Lake Cama

Fish Repopulation Project in the Heart of the Alps

Text and photos by Carlo Roncoroni
Edited by Peter Symes and G. Symes

At Lake Cama, in Switzerland, a fish repopulation project, conceived and implemented by the Hunting and Fishing Office of Graubünden, introduced trout and char into the lake, with the aim of preserving biodiversity and combating the invasion of alien species. Project participant, technical diver and underwater photographer Carlo Roncoroni reports.

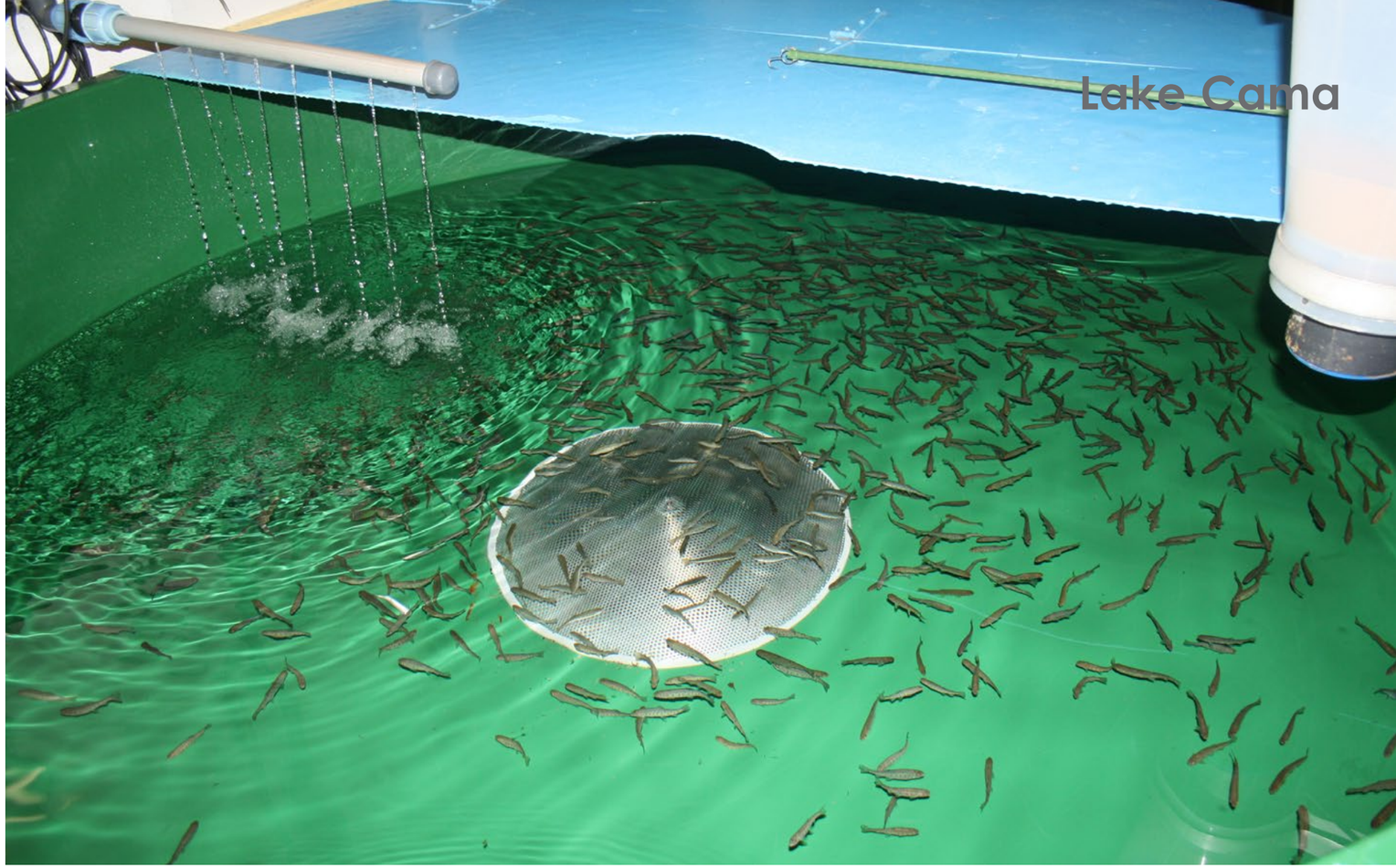
Underwater photographers document the bottom of the remote Lake Cama, located high in the Swiss Alps (above and top right).

A unanimous cry must be raised: "No to the globalisation of fish species in their natural environment!" And, to paraphrase a common Italian saying, "Fish and oxen, stay in your own country."

These are not the words in a speech by climate activist Greta Thunberg, but a reality that is now evident. Blue crabs, American crayfish and catfish are invading aquatic ecosystems in Italy, causing nothing but disaster. The situation can only worsen with rising temperatures, semi-tropical climate conditions and the direct entry of fish species into the Mediterranean from the Suez Canal, which are not exactly Mediterranean but are already adapting quickly.

On the other hand, our Swiss friends in the Canton of Graubünden are demonstrating exemplary management of fish restocking in rivers and lakes, despite ongoing challenges (see the latest flooding). No, it is not

Marco Boldini, project manager and head of the VII Moesa Reno Posteriore Fishing District, transfers river trout fry (top right) into a climate-controlled canister (top left) for transport via helicopter (above) to the release site in a stream near Lake Cama.



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that the grass is always greener on the other side, but they have really proven themselves in this venture.

Birth of the idea

The project was launched by the Canton's hunting and fishing office in 2020, having originated with simple post-dive conversations exchanged on the shores of Lake San Bernardino (between Italy and Switzerland) while sipping alcoholic cappuccinos and grappa. The idea was to explore the bottom of an alpine lake to identify specific issues and monitor the presence of fish fauna. However, the COVID-19 pandemic slowed everything down. Finally, last winter, the operation took shape, thanks to the great commitment of Marco Boldini, the true "deus ex machina" of the whole project and head of the VII Moesa Reno Posteriore Fishing District.

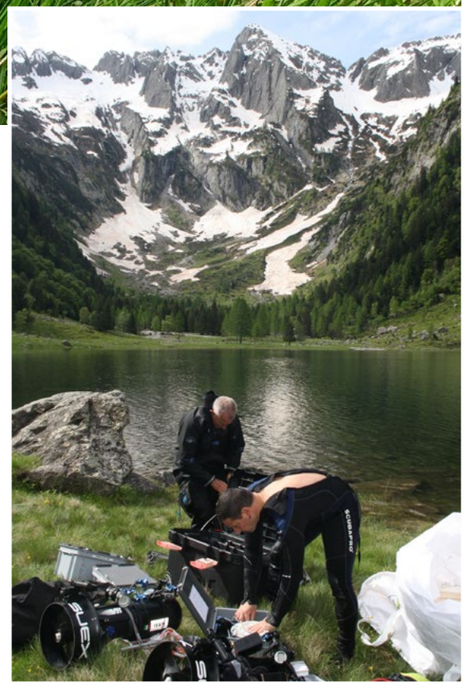
Objective

The project aimed to document the introduction of trout and char into the lake and to explore the lakebed through a video and photographic report. Yes, it all seemed easy in theory, but the lake, measuring approximately 450m by 300m, is located at an altitude of 1,300m and can only be reached after a two-hour walk, as there is no road or mule track connecting to it. The solution? Fly in with a helicopter.

Phase 1: Organisation and logistics

Careful preparation of the fish was required to ensure that they were ready for release at the appropriate stage of growth. This was coordinated with meticulous organisation, resembling a Formula 1 pit stop at the local heliport, all while dealing with the precarious weather conditions at the time.

While Marco and his colleagues began preparing and raising a certain quantity of fry of various species this winter, local and federal organisations and associations were involved in sponsoring the flights and documenting the event. In Graubünden, sensitivity towards nature is evident: Local communities participate very actively in environmental conservation, involving children as well.



A helicopter was used to transport dive equipment and fish fry to Lake Cama (left). Underwater scooters and dive helmets sit ready on the shore (above). Divers prepare underwater cameras and scooters for the dive (right).

Phase 2: Transport of gear and fry to a high altitude

It may seem trivial, but, in a way, the transport of equipment and fry was what required the most adrenaline, punctuality and determination, because neither the fish nor the helicopter could wait! The first thing to be prepared was the dive equipment. We carried our reliable Suex scooters up to the altitude for general reconnaissance, all inside a sturdy travel bag.

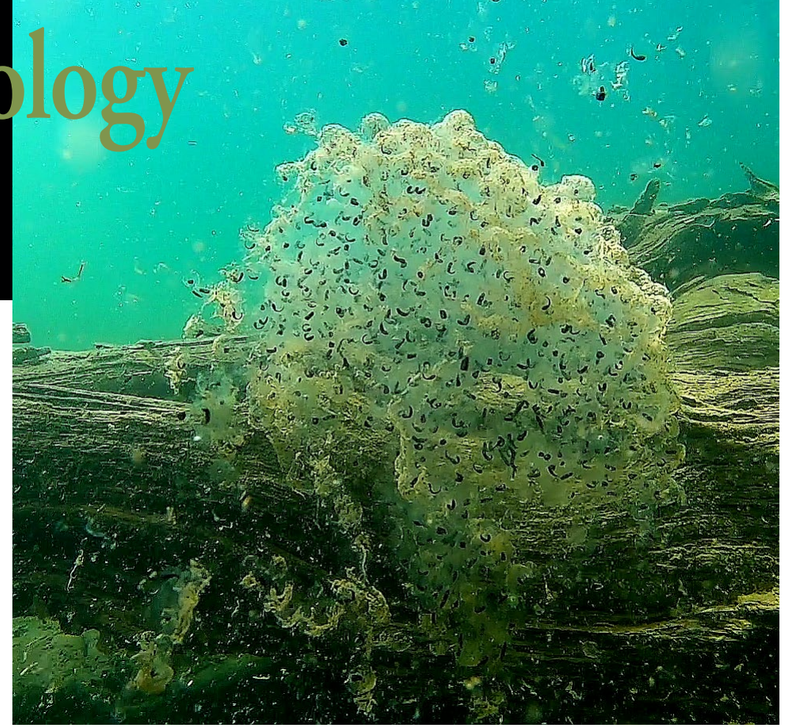
Preparation for transporting the fish was timed to the minute. No more than 15 minutes before the flight, the fish wardens used nets to first remove the fish from the tanks, and then quickly place them directly into a special tank filled with oxygenated water. Luxury treatment was reserved for the river trout, which would travel separately to be released along the stream flowing out of the lake.

Phase 3: Transfer to altitude and release report

It took less than three minutes to climb from 300m to 1,300m, with two flights to transport men and equipment, which were deposited with precise and delicate manoeuvres on the lake shore. By the third flight, we were already in the water, wearing only our wetsuits and carrying our video cameras, waiting for the arrival of the tank containing the fry. Marco immediately clung to the edge of the container, already at the water's edge, while, from the cockpit, flight assistants equipped with remote controls opened the various doors remotely with a pneumatic device, and the cascade of fish finally entered the lake!

Andrea Policastro was already flying his drone and filming the wonder of this lake, nestled in a basin of still snow-capped mountains, with an indiscreet eye—truly a unique sight!

Meanwhile, Ivan Rolli was ready. He mounted the spotlights on the scooter's photographic arms, adjusted the shooting angle, monitored the almost perfect visibility in the water and started the show. It was our turn to fly, but underwater. With two dives of 80 and 20 minutes, at a minimum temperature of 6°C and a maximum depth of 13m,



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Scenes of the underwater world at Lake Cama. Bacterial film produced by the decomposition of wood (right and bottom right).

it was simply beautiful and exciting, navigating a distance of over 1600m.

Marco also entered the water after instructing his wife, Lorenza, and daughter, Zoe, with a laptop and scientific instruments to measure and record certain parameters at specific GPS points. Surface water oxygenation, pH measurement, surface temperature, electrical conductivity, visual examination of turbidity and verification of the presence of algae. All measurements are to be repeated during the hottest period of the summer for data comparison.

Ivan navigated as if he were in an amusement park. Before our masks, proceeding in a north-easterly direction, a calm, muddy expanse appeared at first, interspersed with strange, anaconda-like shapes. But, as we had not yet succumbed to narcosis, we could recognise old, solitary wrecks of trees and pines thrown here by who knows what storm.

The end of the lake, to the north, bordered by a basin of rocks and stones, saw us climb up the bank in the opposite direction to then arrive in the middle of a veritable forest of tangled trees, which had certainly collapsed from the nearby slope and created sudden elevations in the bottom. A fairy-tale world, we are used to, but here it was truly unique.

Our attention then turned to a strange algae, or "mould", as we incorrectly called it, which, according to our biologist friend Emilio Mancuso, was a "bacterial film" produced by the decomposition of wood, completely natural and not harmful to the biology of the lake. The southern part was equally curious, especially just after a large rock face, where

we found ourselves side by side and stationary, with our fins on the ground and scooters immobile, looking at a small gully formed by the melting snow and the force of the stream. With the second dive, we took water samples at various depths, also removing a small sample of our "mould".

Marco, who finally recovered from the low water temperatures (his semi-dry suit had its limits), was able to collect the river trout, which were in a small floating pool and

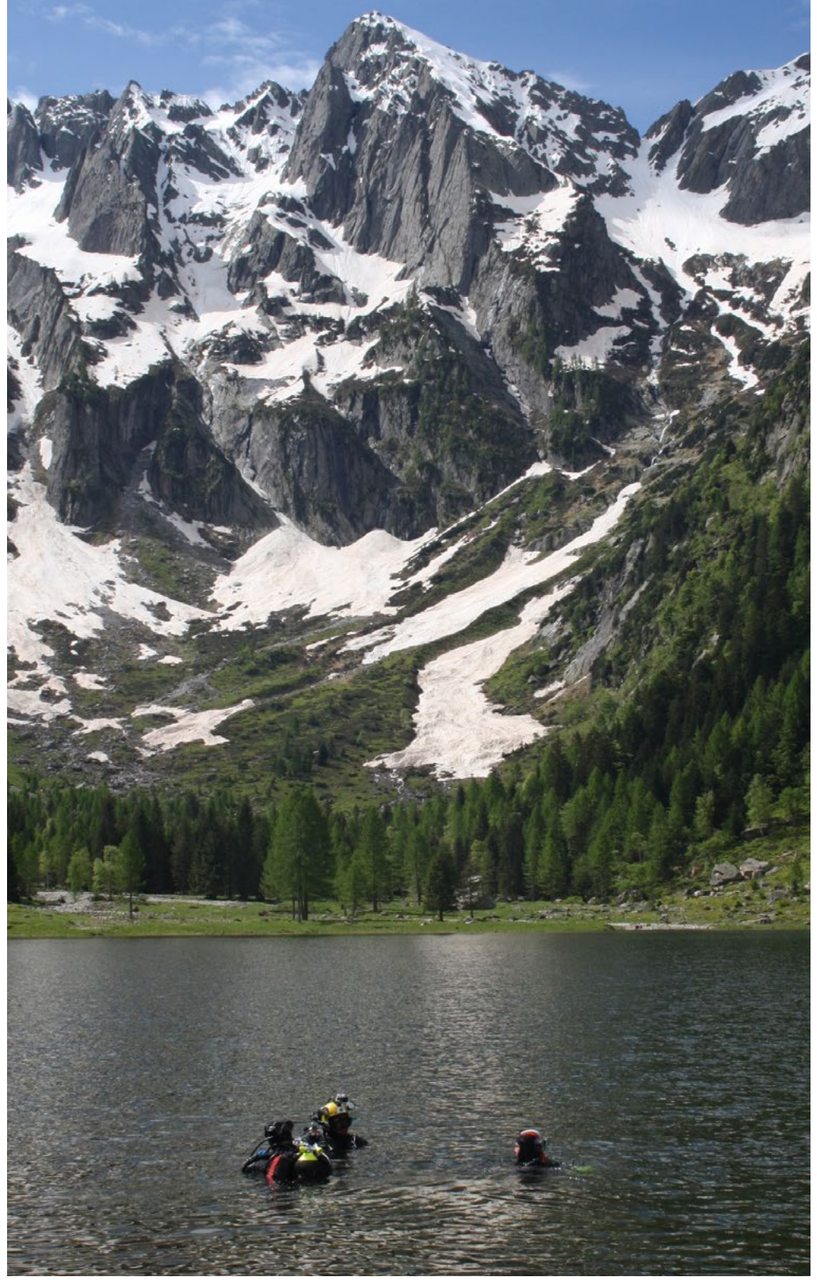
On the second dive, divers collected bacterial film and water samples at various depths.

placed in a semi-oxygenated plastic basket, and release them downstream of the lake into the pools of the beautiful stream.

Results and conclusions

All tasks had been completed, and objectives had been achieved. Satisfaction was sky-high, recognisable in everyone's eyes. After repositioning all the equipment and making it ready for the return flight, we would normally end up with our legs under a dining table, but, with no table available, we sat on the grassy lakeshore and enjoyed some excellent and delicious Swiss bratwurst prepared by Marco on a grill.

Achieving the project's objectives required meticulous coordination and great commitment from all participants. Modern technology allows us to monitor our planet, but it is still the passion and collaboration between people that makes the difference. This project demonstrates that, with dedication and collaboration, exceptional results can be achieved, ensuring the conservation of our ecosystems for future generations. Nature needs our attention and efforts to thrive and not die. ■



Carlo Roncoroni is a technical diver and author with extensive experience in deep diving and diving with mixtures, such as trimix. He has written several articles for ScubaZone, focusing on exploration, lake environments and technical diving. He shares most of his dives with Ivan Rolli, his friend and diving partner, with whom he explores and documents often little-known environments. Together, they promote a vision of diving based on research, adventure, preparation and respect for the environment.

REFERENCE: WIKIPEDIA.ORG

What Is Lake Restoration?

Text by Peter Symes

Lake restoration is the process of improving the ecological health, water quality and usability of lakes that have been degraded by human activity or natural processes. It is carried out to reverse environmental damage and to ensure that lakes can continue to provide important benefits, such as biodiversity, clean water, recreation and cultural value.

Problems addressed

Lakes are vulnerable to a variety of pressures, many of them linked to human land use. One of the most common problems is eutrophication, caused by excess nutrients—mainly nitrogen and phosphorus—from agricultural fertilisers, sewage or urban runoff. This nutrient enrichment stimulates algal blooms, which reduce water clarity, deplete oxygen levels and can release toxins harmful to wildlife and humans. Over time, eutrophication can transform a clear, healthy lake into a turbid, oxygen-poor environment, where fish and aquatic plants struggle to survive.

Other issues include sedimentation, where soil erosion from farmland or deforested areas fills in lake basins, making them shallower and less hospitable. Invasive species, such as non-native fish or plants, can disrupt food webs and outcompete native organisms. Pollution from heavy metals, plastics or industrial effluents also threatens water quality. Climate change exacerbates stress by warming waters, altering rainfall patterns and intensifying droughts and floods, which impact lake ecology.

Methods

Restoration strategies vary depending on the specific problems a lake faces, but they generally aim to reduce nutrient inputs, stabilise ecosystems and improve water quality. Approaches are usually grouped into external and internal measures.

External measures focus on reducing nutrient and pollutant inflows from the surrounding catchment. This may include upgrading sewage treatment plants, introducing buffer strips of vegetation to filter agricultural runoff or restoring wetlands that naturally trap nutrients before they reach the lake. Land management practices, such as reduced fertiliser use or erosion control, are also key.

Internal measures deal with problems already present in the lake. To improve oxygen levels, aeration or oxygenation systems can be installed. Sediment dredging may remove nutrient-rich layers, while chemical treatments—such as aluminium ▶

PETER SYMES

In lake restoration, perch stocks can be strengthened by reducing competing planktivorous fish through netting or removal campaigns. With fewer roach and bream present, perch thrive as top predators, controlling smaller fish and allowing zooplankton populations to recover, which in turn helps suppress algal blooms and improves water clarity.

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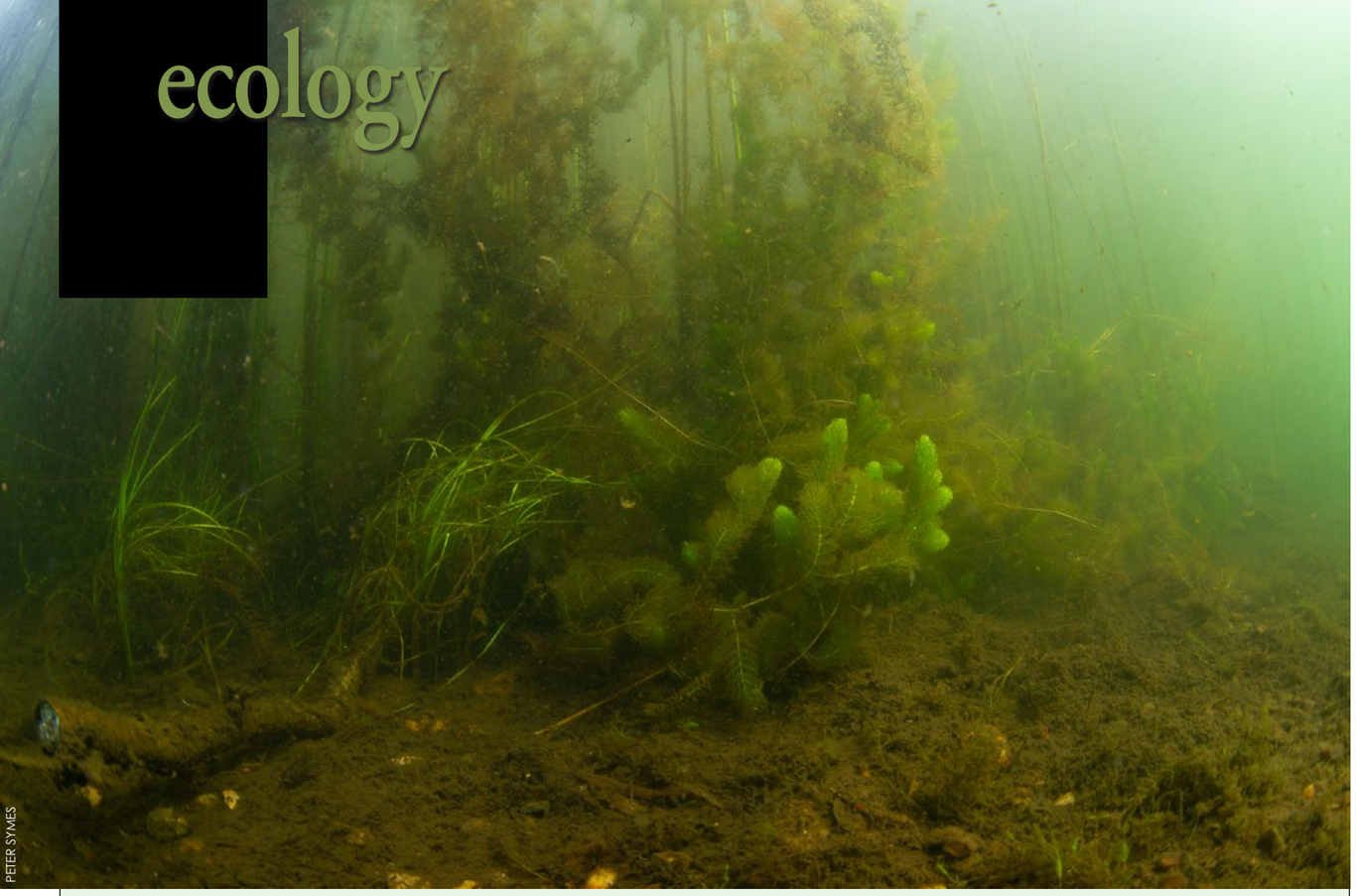
Lake restoration is ultimately an environmental and social investment for future generations.



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A healthy lake bottom with a variety of rooted plants and an oxygenated substrate

◀ salts—can bind phosphorus in the sediments, preventing its release into the water.

Another widely used technique is biomanipulation, which alters fish stocks to restore ecological balance. This often involves reducing populations of planktivorous fish, such as roach or bream, which feed on zooplankton that would otherwise graze on algae. By lowering their numbers—sometimes through large-scale netting campaigns—zooplankton populations recover, leading to clearer water and fewer algal blooms. In some cases, predatory species such as pike or perch are reintroduced or encouraged to thrive, thereby further controlling the population of planktivorous fish. Successful examples of this approach have been documented in several European lakes, including Lake Vesijärvi in Finland, where fish stock manipulation has played a crucial role in enhancing water quality.

Biological methods, such as replanting native aquatic vegetation, can also stabilise shorelines, improve habitats and compete with algae for nutrients.

Outcome

When successful, lake restoration can significantly improve water clarity, reduce harmful algal blooms and revive habitats for fish, birds and invertebrates. It helps secure drinking water resources, supports tourism and recreation and strengthens the resilience of ecosystems to climate change.

Restoration, however, is rarely quick or inexpensive. Depending on the scale of intervention, projects may take several years to decades before lasting improvements are visible, and costs can range from thousands to many millions of euros. Long-term maintenance and monitoring are typically required to ensure sustained results.

Ultimately, it is both an environmental and social investment, ensuring lakes remain vital natural assets for future generations. ■