STORIES OF WETLANDS - EPISODE 1

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ABSTRACTS

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CNR IRSA

Nutrient retention in riparian ecotones: Potential for water quality management.

Raffaella Balestrini, CNR-IRSA

Over the last few decades, riparian areas—ecotones situated at the interfaces between soil and water or groundwater and surface water—have garnered significant attention for their ability to mitigate nutrient fluxes from terrestrial to aquatic ecosystems. Their natural buffering capacity stems from two key characteristics: a disproportionately high rate of biogeochemical activity and their strategic position within the catchment, ensuring that water and nutrients necessarily pass through these ecotones.

This presentation provides an overview of the effectiveness of riparian zones in nitrogen removal, focusing on methodologies and key findings from field studies conducted in Northern Italy across small lowland springs, lakes, and artificial ditches. It specifically highlights the relative contribution of denitrification processes to nitrate reduction, the development of predictive indicators for riparian buffer capacity, and the role of aquatic macrophytes in influencing nutrient retention metrics within small streams in the minor hydrological network of the Po basin.

This work emphasizes the vital role of riparian ecotones in water quality management, focusing on their potential as nature-based solutions to protect and restore aquatic ecosystems in a sustainable way.

Wetland water balance modelling – a case study.

Ivan Portoghese, CNR-IRSA

A simple hydrological model named WetMAT is presented for the estimation of water requirements of temporary wetlands.
The case study for the development of this tool is the Doñana National Park, SW Spain, a pilot site of the LENSES project (PRIMA Call 2020) in which irrigation development is endangering the wetland conservation. Using a simple lumped parameterization, the water balance formulation was validated using historical time series of pond extension. Due to its parsimonious structure the model is suitable for scenario analysis using System Dynamic Modelling (SDM) and impact studies related to climate change and water resource planning. One of the proposed applications concerns the assessment of ecological water needs of the Doñana marshland which enabled the quantification of the annual “ecological inflow” to the wetland.

Constructed wetlands for microbial contamination control

Stefano Amalfitano, CNR-IRSA

Constructed wetlands (CWs) are increasingly recognized as Nature-Based Solutions (NBS) for reclaiming wastewater. This work focuses on the application of CWs to control microbial contamination in effluents from an inland aquaculture system, highlighting their potential to reduce microbial and nutrient load, along with antimicrobial resistance levels.
Using a case study, we will examine the efficiency of CWs in affecting the microbial community functioning and improving water quality of aquaculture effluents. Key microbial processes will be discussed, along with challenges and opportunities for integrating CWs into aquaculture systems to promote environmental sustainability and public health.