Wetland Restoration for the Future

Climate change mitigation which supports biodiversity and is socially just and rewarding

ALFAwetlands, a Horizon Europe project (2022-2026), will

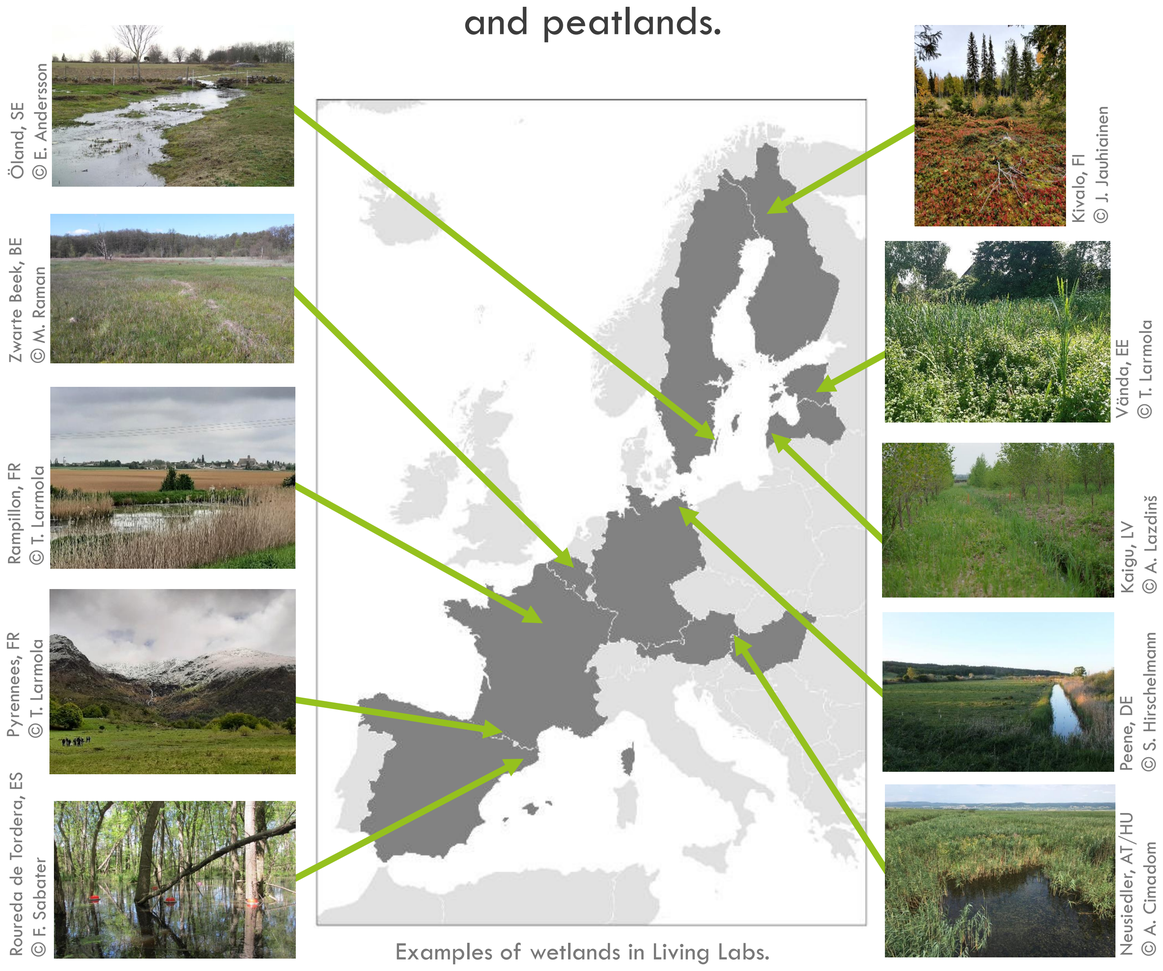
- Advance the geospatial knowledge base of wetlands
- Evaluate pathways of wetland restoration that incorporate a co-creation process
- Provide information to maximize climate change, biodiversity and other ecosystem benefits.

Wetlands accumulate carbon efficiently, globally their estimated carbon storage is 225billion metric tons, but are also a source of greenhouse gases, depending on the water level different greenhouse gases are emitted (GHGE).

Wetland restoration can provide nature-based solutions to decrease GHGE and increase carbon storage in the soil.

- EU aims to reduce GHGE by at least 55% by 2030.
- New GHGE mitigation measures required within all sectors, including Land Use, Land Use Change and Forestry (LULUCF) sector.
- Sustainable management and restoration of carbon rich ecosystems may efficiently contribute to both EU's climate targets and biodiversity by providing cost-efficient climate change mitigation, maintaining biodiversity and water-related services, as well as providing income for landowners.
- Engagement of local communities in sustainable use and protection of wetlands is highly relevant for enabling transition to a climate-neutral and resilient society across EU.
- Significant gaps prevail on wetlands' spatial extent, their magnitude as C sinks and sources, and sustainable restoration measures. This hinders the implementation of efficient C mitigation and adaptation measures in wetlands.

A wide range of wetlands and their land uses across Europe will be covered, including floodplains, coastal and artificial wetlands and peatlands.



Examples of wetlands in Living Labs.

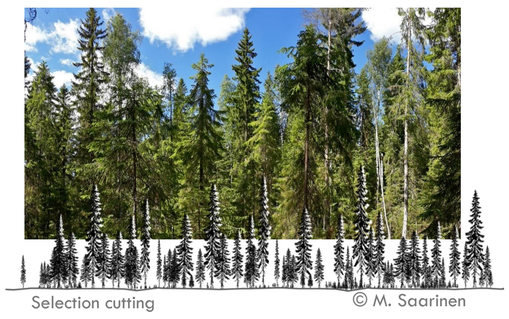
Living Labs support interdisciplinary research on ecological, environmental, economic, and social issues at the local level. Models will be used to explore the potential impacts of upscaled wetland restoration options on biodiversity and ecosystem services (BES) provision, as well as changes in BES provision at the EU level for various policy-relevant periods for both climate change mitigation and biodiversity targets. We will assess the socio-economic impacts of wetland restoration, especially on BES benefits and costs of different measures and wellbeing impacts from local to EU levels.

Boreal drained peatland forests and their management options - one of the foci


Clear cutting, Lettosuo ©J. Jauhiainen

Rotational even aged forestry (BAU Business as usual) including clear cutting and ditch network maintenance (DNM). Almost 50% of Finnish peatlands have been drained for forestry. Native tree species (often the original tree individuals) are grown, rotation time 60-100 yr. Drained peatland forests are an overall net C sink owing to their trees, their soils have turn in to a C source at country level. DNM lowers the water levels in the soil for a long time.

Continuous Cover Forestry (CCF) creating an uneven aged tree stand structure and attenuating water table fluctuations is now intensively studied as a more sustainable alternative to current drainage and clear-cut practice. Continuous Cover Forestry has greater potential to maintain C sink than BAU: Evaporation from the remaining tree stand controls the level in soil water table. Need for ditch maintenance is reduced/avoided.


Selection cutting © M. Saarinen


Ecological restoration by ditch blocking, Tammela © T. Larmola

Ecological Restoration (ER) of forestry-drained peatlands by rewetting (blocking of drainage ditches) and partial or complete removal of the tree layer depending on the pre-drainage tree cover. The decaying felling residue may hamper the recovery toward its nutrient-poor, pristine conditions and create a high risk of nutrient leaching (e.g. Tolvanen et al. 2020). Ecological Restoration can return the water table back to the level of undrained peatlands within few years. It is expected to reduce GHGE emissions from soil and enhance biodiversity in the long term. Ecological restoration is expected to produce climate benefits more rapidly in nutrient-rich forested peatlands than in nutrient-poor peatlands.

What to expect by year 2050, if the management of a site changes today?

	Continuous Cover Forestry	Ecological Restoration
GHG emission mitigation		
Soil net carbon balance		
Biodiversity		
Water quality downstream		
Wood production		
Recreation		
Flood risk reduction		
Management cost		

Our team created hypotheses on expected impacts of alternative management options (Continuous Cover Forestry and Ecological Restoration) compared to BAU (business-as-usual management). We will gather scientific evidence on the implementation of these measures during the ALFAwetlands project.

green = positive impact
darker green = stronger positive impact
blue = negative impact

GHG emission mitigation: (all 3 gases net GWP) on ecosystem scale (expressed as in IPCC guidelines including possible removal of harvested biomasses).
Soil net carbon balance: The difference between carbon added to the soil ecosystem via biomass production and litter input and CO2 and CH_4 lost through soil organic matter decomposition, expressed as moles of carbon.
Biodiversity: all species/habitat aspects combined but focus on features/species that could exist in target wetlands in pristine state (bog, fen, swamp).
Water quality downstream: all improvements in loads of nutrients, pollutants, dissolved carbon, suspended solids etc. First decade after ER negative impact, then expect turn to improving water quality.
Wood production: to provide economic income.
Management cost: Positive impact if the cost of the new restoration measure is lower than BAU.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