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ADAPTATION TO CLIMATE CHANGE

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Agricultural Watershed Trail in Southwestern Finland for Climate Change Adaptation

The Agricultural Watershed Trail is an educational outdoor trail demonstrating water management methods

Warming temperatures are increasing nutrient loads in the Archipelago Sea, threatening its biodiversity and region's livelihoods. Nutrient cycling helps increase the Archipelago's resilience to changing climatic conditions.

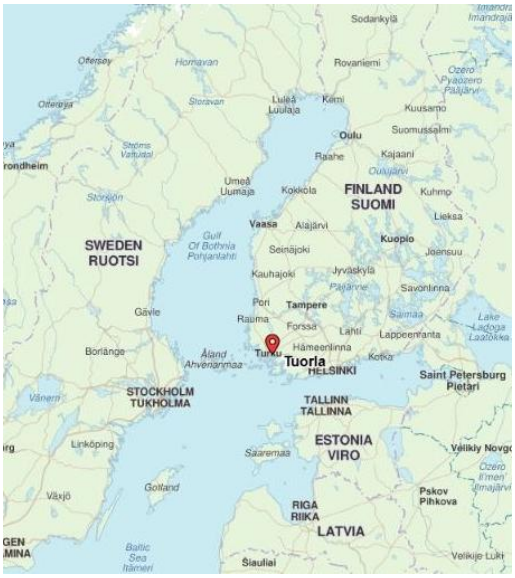
Key Learnings

- **Accessible knowledge**: A unique approach makes water-related knowledge and water management measures accessible to everyone.
- **Tangible and accessible examples**: Small-scale demonstrations and larger field-scale implementations showcase a range of alternative water management measures. Measurement data supports assessing their effectiveness.
- **Collaboration opens new pathways**: Collaboration between the vocational school Livia College and universities created new learning pathways for students and professionals in the field nationwide.
- **Replicable results**: Lessons learned at the pilot sites form the basis for replication and adapting the measures to local circumstances for broader application.

About the region

The Agricultural Watershed Trail is a demonstration site for water protection located in Southwest Finland, which comprises 27 municipalities. The region has a population of about 479,000, including small rural municipalities and urban centres. Southwest Finland is known for its long settlement history and rich cultural heritage, with the City of Turku being its regional capital. Adjacent to Turku lies the city of Kaarina, where the trail is situated in the Tuorla area.

Tuorla is home to the vocational school Livia College, whose premises already featured a variety of natural environments, such as traditional biotopes, two-stage ditches, a coastal shoreline, and a retention pond. The area also includes an operating farm with fields, animal facilities, and a bioenergy production plant. Flowing through the area is the Myllyoja stream, which originates from Lake Littoistenjärvi and discharges into the sea off the coast of Tuorla. The catchment area of Myllyoja covers more than 15 km².



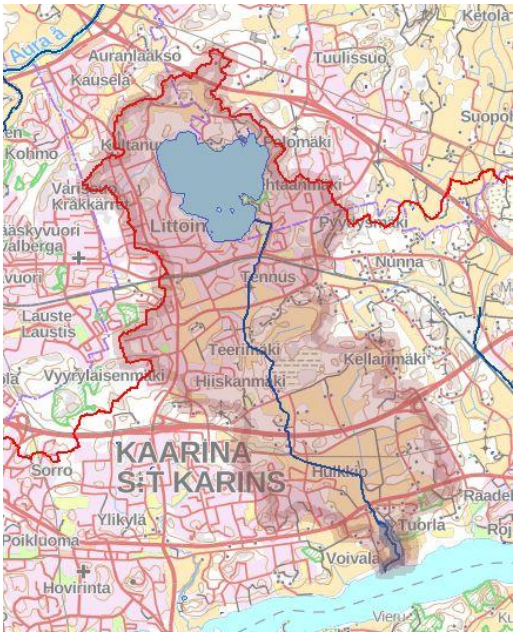


Figure 1: The Myllyoja Watershed in Kaarina. Myllyoja originates from Lake Littoistenjärvi. Image Credit: VALUE – Watershed Delineation Tool KM10, Finnish Environment Institute. Base map: National Land Survey of Finland, 2022.

Climate Hazards

Extreme Heat, Flooding, Droughts, Water Scarcity

Sector

Agriculture, Water Management

Key system

Ecosystems and Nature Based Solutions, Water Management, Land-use and Food Systems

Climate Threats

Southwest Finland is located along the coast of the unique and fragile Archipelago Sea. The main environmental issue affecting the Archipelago Sea has long been eutrophication, caused by excessive nutrient loading and warming temperatures. Water runoff through the clay soils of Southwest Finland carries nutrients from the soil into nearby water bodies, causing the greatest nutrient pollution. Traditional agricultural practices and the effects of climate change exacerbate this problem. Winters with little or no snow and minimal snow cover, combined with heavy rainfall, increase nutrient runoff from fields into water systems in the region. Some areas in Southwest Finland also suffer from flooding, further accelerating the

nutrient transport into the sea. The lack of snow during winter and increasingly hot summers also aggravate the growing drought risk.

The goal of the Archipelago Sea Programme is to reduce nutrient loading

The EU Water Framework Directive and Finland's Water and Marine Management Plans aim to prevent deteriorating surface and groundwater quality, to protect and improve overall water quality, and to restore degraded aquatic ecosystems. In response, the Finnish government launched the Archipelago Sea Programme in April 2021, led by the Prime Minister. The programme aims to reduce nutrient loading from the Archipelago Sea catchment area by 2027. Improving the Archipelago Sea's environmental condition is also one of the key priorities of the Regional Council of Southwest Finland.

"The nutrient load from agriculture to the Archipelago Sea is Finland's last remaining main pollution sites – HELCOM hotspot. Since water protection measures in agriculture are voluntary for farmers, the Archipelago Sea Programme provides them with various forms of support to implement these measures.",

Essi Hillgren programme manager for Achipelago Sea Programme at ELY Centre for Southwest Finland

Turning Fields into Classrooms – A Trail Toward Sustainable Water Practices

The Agricultural Watershed Trail is an information trail and supports improving the Archipelago Sea and adaptation to climate change by providing concrete examples for preventing nutrient runoff. A constructed wetland, a runoff water management system for a cattle yard, an agroforestry plot, controlled subsurface drainage, and demonstration plots showing the benefits of soil amendments such as gypsum, fibre, and structural lime have been implemented in the area. In addition, a stream restoration was carried out in the Myllyoja stream to enhance aquatic biodiversity, and wooden deflectors were added to the stream to help prevent erosion. These methods show how to keep nutrients in fields, prepare for droughts in agriculture, and prevent erosion. Bioversity protection is also a vital project consideration.

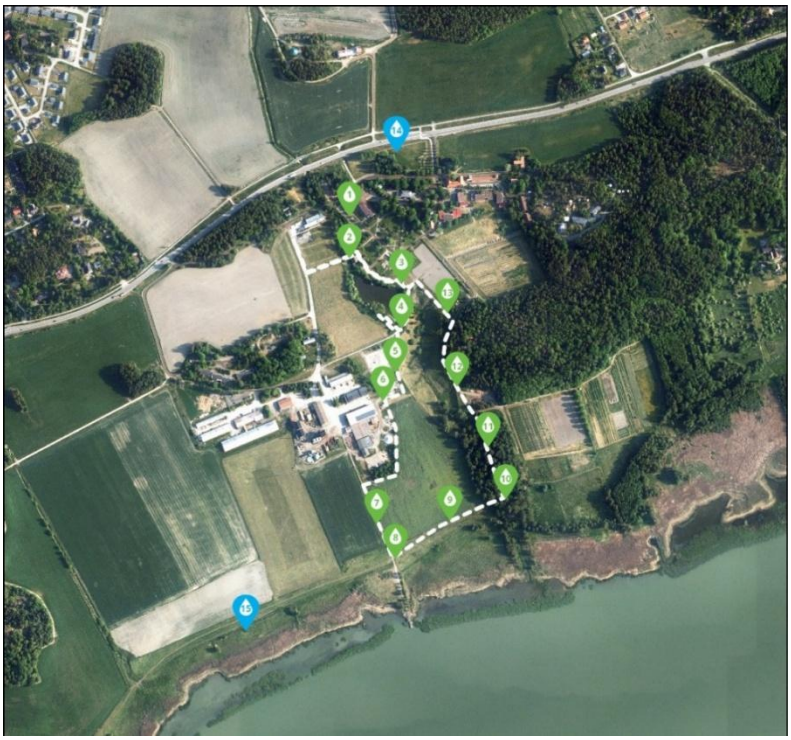


Figure 2: The Agricultural Watershed Trail showcases several different water management methods. Image Credit: Seela Brax, University of Turku.

The project team engaged local farmers in the catchment area to explore sustainable water management options through knowledge-sharing, training sessions, and practical examples like wetlands, agroforestry blocks, and runoff water sites. The initiative includes events and training at the Livia site, with materials made widely accessible. The trail acts as an educational tool for all ages, from early years to higher education, while also targeting future farmers and anyone interested in sustainable water management. It aims to strengthen water and nature literacy among key groups shaping future climate adaptation and environmental protection decisions.

To reach even more people, a virtual 3D version of the trail, including a child-friendly edition, will launch in June 2025, offering an interactive learning experience that supports sustainable practices and nature-based solutions across Finland.

Alternative Water Management Solutions

The pathway offers visitors the opportunity to explore a variety of water environments along the route. To demonstrate the practical application of sustainable water management, the project partners designed and implemented various solutions on-site. These alternative water management methods refer to nature-based or improved technical measures aimed at reducing nutrient runoff and enhancing climate change adaptation, in contrast to conventional systems where water is often discharged without targeted control or protection measures.

Examples include a constructed wetland that filters runoff, a restored stream that improves habitat diversity and flow conditions, and demonstration plots showcasing the effects of soil amendments, such as structural lime, gypsum, and fibre, on soil structure and nutrient leaching. The pathway also features an agroforestry plot that combines crop cultivation and tree growth, a controlled subsurface drainage system that allows for water retention and regulation, and a runoff management solution for a cattle yard that prevents nutrients from directly entering water bodies.

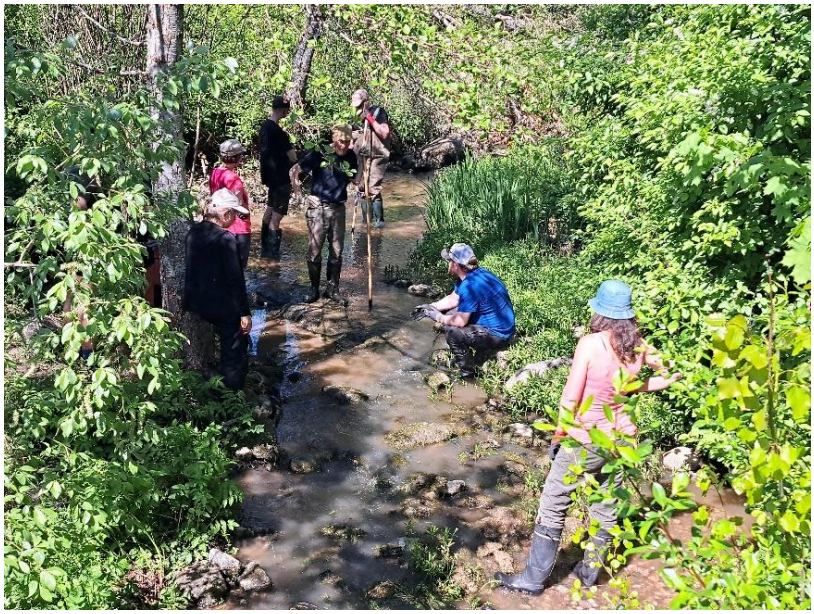


Figure 3: Volunteers together with Livia's environmental studies students carried out the Myllyoja stream restoration in spring 2024. Image Credit Omar Badawieh.

Water quality and flow speed are monitored at several points along the route to assess the *effectiveness* of these measures under real conditions and to guide further development and improvements.

Before the project, several water protection measures had already been implemented in the area, such as buffer zones, a two-stage ditch, and carbon farming practices, which the project team integrated into the new Pathway.

In addition, the restoration work has improved the number and quality of rapids and flowing sections of the Myllyoja stream, enhancing biodiversity. These actions improve the habitats of aquatic organisms and the condition of an endangered habitat type.

New tree plantings provide shading for aquatic life and reduce water temperature increases, keeping water quality stable. As the Myllyoja stream suffers from erosion, wooden deflectors provide further benefits for biodiversity and water protection.

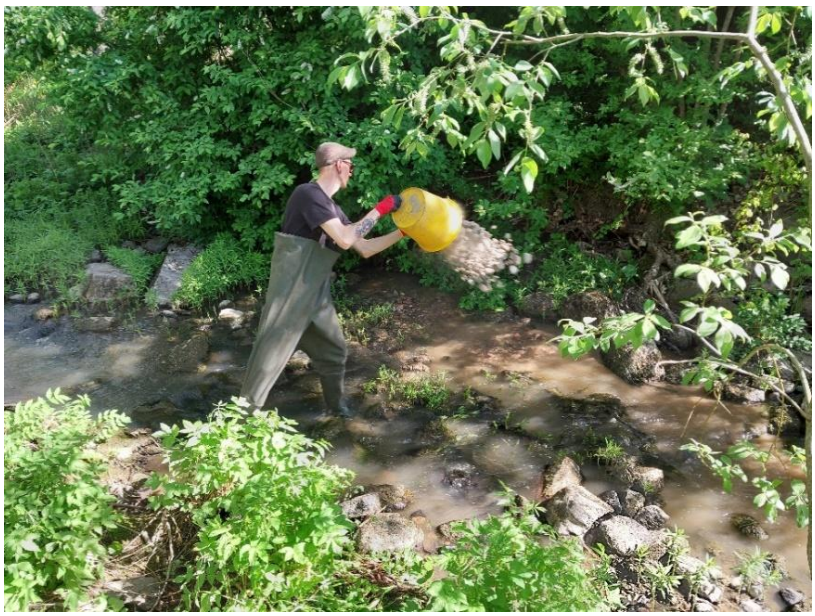


Figure 4: Spots in the Myllyoja stream support aquatic organisms living in flowing waters. Image Credit: Omar Badawieh.

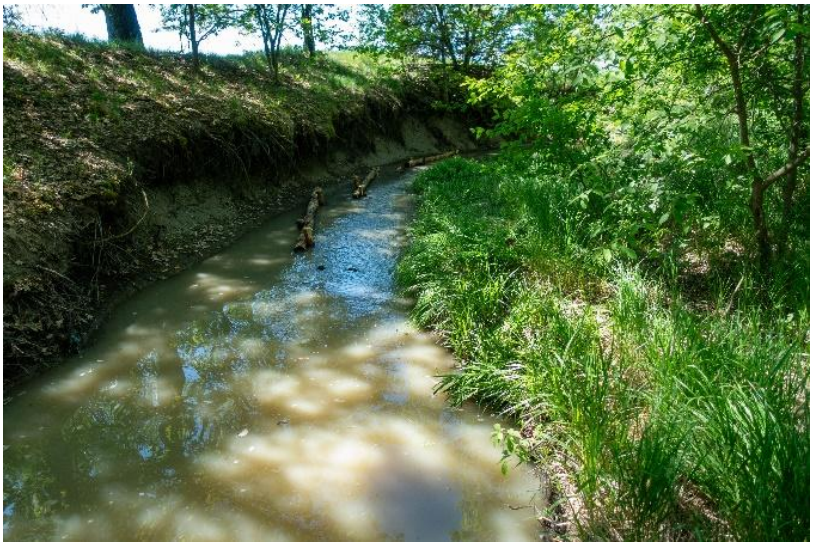


Figure 5: Wooden deflectors were installed in the eroded channel of the Myllyoja stream to prevent further erosion and to create additional flowing water habitats. Image Credit:Omar Badawieh.

Figure 6: The Agricultural Watershed Pathway showcases several different water management methods. Image Credit: Seela Brax, University of Turku; National Land Survey of Finland Orthophoto 07/2023.

Summary

The Agricultural Watershed Pathway in Southwest Finland showcases nature-based solutions for water management on farmland, enhancing biodiversity and supporting climate change adaptation. Located near the unique and sensitive Archipelago Sea, the trail demonstrates practical methods to reduce nutrient runoff and retain water in agricultural fields. Through various field demo sites and an open-access learning route, soon also available in virtual form, the Pathway supports environmental education from early childhood to higher education. It raises awareness among farmers and the wider public, promoting water quality and biodiversity improvements.

Further information

The work presented in this adaptation story is part of the Agricultural Watershed Trail project.

The project has received national funding from the Centre for Economic Development, Transport and the Environment of Northern Ostrobothnia, through the Ministry of the Environment Finland's water protection programme. The project supports the goals of promoting water management in agriculture and forestry in line with the national water protection programme. In addition, the project has received a grant from the Archipelago Sea Protection Fund.

The project coordinator was Livia College, and the co-implementers were Turku University of Applied Sciences, the University of Turku, the City of Kaarina, and Valonia/Regional Council of Southwest Finland.

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