



Riparian zones – A key factor in conservation efforts for terrestrial and freshwater connectivity

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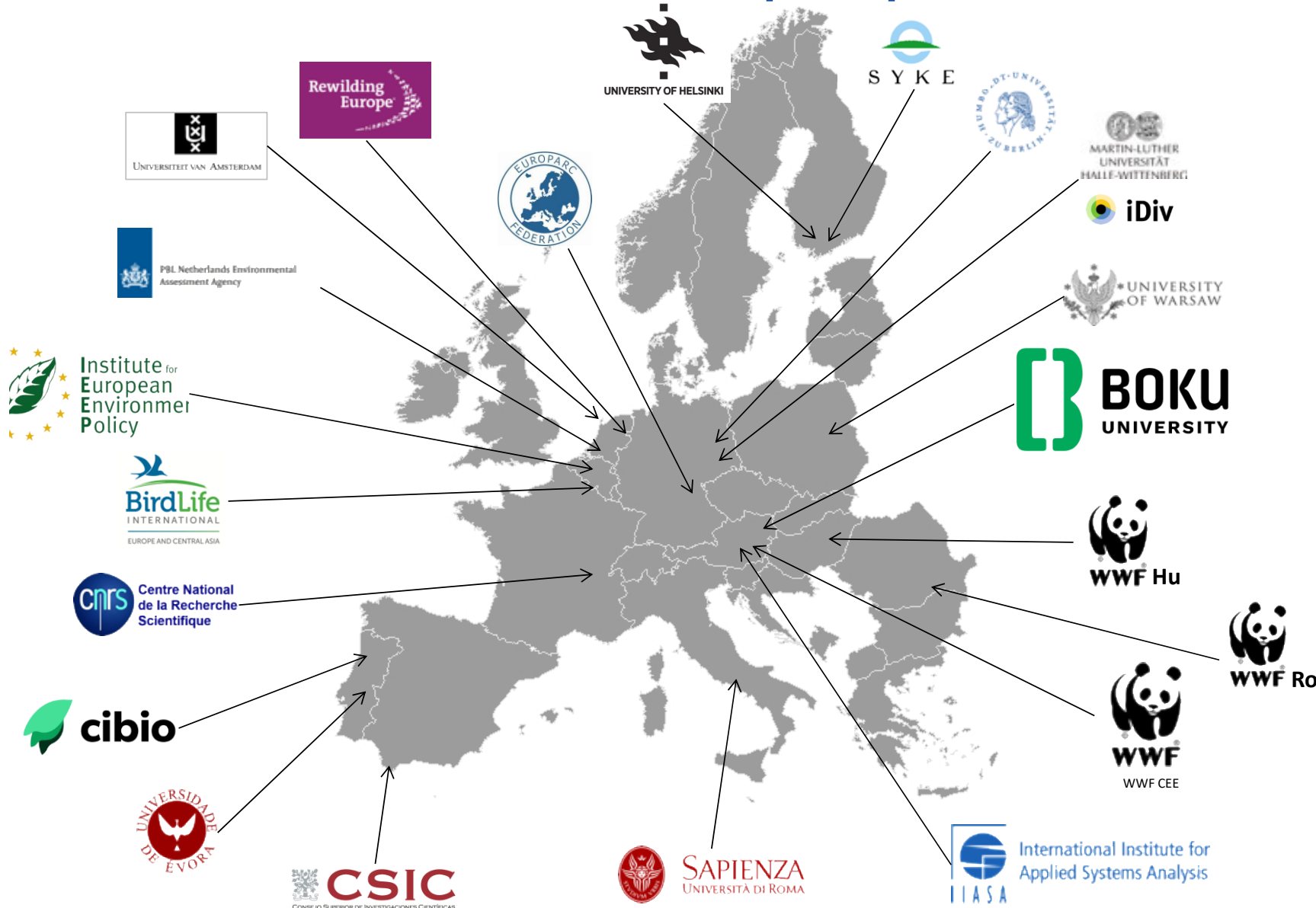
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Piero Visconti, Project Coordinator, IIASA

Henrique Pereira & Nestor Fernandez, Co-Coordinators, iDiv



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D6.1 Guidelines for connectivity conservation and planning in Europe with supporting web-based inventory and databases

Connectivity is an integral component of protected area planning in Europe

Understanding and distinguishing between different connectivity concepts and approaches is vital

Connectivity goals are being featured prominently in several recent global and EU policy instruments

Comprehensive assessments providing a pan-European overview of connectivity implementation gaps and needs are limited



Case Study: Danube-Carpathian Region (DCR)

- **Scope**

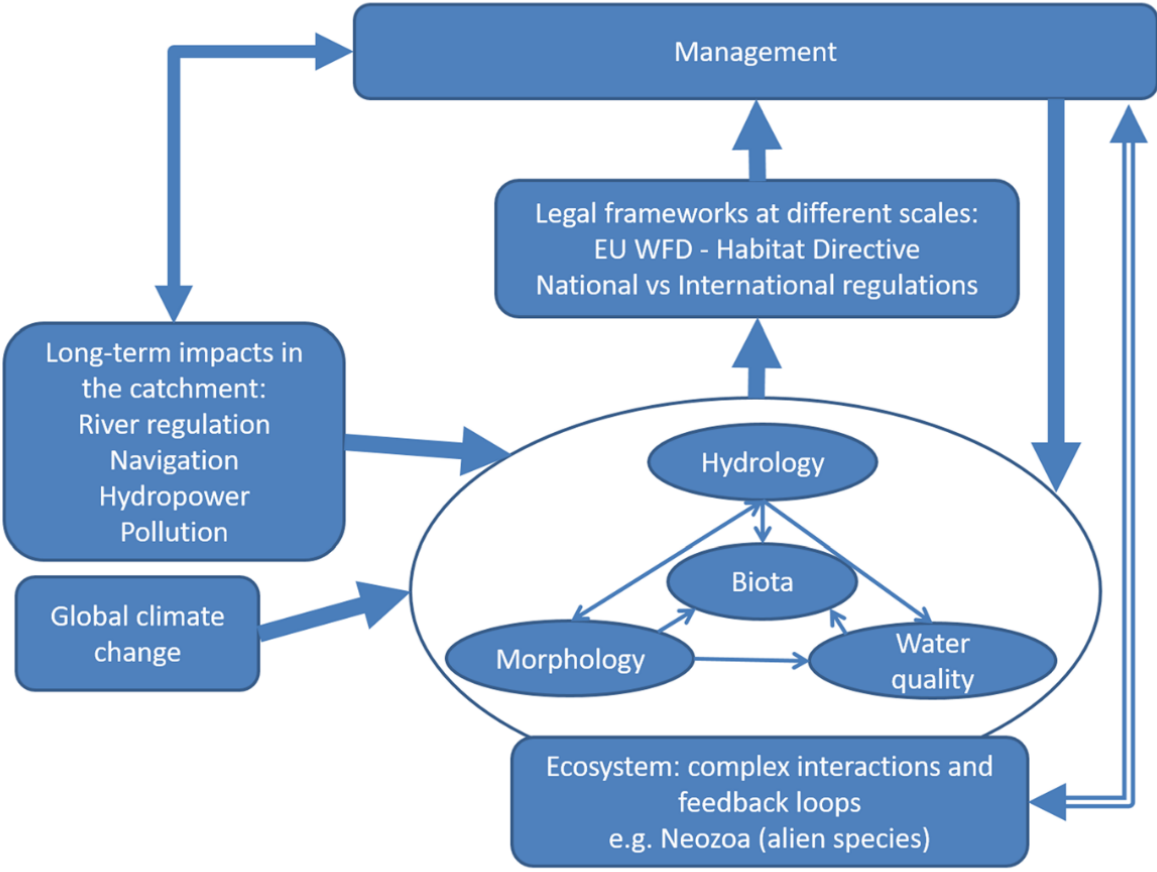
- Connectivity across realms and across national borders
- Green and blue infrastructure planning

Twenty countries (11 EU/9 non-EU) in a cross-border region

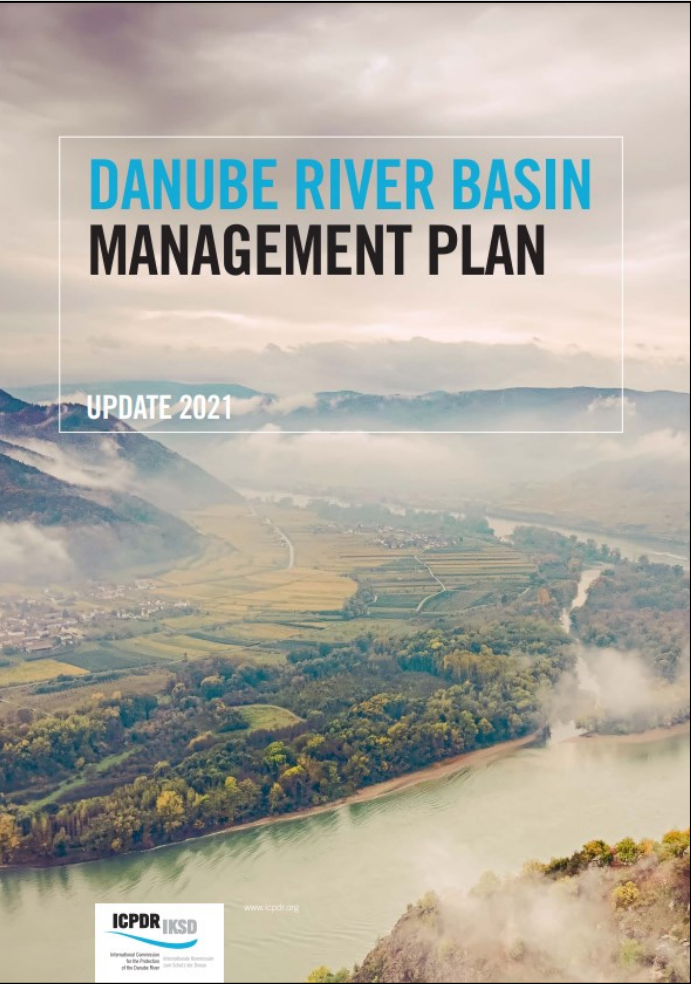
Area of 839,140 km² (26% Carpathian Region; 96% Danube catchment).



Management challenges in the Danube River Basin



Management challenges in the Danube River Basin; Hein et al., 2019, River Research and Applications



ICPDR: „Ecological Prioritisation Approach for River and Habitat Continuity Restoration“

Criteria	Rating
1. Migratory habitat	
- Long-distance migrants habitat (Danube)	4
- Long-distance migrants habitat (tributary)	2
- Medium-distance migrants habitat	1
- Short-distance migrants habitat (head waters)	0
2. River Segment	
- First river segment in Danube	4
- First river segment upstream of mouth (tributary)	4
- Second river segment upstream of mouth	2
- Third river segment upstream	1
- River segments upstream of third river segment	0
3. Length of reconnected habitat (Danube/tributary)	
- >100 km / >50 km (tributary)	2
- 40-100 km / 20-50 km (tributary)	1
- <40 km / <20 km (tributary)	0
4. Protected site	
- Yes	1
- No	0
5. Pressures	
- 0 pressures	3
- 1 pressure	2
- 2 pressures	1
- 3 pressures	0

Lateral connectivity? Biodiversity?



The ecological prioritisation approach (Part A) is not meant to substitute the similar national approaches, but to outline the basin-wide perspective. Low restoration priority indicated on the basin-wide level does not imply that no measures should be undertaken on the national level, as all fish species need open river continuity. On the other hand, ecological prioritisation is only one of the many aspects in deciding which measures to adopt and implement. Final decision will be taken at the national level.

This ICPDR product is based on national information provided by the Contracting Parties to the ICPDR (AT, BA, BG, CZ, DE, FR, HU, MD, ME, RO, RS, SI, SK, UA) and CH. EuroGlobalMap data from EuroGeographics was used for all national borders except for AL, BA, ME where the data from the ESRI World Countries was used; Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as elevation data layer; data from the European Commission (Joint Research Center) was used for the outer border of the DRBD of AL, IT, ME and PL.

www.icpdr.org

ICPDR IKSD

Case Study: Danube-Carpathian Region

Science-based, strategic nature conservation planning approach

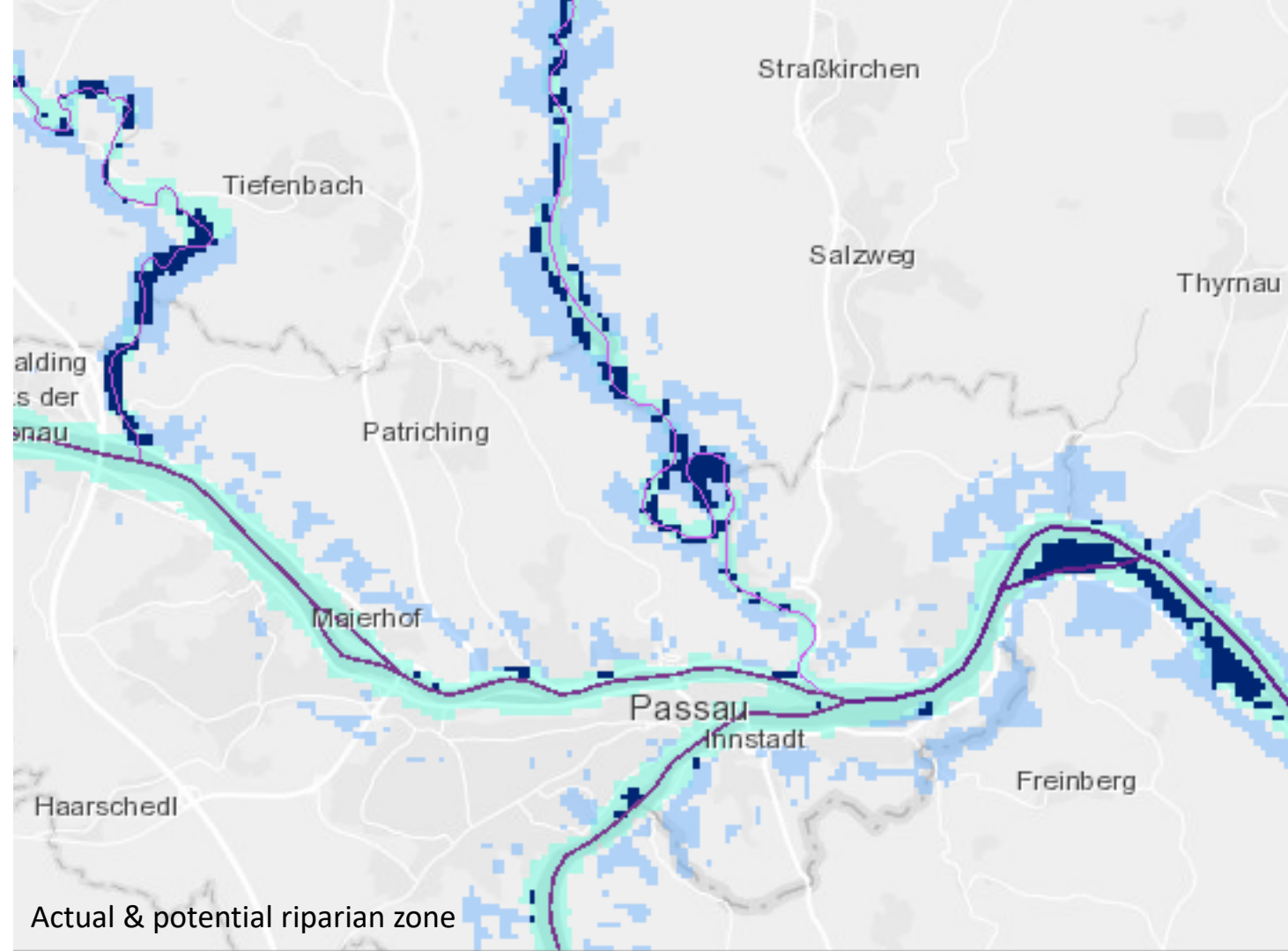
- **Data integration:** GIS-database for Danube-Carpathian Region
- **Conduct integrative, catchment-scale analyses** of pressures, biodiversity/conservation needs, protected areas, and connectivity

→ **Adopt & extend the ICPDR prioritisation approach for continuity restoration** to the lateral dimension

→ **Support integrated management and planning of ecological connectivity and biodiversity across realms**

Riparian zones

- Transitional areas between land and freshwater ecosystems
- Distinctive hydrology, soil and biotic conditions
- Strongly influenced by river water but also land use in surrounding catchments
- Provide wide range of riparian functions & ecosystem services (as e.g. shown by Funk et al. 2019)
- Important for the objectives of several European legal acts:
 - Biodiversity Strategy 2020
 - Habitats and Birds Directive
 - Water Framework Directive



Copernicus Land Monitoring Service - Local Component: Riparian Zones

2. Delineation of Riparian Zones

Delineation of potential and actual riparian zones:

- derived by hydrological modelling from various geo-data and earth observation imagery
- potential riparian zone: characterised by natural potential only; un-influenced by actual land use
- actual riparian zone: restricted by actual land use
- equivalent scale: 1:50,000

Questions to be addressed in the Danube-Carpathian Region (DCR)

- How well is the DCR covered by nature protection areas?
- Where are **biodiversity hotspots** related to freshwater and wetlands in the DCR? How are these hotspots connected?
- What are the **main pressures** on the freshwater and wetland species and habitats in the DCR?
- Which parts of the DCR should be protected/restored for biodiversity?

Datasets reported under Art.17 & 12 of the EU Habitats- and Birds-Directive

Spatial datasets

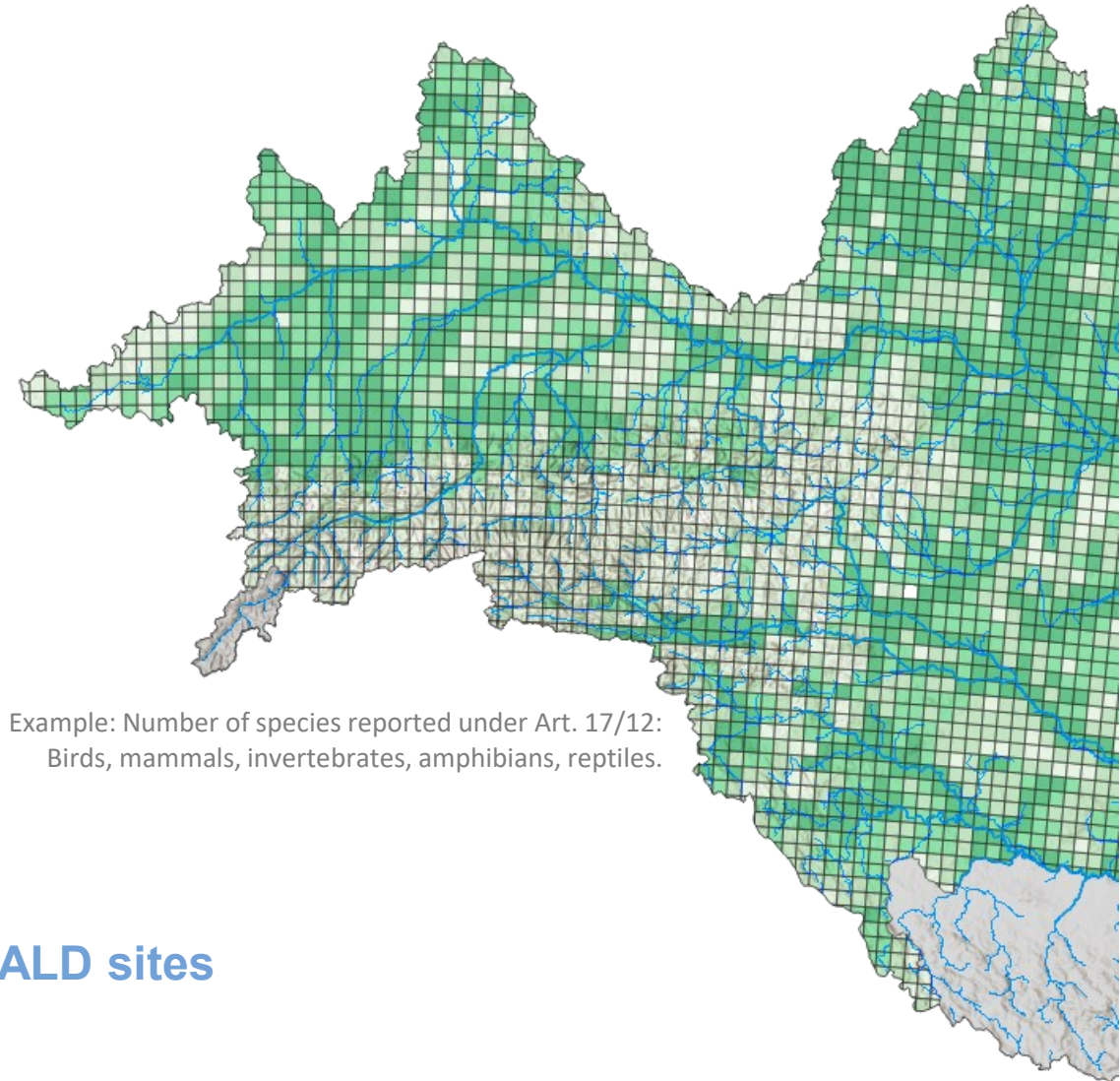
- Habitats (Habitats Directive)
- Species (Habitats and Birds Directive)
- Spatial resolution: 10 x 10km
Extent: European Union

Tabular datasets

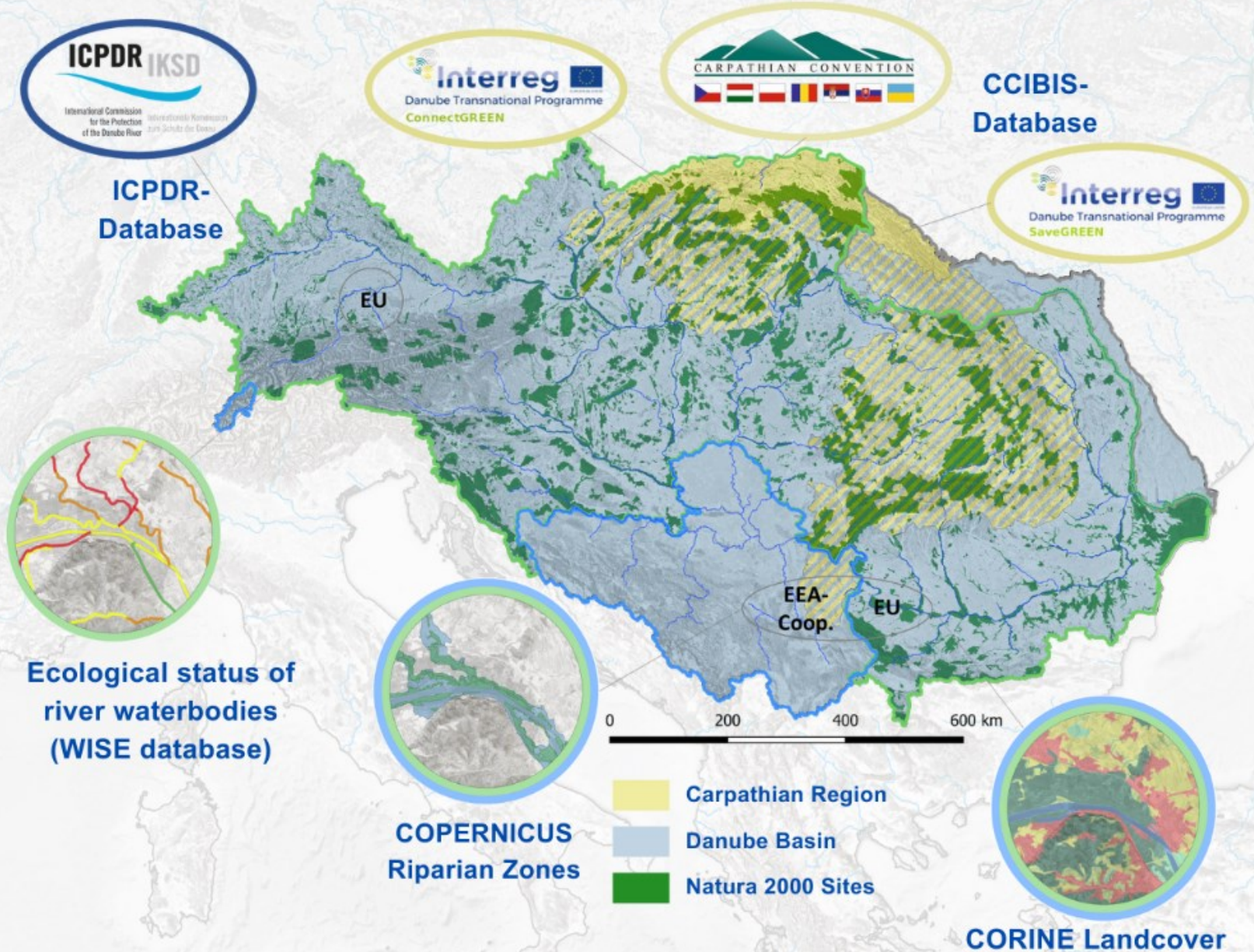
- Conservation status of species and habitats
- Pressures

Spatial resolution: countries/bioregions

“Alternative” for areas outside of EU-territory: EMERALD sites



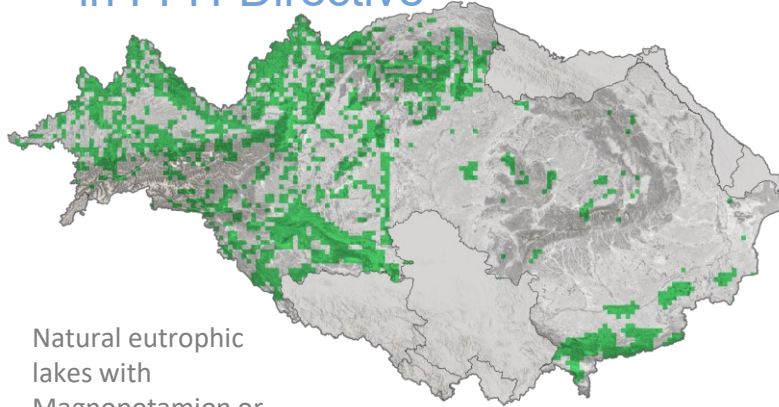
Integration of data sources



Overall, 3,823 N-2000 sites provide information about the occurrence of protected species and habitats

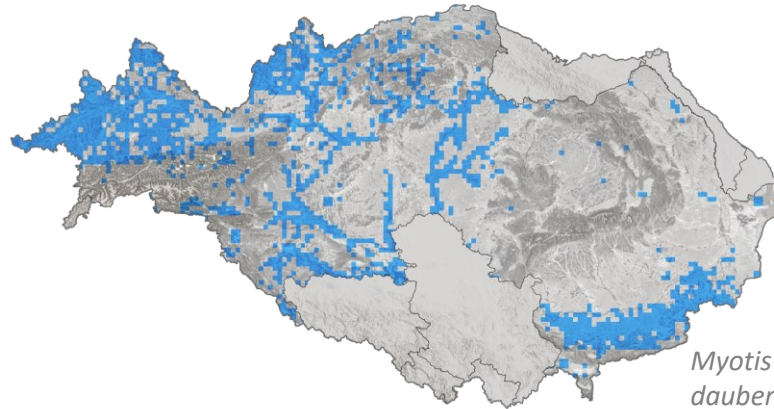
Selection and grouping of species and habitats

33 habitats listed
in FFH-Directive



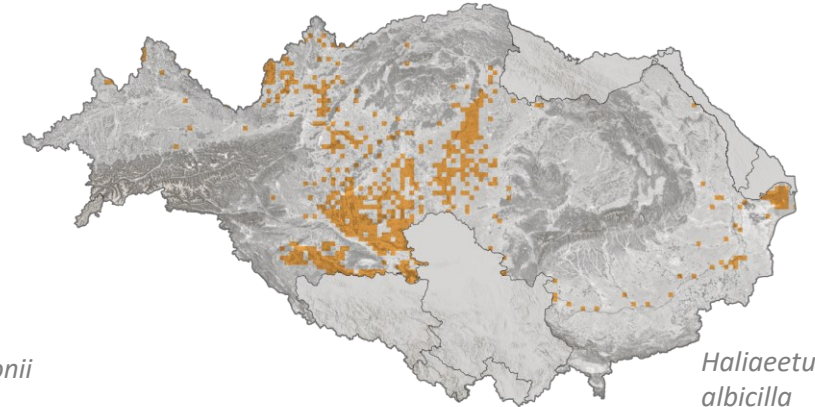
Natural eutrophic
lakes with
Magnopotamion or
Hydrocharition - type
vegetation

160 species listed
in FFH-Directive



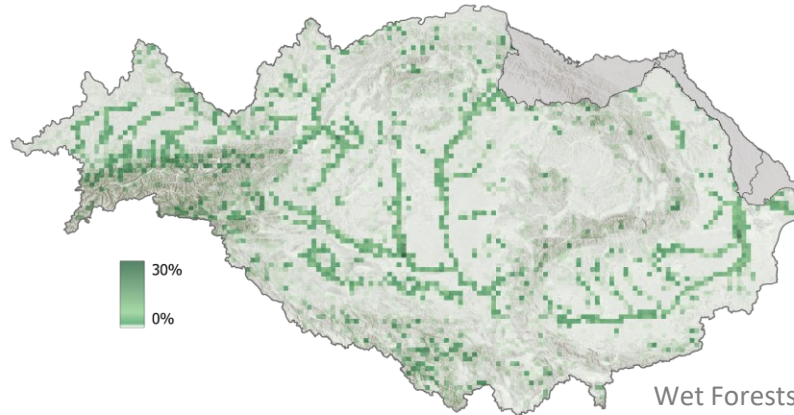
*Myotis
daubentonii*

118 species listed in
Birds-Directive

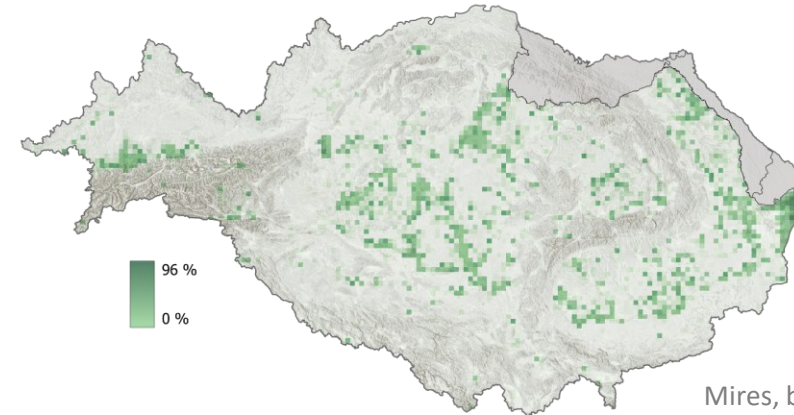


*Haliaeetus
albicilla*

Area covered by 5 habitat categories (extended wetland ecosystem layer 2018)



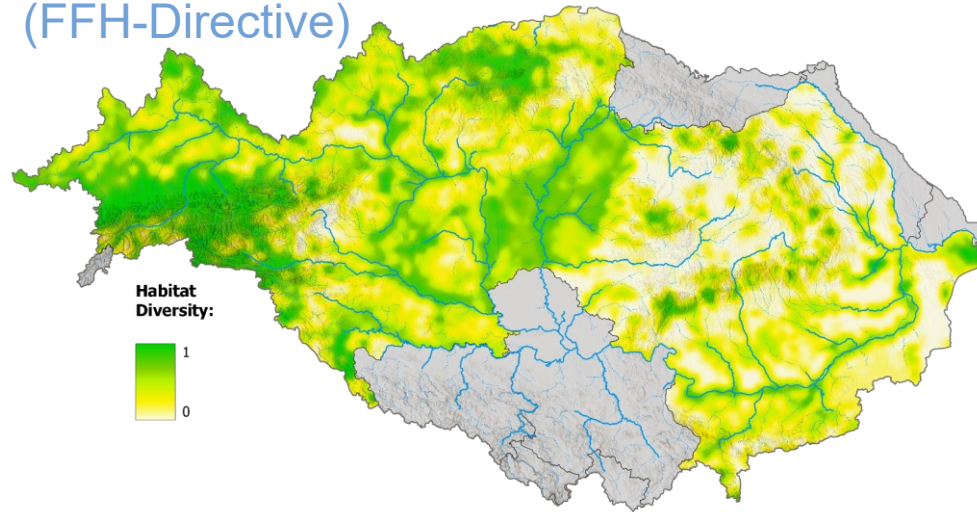
Wet Forests



Mires, bogs and fens

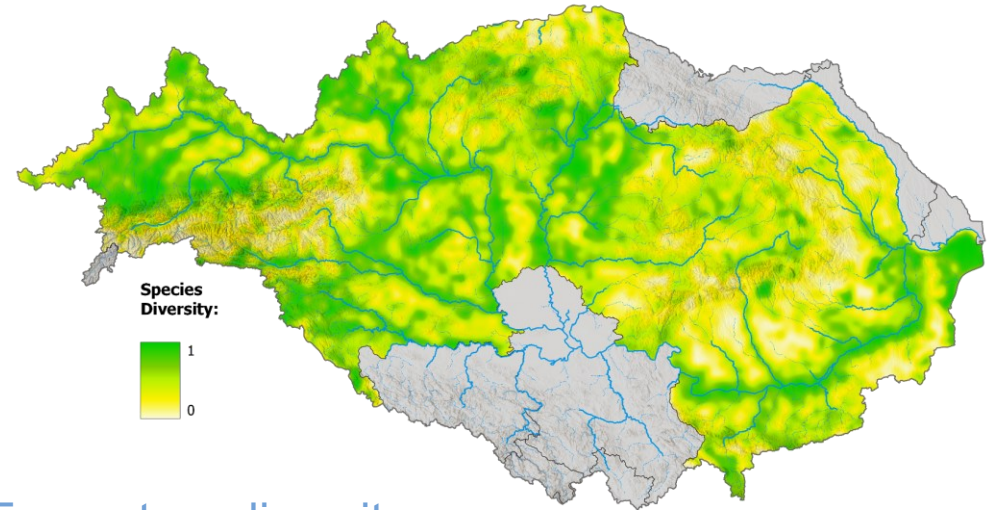
Freshwater and wetland related biodiversity hotspots based on datasets reported under Art.17 of Habitats- and Art. 12 of Birds-Directive

Habitat diversity
(FFH-Directive)

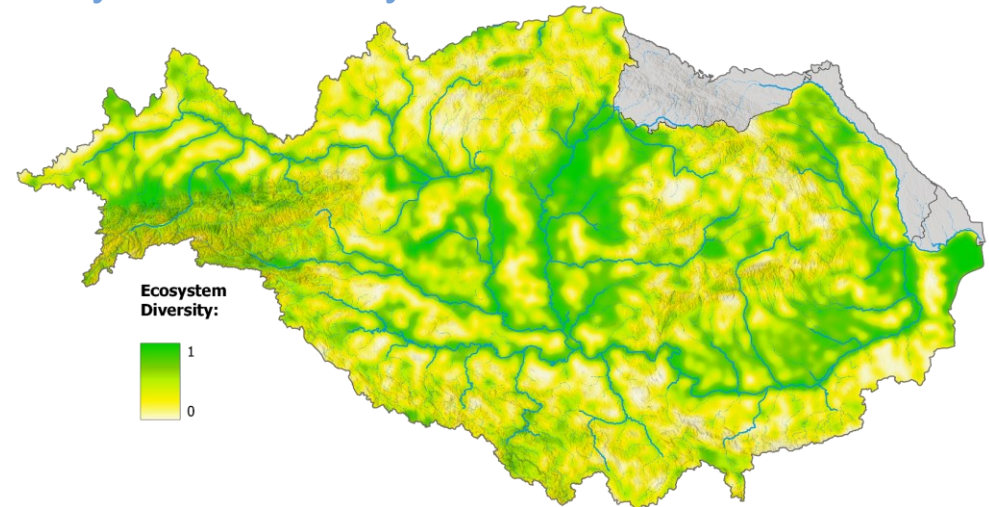


Diversity calculated with Rarity-Weighted Richness (RWR)

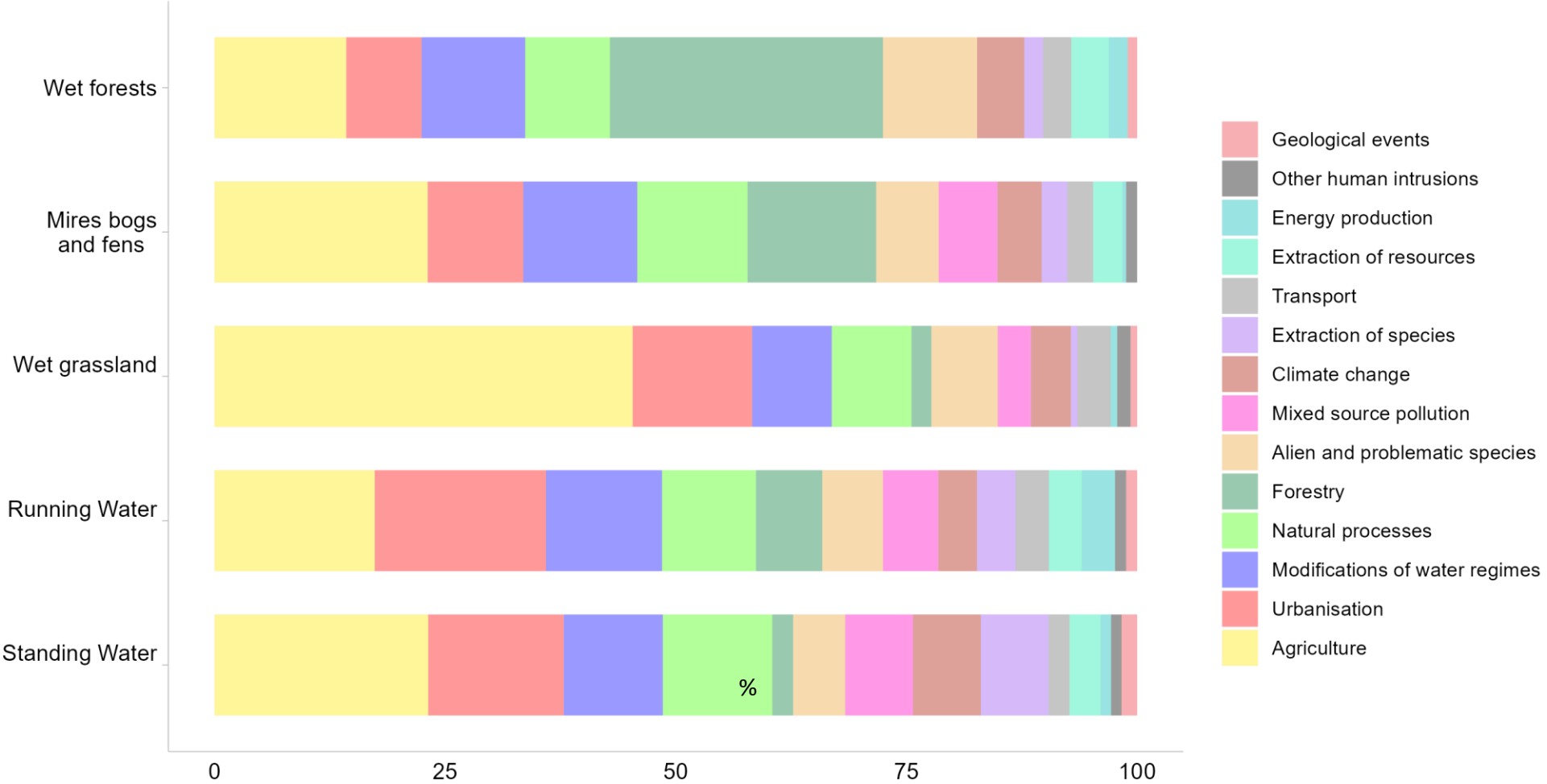
Species diversity (FFH and Birds-Directive)



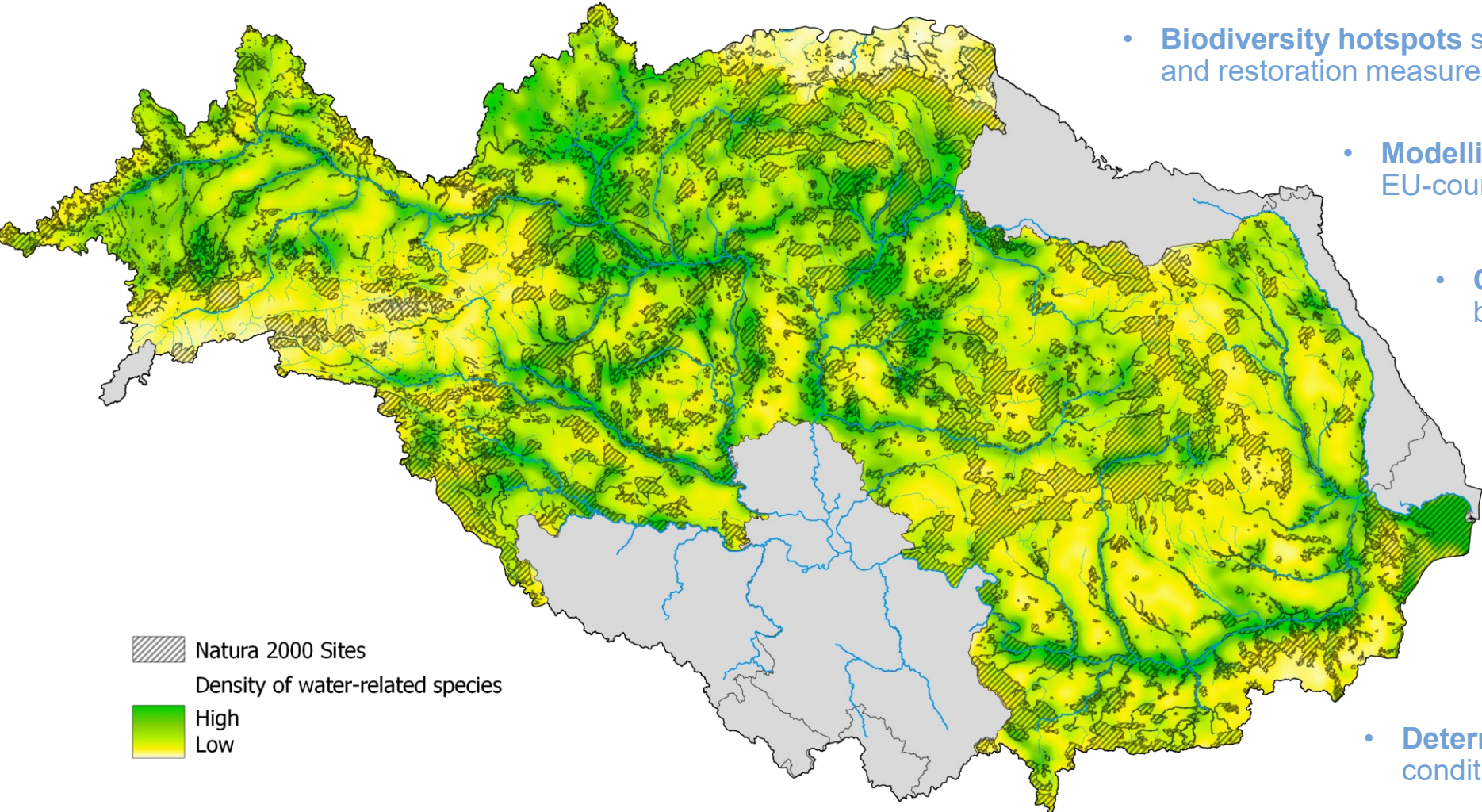
Ecosystem diversity



Pressures on freshwater and wetland related habitats based on datasets reported under Art.17 of the Habitats- Directive

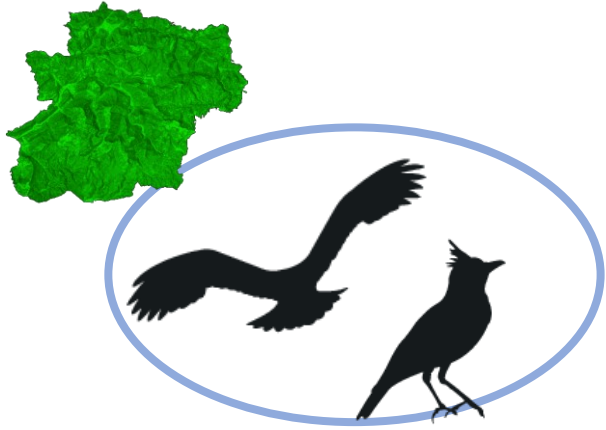


Freshwater and wetland related biodiversity hotspots based on datasets reported under Art.17 of the Habitats- and Art.12 of the Birds-Directive

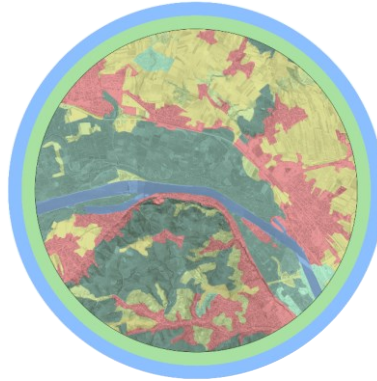


▨ Natura 2000 Sites
Density of water-related species
■ High
■ Low

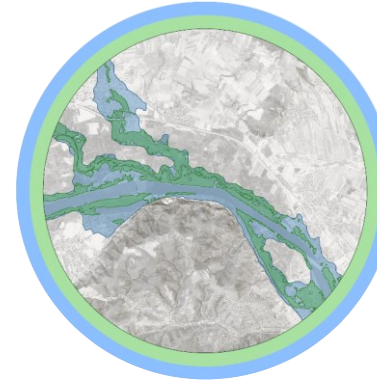
- **Biodiversity hotspots** should be prioritised for protection and restoration measures
- **Modelling biodiversity patterns** in non-EU-countries
- **Connectivity analyses** between biodiversity hotspots - corridors
- **Determine main pressures** on freshwater and wetland related species and habitats.
- **Determine main pressures** and conditions of Natura 2000 sites



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Richness of protected species in the N2000 sites

- Fish
- Birds
- Mammals

Entire N2000 site

- Size of the N2000 site
- Landcover-classes (% of different LCC)
- Diversity of natural LCC (Shannon diversity index)
- Diversity of wetland ecosystems
- Ecological integrity/ biodiversity assessment (Stoll et al. 2015)

Riparian zone

- Share of riparian zone in entire N2000 area (%)
- Landcover (% of different LCC in relation to entire N2000 area)
- Share of actual riparian zone in potential riparian zone (%)
- Diversity of natural LCC (Shannon diversity Index)
- Ecological integrity/ biodiversity assessment (Stoll et al. 2015)

River waterbody

- Mean ecological status of river waterbodies in Natura 2000 area

Conclusions and outlook

So far...

- Heterogeneity in Natura 2000 datasets – limitations
- Basin-wide biodiversity hotspots

Further analyses...

- Deepen pressure analyses – based on sub-basins and considering different dimensions of connectivity
- Assess characteristics of protected areas
- Highlight restoration potential of riparian zones & floodplains

Next steps...

- Stakeholder consultation ICPDR and Carpathian Convention
- Supporting the development of a truly coherent Trans-European Nature Network (TEN-N) of conserved areas that protect at least 30% of land in the European Union



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Selection and grouping of species and habitats

- Identification of all listed species and habitats that occur in the DCR
-> Based on spatial dataset reported under Art.17 & 12 of the EU Habitats and the Birds Directive
- Selection of freshwater- and wetland-related habitats in the DCR
- Selection of the freshwater- and wetland-related species based on “Ecological groups of habitats and species, EEA, 2022” (wetland and freshwater related species)
- Grouping of **species** (birds, fish, mammals, invertebrates, amphibians, reptiles) and **habitats** (standing waters, running waters, wet grasslands, bogs, mires & fens and wet forests)