



# Preface: Freshwater wetlands, biodiversity, functioning, restoration and utilization

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The fundamental importance of freshwater wetland resources, the conservation of freshwater biodiversity, and the restoration and utilization of freshwater wetland ecosystems together signal a preeminent need for renewed scientific focus and greater resources. Against this background, the Themed Section of *Hydrobiologia* on “Freshwater wetlands: biodiversity, functioning, restoration and utilization” addresses how to maintain the services of existing freshwater

ecosystems, restore damaged systems and promote the economic, social, and environmental sustainability of freshwater ecosystems, aiming to develop and show the application of ecological science to issues in freshwater wetland management.

In this Themed Section, two papers addressed plant invasions in wetland ecosystems and non-hydrophyte species that exist in re-flooding conditions. Wang et al. (2022) conducted a field experiment in Jinchuan wetland under different water level conditions (high water level: 6–7 cm; low water level: 1.5–2.5 cm). The above-ground biomass, the heights and areas of tussocks, the names and number of species on each tussock were measured, the proportions of non-hydrophyte species (PNH) were calculated. In the high-water level condition, tussocks accumulated more biomass, increased the heights and reduced the areas. The results show that the degradation progress of wetlands could be retarded through modifying the heights and the areas of tussocks to reduce the living space of non-hydrophyte species.

Additionally, Shen et al. (2022) investigated the effects of plant invasion and water nutrition on the morphological characteristics and interspecies relationships of submerged plants with different leaf types. The research found that the increase of water nutrients increased the height and biomass of *Hydrilla verticillata* (LF) Royle while decreasing that of *Myriophyllum verticillatum* L. The increase in water nutrients has also changed the interspecific relationship between the two species from promotion

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to competition. In the future, this research can be applied to plant invasion studies in freshwaters as well as ecological engineering projects.

Altering the hydrological connectivity between river channels and their riverine wetlands is a significant threat to the functioning of river ecosystems. Meng et al. (2022) investigated the response characteristics such as community structure and functional characteristics of aquatic insects in the Manjiang and Songjiang Rivers, impacted by a water diversion project in the Changbai Mountains in northeast China. The results showed dam construction led to differences in aquatic insect community compositions between the riverine wetlands of reservoir reaches, flow-reduced reaches, and natural reaches. Invertebrate assemblages differed functionally among wetland types.

Jacquemin et al. (2022) established baseline coliform loads for one of the major tributaries into GLSM (Coldwater Creek) in Grand Lake St Marys (GLSM), test for any potential covariation with environmental parameters in Coldwater Creek, and quantify the effect of an existing nutrient remediation wetland (Coldwater Creek Wetland) on coliform loading into the lake. The study demonstrated clear relationships between coliform bacteria and physical and chemical conditions, nutrient levels, manure application, season, and processing potential of wetlands, as well as interactions among a host of these parameters. Future management should continue to expand wetland restoration programs and incorporate coliform monitoring into programs.

Xu et al. (2022) examine the decomposition processes and return of elements carbon, nitrogen, and phosphorus in *Phragmites* litter under the influence of different detritus amounts. The results indicated that the detritus amount of *Phragmites* litter after the typical harvesting method might affect the decomposition of *Phragmites* litter more by influencing water.

The five papers in this special issue were selected from 12 submitted manuscripts, and this is just the beginning. The selected papers provide highly needed information, necessary for scientifically underpinned

management plans. We consider that: 1. wetland conservation and reasonable utilization should be promoted together and not be contradictory; reasonable utilization is one of the purposes of wetland conservation and an important assurance to enable sustainable conservation; 2. wetland restoration is a long-term process, not only structural but also functional enhancement; 3. wetland conservation and restoration is a complex process, which can begin with the study of wetland habitats. Finally, we acknowledge with appreciation the efforts of the guest editors, the authors who contributed to this volume, and the many referees who kindly took the time to improve the original manuscripts.

## References

- Jacquemin, S. J., J. Birt, Z. Senger, B. Axe, B. Strang, C. Ewing, et al., 2022. On the potential for reconstructed wetlands to remediate fecal coliform loading in an agricultural watershed. *Hydrobiologia*. <https://doi.org/10.1007/s10750-022-05078-2>.
- Meng, Y., H. Wu, Q. Guan, K. Lu, Y. Kang & G. Dai, 2022. Responses of riparian insect communities to flow regulation in riverine wetlands of northeastern China. *Hydrobiologia*. <https://doi.org/10.1007/s10750-022-04971-0>.
- Shen, Y., S. Zhang, X. Yuan, K. Sun, J. Cai, J. Xue, et al., 2022. Flat-leaf submerged plants are more sensitive to invasion intensity and water nutrition levels than needle-leaf ones. *Hydrobiologia*. <https://doi.org/10.1007/s10750-023-05226-2>.
- Wang, X., Y. Li, L. Sheng, L. Ma, H. Yan & W. Luo, 2022. A new maintenance mechanism of species diversities on tussocks under water level change. *Hydrobiologia*. <https://doi.org/10.1007/s10750-022-04970-1>.
- Xu, C., X. Yu, H. Duan, J. Li, S. Xia, Q. Zhang, et al., 2022. The decomposition processes and return of carbon, nitrogen, and phosphorus of *Phragmites australis* litter with different detritus amount. *Hydrobiologia*. <https://doi.org/10.1007/s10750-022-05026-0>.

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