Project Title: **Managing freshwater nutrients for ecological health and sustainable water supply**

Lead Institution/Department: University of Bristol
Primary Supervisor: Professor Penny Johnes, School of Geographical Sciences, University of Bristol
Co-Supervisor: Professor Martin Genner, School of Biological Sciences, University of Bristol
Collaborator: Natasha Clark, Environment Strategy Manager, Bristol Water.

Scholarship: A fully funded PhD studentship including UK fees, a tax-free stipend at the UKRI minimum rate (£20,780 in 2025-26) and a full UKRI Research Training Support Grant (RTSG) to support project costs, training and travel is available, led by the University of Bristol. Study will begin in October 2025 and is funded for four years. The deadline for applications is 31 August 2025.

Project aims and methods

We are seeking a candidate passionate about freshwater ecosystems and nutrient cycling for an exciting PhD opportunity to investigate the interaction between nutrient inputs and the ecological health of water bodies, and to assess management strategies that will limit nutrient inputs, provide positive outcomes for ecosystem health, and enable sustainable water supplies. This studentship comes with 4 years funding and a full Research Training Support Grant at UKRI level. The student will be based in a diverse research group at the University of Bristol, led by Professor Penny Johnes, who researches the nature, origins, behaviours and impacts of nutrient pollution in freshwater ecosystems.

Management of nutrient input is a key element of maintaining ecosystem function and biodiversity of freshwaters. Therefore, the development of methods to reliable predict the sources and impacts of nutrient loading is central to conserving the natural environment, yet this remains challenging due to the complexity of interacting factors including variation in input sources, outflows and nutrient cycling in the water body. In this project, you will use new and existing data to develop insight into how catchment management methods affect nutrient input and biodiversity within the lake, with a particular focus on what is driving charophyte decline in the lake at present. The project will have a specific focus on Blagdon Lake, a managed reservoir near Bristol in the Mendip Hills. It is a designated site of special scientific interest (SSSI) by Natural England for nationally important bird populations and proximate wildflower meadows but has other valuable characteristics including macrophyte beds and a trout fishery. You will advance understanding of how to manage this environment by implementing models of nutrient dynamics and using the models to determine how to optimally manage the system. You will have access to state-of-the-art water chemistry methods at the University of Bristol, and there will be opportunity to explore the dynamics of nutrients in relation to key biological variables, both in the field and laboratory. Your research will have real-world impact, being used to provide recommendations for future reservoir management to achieve SSSI nutrient targets, in line with climate change pressures.

Focal research activities will include: (1) Analyses to quantify patterns and drivers of nutrient fluxes, in inflows, outflows, the main water body, and sediment. (2) Calculation of the rates and origins of

nutrient loss from land in the catchment, under different management scenarios. (3) Field and controlled laboratory experiments to evaluate the rates of nutrient release to the water column, and biological responses and adaptations to these fluxes. (4) Quantitative sampling of water, biota and sediments with advanced chemical analysis to generate data to parameterise modelling methods. (5) Develop and implement models, to assess how management interventions impact nutrient-load in the lake, will enable nutrient targets to be achieved, and to determine how different scenarios will impact biological variables.

The research, guided by the supervisor team and advisors from a steering group including two UK public bodies agencies (Natural England; Environment Agency), will yield recommendations for management interventions to secure Favourable Condition of the SSSI over an appropriate timescale. Specific focus will be given to achievement of the nutrient targets and the re-establishment/attainment of a macrophyte dominated plant community.

Training and skills:

You will have access to state-of-the-art experimental, field monitoring, analytical facilities and training in modelling, as well as access to a wide range of core skill training at the University of Bristol. You will also gain experience working within a multidisciplinary research team, with opportunities to collaborate more widely, and present at national and international conferences.

This project will be supervised and led by Prof. Penny Johnes at the University of Bristol, and co-supervised by Prof. Martin Genner in the School of Biological Sciences. Further support will be provided by postdoctoral research assistants in the large teams run by the two supervisors, and the opportunity to work alongside and collaborate with other PhD students in these teams. The student will also benefit from collaboration with Bristol Water (Natasha Clark) who are providing financial support to the project, with advice from colleagues at Natural England and the Environment Agency.

Candidate Requirements

The successful candidate will be expected to meet the following criteria:

- Hold or expect to obtain at least a first-class or upper second-class honours degree providing knowledge and skills in ecology, environmental sciences and mathematical modelling.
- Have appropriate laboratory skills and experience.
- Demonstrate excellent organisational and time management abilities
- Show enthusiasm for field-based and laboratory research and willingness to conduct sampling in various weather conditions
- Have the aptitude to develop simple modelling approaches to bring the observational and experimental data together, to test hypotheses and likely responses to proposed mitigation methods.

Useful Links

For informal enquiries, please contact the lead supervisor, Prof. Penny Johnes (penny.johnes@bristol.ac.uk)

How to Apply: please apply through the following link, selecting the Geography (PhD) option at https://www.bristol.ac.uk/study/postgraduate/apply/

Application deadline: 31 August 2025.