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**Baseline riparian forest and aquatic
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Danube right bank near Draž (Croatia), to
support before-after monitoring of side-
arm reconnection (2024-2025)**

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Baseline riparian forest and aquatic macrophyte vegetation dataset from the Danube right bank near Draž (Croatia), to support before-after monitoring of side-arm reconnection (2024-2025)

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Abstract

Background

Baseline biodiversity data collected prior to hydromorphological interventions are essential for understanding and evaluating ecological change following restoration or engineering measures. In large river floodplains, interventions such as side-arm reconnection are expected to alter hydrological regimes, habitat connectivity, and disturbance patterns, with cascading effects on both riparian and aquatic plant communities. However, without well-documented pre-intervention datasets, post-restoration assessments often lack a reliable reference against which observed changes can be interpreted.

Along the right bank of the Danube River near the village of Draž (Croatia), planned hydro-technical measures aim to reconnect a cut-off side arm to the main channel. This reconnection is expected to modify local hydrological conditions and habitat structure in adjacent riparian forests and aquatic habitats, creating a clear need for baseline vegetation data collected prior to intervention.

New information

This data paper presents a baseline dataset of riparian forest and aquatic vegetation collected prior to side-arm reconnection. Riparian forest vegetation was surveyed on 20 May 2024 using three 10 × 10 m plots per site, with species cover estimated using the Domin cover-abundance scale and reported as plot means. Aquatic vegetation was

surveyed on 30 July 2025 using three 10 m belt transects per site, with species cover recorded in five ordinal cover classes and reported as transect means.

The dataset comprises 20 sampling events (10 forest and 10 aquatic), 251 taxon-by-event occurrence records, and 331 measurements, including species cover or abundance, establishment status (native, introduced, invasive), and event-level environmental descriptors such as canopy cover classes, water physicochemistry, water velocity class, and CORINE Land Cover categories. Taxonomic nomenclature was checked against Plants of the World Online (POWO). The sampling design and data structure allow the dataset to serve as the “before” component of a before–after monitoring framework, supporting future assessments of vegetation responses to hydrological reconnection.

Keywords

riparian vegetation, aquatic macrophytes, baseline dataset, Danube River, floodplain habitats, ecological restoration, side-arm reconnection, before-after monitoring, invasive species, vegetation survey

Introduction

Baseline biodiversity data collected prior to hydro-morphological interventions are essential for understanding and evaluating ecological change following restoration or engineering measures. In large river floodplains, interventions such as side-arm reconnection are expected to alter hydrological regimes, habitat connectivity, and disturbance patterns, with cascading effects on both riparian and aquatic plant communities. Without well-documented pre-intervention datasets, post-restoration assessments often lack a reliable reference against which observed changes can be interpreted (Underwood 1994). Publishing structured biodiversity datasets alongside peer-reviewed articles improves transparency, facilitates reuse and synthesis, and supports long-term ecological monitoring (Chaven et al. 2017).

Along the Middle Danube floodplain near the village of Draž (Croatia), planned hydro-technical measures aim to reconnect a cut-off side arm to the main river channel. This reconnection is expected to modify local flow conditions, inundation dynamics, and habitat structure, potentially reshaping vegetation composition in adjacent riparian forests and aquatic habitats (Tockner et al. 2009). River-floodplain systems are known to exhibit strong spatial and temporal heterogeneity, and vegetation responses to altered hydrological connectivity are often gradual and context dependent (Tockner and Stanford 2002).

The dataset presented here documents the composition and cover of riparian forest and aquatic vegetation prior to the planned reconnection, using standardized and repeatable sampling design. Riparian forests and aquatic habitats were surveyed separately but

within the same spatial framework, allowing the two vegetation compartments to be analyzed independently or in combination. Species abundance was recorded using ordinal cover-abundance scales appropriate to each habitat type, and complemented by event-level environmental descriptors, including canopy cover, water physico-chemistry, water velocity class, and land-cover context.

The sampling design and data structure allow the dataset to function as the “before” component of a before-after monitoring framework, supporting future assessments of vegetation responses to hydrological reconnection. Beyond restoration evaluation, the dataset provides a reference for studies of invasion dynamics, habitat-specific community turnover, and comparative analyses of riparian and aquatic vegetation in large river floodplains.

General description

Purpose: This dataset was collected in the context of the Horizon Europe project “Danube Wetlands and flood plains Restoration through systematic, community engaged and sustainable innovative actions” (acronym: DaWetRest; project number: 101113015), funded under the call HORIZON-MISS-2022-OCEAN-01 (topic HORIZON-MISS-2022-OCEAN-01-02) as a Horizon Innovation Action (duration: 48 months) and managed by the European Climate, Infrastructure and Environment Executive Agency (CINEA).

Sampling methods

Description: Ten localities were sampled in riparian forest habitats and ten localities in aquatic habitats. Each sampling event corresponds to a site-level aggregation of three replicate sampling units. An overview of sampling events, site locations, and key site-level characteristics is provided in Table 1.

Sampling description: Forests: at each site, three 10 × 10 m plots were surveyed, cover was estimated using the Domin cover-abundance scale (0-9) and averaged across plots. Aquatic habitats: at each site, three 10 m belt transects were surveyed; species cover was recorded using five ordinal cover classes (1: >1-5%; 2: >5-25%; 3: >25-50%; 4: >50-75%; 5: >75-100%) and averaged against transects.

In addition to vegetation data, a set of site-level environmental descriptors was recorded for each sampling event. For forest sites, canopy cover was estimated using ordinal cover classes. For aquatic sites, basic water physicochemical parameters (pH, dissolved oxygen, conductivity, and water temperature) were measured in the field, and water velocity was classified into ordinal classes representing standing or slow-flowing conditions. For all sites, the surrounding land-cover context was characterized using CORINE Land Cover (CLC) classes derived from Copernicus datasets (<https://land.copernicus.eu/en/products/corine-land-cover/> Retrieved 26 February 2026). These

environmental variables are provided as event-level measurements linked to sampling events.

Quality control: Species names were standardized against Plants of the World Online (POWO 2026). Data were checked for consistency of event identifiers across tables and for valid links between occurrence and measurement records. Environmental variables were stored as event-level measurements to preserve interpretability with Darwin Core (sampling-event datasets).

Geographic coverage

Description: Croatia, Osijek-Baranja County, vicinity of the village Draž; Danube right bank floodplain and adjacent aquatic habitats. Coordinates are included per sampling event in the dataset.

Coordinates: ; .

Taxonomic coverage

Description: Vascular plants recorded in riparian forest and aquatic habitats. The dataset includes 72 taxa in total (44 forest taxa; 32 aquatic taxa). Nomenclature was checked against POWO 2026. A complete list of recorded taxa, together with habitat association and establishment status is provided in Table 2.

Temporal coverage

Notes: Forest surveys: 20 May 2024. Aquatic surveys: 30 July 2025.

Usage licence

Usage licence: Open Data Commons Attribution License

Data resources

Data package title: Baseline riparian forest and aquatic vegetation dataset from the Danube right bank near Draž (Croatia) supporting before-after monitoring of side-arm reconnection (2024-2025)

Number of data sets: 3

Data set name: Sampling events dataset

Character set: UTF-8

Data format: CSV

Description: Event-level dataset describing sampling events conducted in riparian forest and aquatic habitats along the right bank of the Danube River near Draž (Croatia). The dataset contains spatial coordinates, elevation, sampling dates, habitat classification, and information on sampling protocols and sampling unit dimensions. The dataset is provided in the Suppl. material 1.

Column label	Column description
eventID	Unique identifier of the sampling event.
eventID_raw	Original identifier of the sampling site used during field recording.
year	Year in which the sampling event was conducted.
habitat	Habitat type of the sampling site (riparian forest or aquatic habitat).
samplingProtocol	Description of the vegetation sampling method applied.
sampleSizeValue	Number of sampling units used within the event.
sampleSizeUnit	Unit describing the sampling unit (e.g., plots or transects).
plotSize_m2	Area of forest vegetation sampling plots in square meters.
transectLength_m	Length of aquatic vegetation belt transects in meters.
decimalLatitude	Latitude of the sampling site in decimal degrees.
decimalLongitude	Longitude of the sampling site in decimal degrees.
elevation_m	Elevation of the sampling site in metres above sea level.
eventDate	Date when the sampling event was conducted.

Data set name: Species occurrence dataset

Character set: UTF-8

Data format: CSV

Description: Occurrence-level dataset containing plant species records linked to sampling events. Each record includes the scientific name of the observed taxon, occurrence status, establishment status (native, introduced, invasive), and references used for taxonomic standardization. The dataset is provided in the Suppl. material 2.

Column label	Column description
occurrenceID	Unique identifier of each species occurrence record.
eventID	Identifier linking the occurrence record to the corresponding sampling event.
scientificName	Scientific name of the recorded plant taxon.
basisOfRecord	Type of record indicating that the occurrence was based on a human observation.

occurrenceStatus	Indicates whether the taxon was present in the sampling unit.
establishmentMeans	Establishment status of the taxon (native, introduced, invasive).
habitatType	Habitat category in which the occurrence was recorded.
identificationReferences	Reference used for taxonomic standardisation.

Data set name: Species abundance and environmental measurement dataset

Character set: UTF-8

Data format: CSV

Description: Measurement-level dataset containing species abundance data and environmental measurements linked to sampling events and species occurrences. Species cover values are recorded using the Domin scale for forest plots and ordinal cover classes for aquatic transects. Environmental variables include canopy cover classes, water physicochemical parameters, water velocity classes, and CORINE Land Cover categories. The dataset is provided in the Suppl. material 3.

Column label	Column description
measurementID	Unique identifier of the measurement record.
occurrenceID	Identifier linking the measurement to the corresponding species occurrence record.
eventID	Identifier linking the measurement to the sampling event.
scientificName	Scientific name of the taxon for which the measurement was recorded.
habitatType	Habitat category in which the measurement was recorded.
measurementType	Type of measurement or environmental variable recorded.
measurementValue	Recorded value of the measurement.
measurementUnit	Unit associated with the measurement value.
measurementMethod	Method or scale used to obtain the measurement.

References

- Chaven V, Penev L, Hobern D, et al. (2017) Strategies and guidelines for scholarly publishing of biodiversity data. *Research Ideas and Outcomes* 3: e12431. <https://doi.org/10.3897/rio.3.e12431>
- POWO (2026) Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <https://powo.science.kew.org/>. Accessed on: 2026-2-26.
- Tockner K, Stanford JA (2002) Riverine flood plains: present state and future trends. *Environmental Conservation* 29 (3): 308-330. <https://doi.org/10.1017/S037689290200022X>
- Tockner K, Uehlinger U, Robinson CT (2009) *Rivers of Europe*. Academic Press, London.

- Underwood AJ (1994) On beyond BACI: sampling design that might reliably detect environmental disturbances. *Ecological Applications* 4 (1): 3-15. <https://doi.org/10.2307/1942110>

Table 1.

Overview of sampling events and site-level characteristics of riparian forest and aquatic habitats surveyed along the Danube right bank near Draž (Croatia). Canopy cover classes: 2 = 5-25%; 3 = 25-50%; 4 = 50-75%. Water velocity classes: 1 = no flow, stagnant; 2 = low flow. CLC - CORINE Land Cover codes follow the Copernicus classification (<https://land.copernicus.eu/en/products/corine-land-cover/> Retrieved 26 February 2026).

eventID	habitatType	eventDate	latitude	longitude	elevation [m]	canopy cover	water velocity class	CLC
forest_Lrnc1_1	forest	20-05-24	45.85311	18.80308	103	4	-	311
forest_Lrnc1_2	forest	20-05-24	45.85245	18.80394	100	4	-	311
forest_Lrnc2_1	forest	20-05-24	45.87516	18.81986	91	3	-	311
forest_Lrnc2_2	forest	20-05-24	45.87578	18.82291	93	3	-	311
forest_Lrnc2_3	forest	20-05-24	45.87535	18.82184	95	4	-	311
forest_Lrnc3_1	forest	20-05-24	45.88315	18.81778	88	4	-	311
forest_Lrnc3_2	forest	20-05-24	45.88253	18.81794	94	3	-	311
forest_Lrnc3_3	forest	20-05-24	45.88008	18.8191	105	4	-	311
forest_Topoljski	forest	20-05-24	45.84903	18.79994	93	2	-	324
forest_Sarkanj	forest	20-05-24	45.84716	18.80188	91	3	-	311
aquatic_Tplj1	aquatic	30-07-25	45.84734	18.79867	81	-	1	112
aquatic_Tplj2	aquatic	30-07-25	45.84722	18.79766	81	-	1	242
aquatic_Tplj3	aquatic	30-07-25	45.84726	18.79534	81	-	1	242
aquatic_Srknj1	aquatic	30-07-25	45.84878	18.80597	83	-	2	411
aquatic_Srknj2	aquatic	30-07-25	45.84869	18.80567	83	-	2	411
aquatic_Srknj3	aquatic	30-07-25	45.84784	18.80288	83	-	2	411
aquatic_Srknj4	aquatic	30-07-25	45.84744	18.80157	83	-	2	411
aquatic_Lrnc3	aquatic	30-07-25	45.8843	18.81829	87	-	1	411
aquatic_Lrnc2	aquatic	30-07-25	45.87553	18.82112	86	-	1	411
aquatic_Lrnc1	aquatic	30-07-25	45.85321	18.8046	84	-	1	411

Table 2.

List of vascular taxa recorded in riparian forest and aquatic habitats prior to side-arm reconnection, with habitat association and establishment status. Nomenclature follows Plants of the World Online (POWO 2026).

Scientific name	Habitat type	Establishment status
<i>Acer negundo</i> L.	forest	invasive
<i>Agrostis stolonifera</i> L.	aquatic	native
<i>Alisma lanceolatum</i> With.	aquatic	native
<i>Alisma plantago-aquatica</i> L.	aquatic	native
<i>Alliaria petiolata</i> (M.Bieb.) Cavara & Grande	forest	native
<i>Ambrosia artemisiifolia</i> L.	aquatic	invasive
<i>Amorpha fruticosa</i> L.	forest	invasive
<i>Bidens tripartita</i> L.	aquatic	native
<i>Carex remota</i> L.	forest	native
<i>Carex</i> sp.	aquatic	native
<i>Ceratophyllum demersum</i> L.	aquatic	native
<i>Cornus sanguinea</i> L.	forest	native
<i>Crataegus</i> sp.	forest	native
<i>Cyperus michelianus</i> (L.) Delile	aquatic	native
<i>Echinochloa crus-galli</i> (L.) P.Beauv.	aquatic	introduced
<i>Epilobium angustifolium</i> L.	forest	native
<i>Euphorbia palustris</i> L.	aquatic	native
<i>Euphrosine xanthiifolia</i> (Nutt.) A.Gray	aquatic	introduced
<i>Frangula alnus</i> Mill.	forest	native
<i>Fraxinus angustifolia</i> Vahl	forest	native
<i>Fraxinus excelsior</i> L.	forest	native
<i>Galium aparine</i> L.	forest	native
<i>Galium palustre</i> L.	forest	native
<i>Geum urbanum</i> L.	forest	native
<i>Glechoma hederacea</i> L.	forest	native
<i>Humulus lupulus</i> L.	forest	native
<i>Hydrocharis morsus-ranae</i> L.	aquatic	native
<i>Iris pseudacorus</i> L.	both	native
<i>Juncus compressus</i> Jacq.	aquatic	native
<i>Lemna minor</i> L.	aquatic	native
<i>Leucojum vernum</i> L.	forest	native
<i>Lycopus europaeus</i> L.	aquatic	native

<i>Lysimachia nummularia</i> L.	forest	native
<i>Lysimachia vulgaris</i> L.	both	native
<i>Lythrum salicaria</i> L.	aquatic	native
<i>Morus alba</i> L.	forest	introduced
<i>Morus nigra</i> L.	forest	introduced
<i>Myosotis scorpioides</i> L.	forest	native
<i>Myriophyllum spicatum</i> L.	aquatic	native
<i>Najas marina</i> L.	aquatic	native
<i>Najas minor</i> All.	aquatic	native
<i>Panicum capillare</i> L.	aquatic	introduced
<i>Parietaria officinalis</i> L.	forest	native
<i>Persicaria amphibia</i> (L.) Gray	aquatic	native
<i>Persicaria hydropiper</i> (L.) Delabre	aquatic	native
<i>Persicaria mitis</i> (Schrank) Assenov	forest	native
<i>Phalaris arundinacea</i> L.	aquatic	native
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	aquatic	native
<i>Plantago major</i> L.	forest	native
<i>Populus alba</i> L.	forest	native
<i>Populus nigra</i> L.	forest	native
<i>Populus x canadensis</i> Moench	forest	introduced
<i>Prunus cerasifera</i> Ehrh.	forest	native
<i>Quercus robur</i> L.	forest	native
<i>Ranunculus repens</i> L.	forest	native
<i>Rhamnus cathartica</i> L.	forest	native
<i>Rorippa amphibia</i> (L.) Besser	both	native
<i>Rubus caesius</i> L.	forest	native
<i>Rumex sanguineus</i> L.	forest	native
<i>Salix alba</i> L.	forest	native
<i>Salvinia natans</i> (L.) All.	aquatic	native
<i>Spirodela polyrhiza</i> (L.) Schleid.	aquatic	native
<i>Stachys palustris</i> L.	forest	native
<i>Stellaria neglecta</i> (Lej.) Weihe	forest	native
<i>Stuckenia pectinata</i> (L.) Börner	aquatic	native
<i>Symphytum officinale</i> L.	forest	native
<i>Trapa natans</i> L.	aquatic	native
<i>Typha angustifolia</i> L.	aquatic	native
<i>Ulmus laevis</i> Pall.	forest	native

<i>Urtica dioica</i> L.	forest	native
<i>Vitis vinifera</i> L.	forest	native

Supplementary materials

Suppl. material 1: Event-level data (CSV)

Authors: Dragana Vukov, Danijela Žunić, Nataša Prodanović, Vladimir Sabadoš

Data type: sampling unit identifiers, geographic coordinates, elevation, sampling dates, habitat descriptions and sampling protocols

Brief description: Event-level table containing sampling unit identifiers, geographic coordinates, elevation, sampling dates, habitat descriptions and sampling protocols for riparian forest and aquatic sites.

[Download file](#) (4.75 kb)

Suppl. material 2: Occurrence-level data (CSV)

Authors: Dragana Vukov, Danijela Žunić, Nataša Prodanović, Vladimir Sabadoš

Data type: occurrences linked to sampling events, including establishment status (native, introduced, invasive) and taxonomic identification references

Brief description: Occurrence-level table containing taxon presence records linked to sampling events, including establishment status (native, introduced, invasive) and taxonomic identification references.

[Download file](#) (57.31 kb)

Suppl. material 3: Measurement-level data

Authors: Dragana Vukov, Danijela Žunić, Nataša Prodanović, Vladimir Sabadoš

Data type: species cover/abundance data and event-level environmental variables

Brief description: Measurement-level table containing species cover/abundance data (Domin scale for forest plots; ordinal cover classes for aquatic transects) and event-level environmental variables (canopy cover class, water physico-chemistry, water velocity class, and CORINE Land Cover class).

[Download file](#) (61.07 kb)