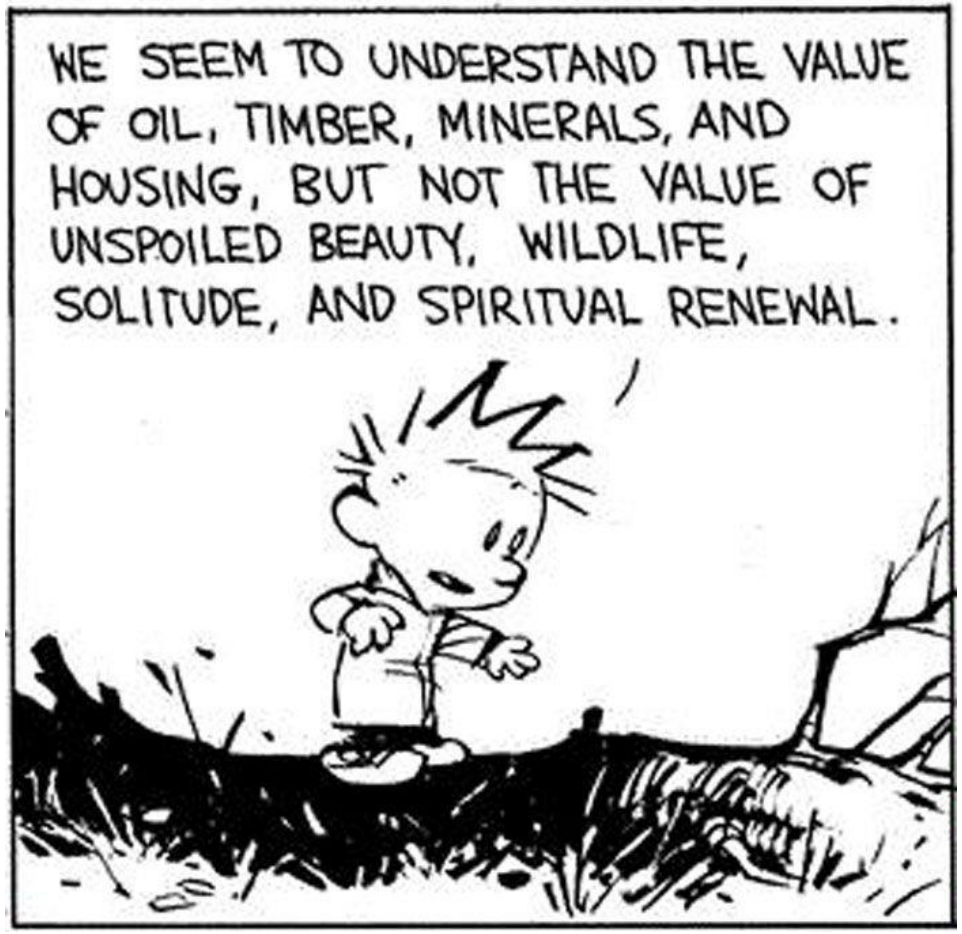
Project Dammed Fish: Impact of Structural and Functional River Network Connectivity Losses on Fish Biodiversity – Optimizing Management Solutions
(Grant number: PTDC/CTA-AMB/4086/2021, DOI: 10.54499/PTDC/CTA-AMB/4086/2021)

Mameri, D., Duarte, G., Cabo, J., Figueira, R., Segurado, P., Santos, J. M., Ferreira, M. T., & Branco, P. (2024). RivFISH Maps – Presence of freshwater fish species in European river basins (1.0). Zenodo. https://doi.org/10.5281/zenodo.13891164

Necessidades e potencial de restauro de sistemas de água doce na Europa

Paulo Branco

pjbranco@isa.ulisboa.pt



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TERRA Laboratory for sustainable land use and ecosystem services

DammedFish