

The research activity will be part of the PNRR project INEST, in its SPOKE 8 and with reference to the RT1 - Biology of hydrosphere ecosystems.

### General Objectives

Within the RT1 of iNEST Spoke 8, the aim is to fuse a large volume of diverse biological data to enable communication with real-world systems and mathematical and informatics models. The strategy is based on recovering relevant “sleeping” or produce new biodiversity data and establish regional partnerships with data owners to unlock information on freshwater life and human activities that affect it. The general goal of the RT1 is to harmonise data, protocols and vocabularies amongst biodiversity monitoring activities and actors and to warrant a secured, sustained, and reliable data flow from biodiversity monitoring programmes.

The position advertised through this call specifically focuses on the Task S8\_RT1.4 “Digital databases and modelling tools for assessing and quantifying freshwater habitat”.

Habitat availability is recognized as one of the key critical constraints to freshwater biodiversity. Large biodiversity losses have occurred in the last decades because of the reduction of available habitat resulting from hydromorphological alterations due to human activities. Knowledge of the processes controlling change of river habitat availability in rivers is still mostly focusing on streamflow variability only, while at the timescale of decades, which is relevant for local and large-scale biodiversity losses, changes in habitat availability is also fundamentally controlled by the river morphological dynamics (“morphodynamics”). Suitable exploitation of the resources of the hydrosphere requires the availability of predictive, quantitative tools that allow to compare the biological and ecological effects of different exploitation patterns, together with the corresponding effects on the human activities that depend on such exploitation. Modelling approaches in this field, able to link the hydromorphological dynamics of rivers with habitat availability for flora and fauna, are still in their infancy, and this project proposes a major step forward in their development, testing and application.

### Description of Work

The first subtask, S8\_RT1.4.1 foresees the creation of a digital database of habitat availability and suitability for target fish species in streams of the NE of Italy (the region of the INEST project). The product will be an accessible, geo-referenced digital database of habitat availability in selected reaches of representative streams in the NE of Italy. More specifically, this should be achieved through (i) the collection and systematization of existing river habitat datasets and (ii) the setup and testing of an efficient and innovative hydro-morphological data collection and analysis method that optimizes the potential offered by drones. This shall include river bathymetry, grain size distribution and flow velocity. Case studies will preferably focus on Alpine streams in the NE of Italy. The method shall allow smooth integration of 2D hydraulic models with field data for habitat assessment.

The second SubTask S8\_RT1.4.2 focuses on the application of a novel modelling approach for habitat suitability in rivers at the reach scale, that can be fully integrated within the workflow developed in the previous Subtask S8\_RT1.4.2. The product of this activity will be an innovative modelling platform able to predict the general trend and the key controlling parameters of habitat availability for target species concerning the river reaching hydromorphological conditions. Thanks to this, habitat variability will be assessed in dependence on the properties of the flow regime, which is modified by a different scenario of water resources exploitation.