

# CASE STUDY

## CUSTOMER

Local, UK and  
European governments

## DELIVERABLE

Over 70 years of research  
producing new assessment  
and decision support tools

## OUTCOMES

Lake restoration work including  
a £4m investment at Loch Leven,  
and innovative assessment tools



*The work on nutrient and algal standards by the Centre for Ecology & Hydrology provided SEPA/UK environment agencies with high quality and credible science, and delivered an excellent foundation on which to base new UK Environmental Standards... and new... assessment schemes required for the Water Framework Directive"*

### Dr Willie Duncan

Scottish Environment Protection  
Agency, Ecology Partnership &  
Development Unit Manager

## Restoring and improving the quality of Europe's lakes

Providing new environmental standards for lakes, tools for monitoring ecological quality, and successful restoration and species survival at nationally important sites

### The challenge

Lakes provide a critical service, both to human health and the economy. As well as providing drinking water they also serve as popular tourist attractions, with more than 15 million people visiting the English Lake District every year.

When their quality deteriorates it can be devastating – single algal bloom events at Loch Leven and Windermere cost millions of pounds and damaged their reputation for many years. Similarly, lake biodiversity can take decades to recover after periods of acidification and eutrophication, and in some cases may never return.

### The research

The Centre for Ecology & Hydrology's (CEH) lake research spans over 70 years and across countries and continents. We have conducted long-term research in the English Lake District and Loch Leven and large-scale studies of lakes across Europe, and our role in the successful restoration of Loch Leven is one of the best scientific studies of lake restoration in the world.

This large-scale research covers many areas including climate change, the effect of non-native species, the social and economic benefits of restoration, and nutrient pollution. These studies on nutrient pollution encompass a wide range of research, investigating the importance of catchment sources of nutrients, controls of algal blooms and impacts on plant habitats and fish.



*Work on vendace... by the Centre for Ecology & Hydrology has provided the Environment Agency and other UK environment agencies with the specialised ... assessments required for the Habitats Directive and informed our understanding of the ecology of these threatened populations, leading to informed and feasible management plans to ensure their continued survival."*

**Dr Andy Gowans**

Environment Agency Fisheries  
Technical Specialist

## The outcomes

CEH's lake research has had national and international impacts, contributing to environmental standards and lake restoration projects across the UK including:

- legally-binding UK Environmental Standards for nutrients and European standards for algae, established to protect water quality and limit algal blooms.
- new tools used by statutory regulators across Europe for assessing the ecological health of lakes, as required by the EU Water Framework Directive.
- decision-support tools used by Defra and UK environment agencies to identify which lakes to target for successful restoration.
- policy guidance on control of public health risks from algal blooms, fertiliser use and taxation, waste water planning and rural development in nutrient sensitive catchments.
- a £4m investment programme at Loch Leven, delivering changes to industrial processes, sewage works, farming practices and local authority planning regulations.
- advice at Windermere and other Cumbrian Lakes on nutrient reduction requirements to sustain good water quality in the face of other stressors such as climate change and expansion of invasive species.
- research underpinning the survival of the rare vendace fish at its two remaining Cumbrian locations and assisting the establishment of refuge populations in Cumbria and Scotland.

Decades of wide-ranging research allows CEH to advise governments on how to reduce risks to human health, reduce pollution, and revive biodiversity through the restoration of the nation's lakes.



Windermere



Monitoring at Loch Leven

*The CEH projects described here have multiple partners across the UK, Europe and worldwide that are too numerous to mention individually. Please visit our website for partner details.*