

# PRINCESS

## Peatland Rewetting In Nitrogen-Contaminated Environments: Synergies and trade-offs between biodiversity, climate, water quality and Society



**DURATION**  
15/12/2020 - 14/03/2024

**BUDGET**  
249 238 €

### PROJECT DESCRIPTION

**PRINCESS quantifies the potential of peatland rewetting as a nature-based climate change mitigation and adaptation solution across scales** – from micro- and mesocosms to field scale and catchment scale to EU level. Peatland *rewetting mitigates climate change* by reducing GHG emissions because rewetting effectively stops the decomposition of the drained peat. Still, methane emissions need to be considered and will be specifically tackled. In addition, carbon sequestration through new peat formation in rewetted fens is mainly driven by below-ground plant production and microbial decomposition, with the latter being limited by high water levels. Nitrogen loads, however, might affect this interaction and are, hence, a major topic for evaluation in PRINCESS. Above-ground biomass harvests can further substitute fossil resources, with N loads presumably increasing this potential. Even without taking biomass harvests into account, the carbon mitigation potential of a rewetted fen after 20 years is estimated to be similar to that of a beech forest after 130 years. In addition, *peatland rewetting serves climate change adaptation* by e.g. evaporative cooling, groundwater and coastal protection, and stopping subsidence. In PRINCESS, we specifically aim at optimizing rewetting peatlands as nature based solution for mitigating and adapting to climate change by evaluating the effects of three main land use options after rewetting and further considering synergies with other policy aims such as restoration of native biodiversity, nitrogen sink capacity, and rural economies across Europe.

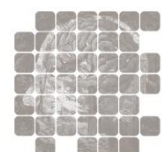


PRINCESS examines the role of land use options after rewetting peatlands on biodiversity, and, specifically, the climate-biodiversity feedback processes. GHG balance and nutrient sink capacity of rewetted peatlands are known to be strongly affected by functional biodiversity of the vegetation and the microbiome. Quantifying and projecting the influence of land use options on these **climate-biodiversity feedback processes under different nitrogen loads is consequently a key topic of PRINCESS**. While vast areas of wet wilderness and considerable areas of low-intensity paludiculture exist across Europe, high-intensity paludiculture is realized only in few pilot projects so far. PRINCESS quantifies the feedback between biodiversity as mediated by land use and nitrogen loads, and GHG emissions.

PRINCESS investigates rewetting of formerly drained and intensively used **peatlands as a prime example of creating synergies between biodiversity restoration and climate change mitigation while also taking eutrophication and fair income for farmers into account**. Scaling up from process-based understanding to generalization across field sites in a Europe-wide gradient allows for sound projections of synergies and trade-offs between policies on biodiversity, climate, eutrophication, and national economies at the EU level through modelling.

The **main research questions** are:

- What are the effects of land use options of differing intensity (high-intensity paludiculture, low-intensity paludiculture, wet wilderness) for rewetted, formerly deeply drained peatlands on key EU biodiversity, climate, water and societal policy objectives? Are there synergies and trade-offs?
- How do nitrogen loads influence compliance with the policy objectives under different land use options?
- How do nitrogen loads determine which land use option optimizes between these policy objectives, are there thresholds or tipping-points for choosing between these land use options?



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Finally, PRINCESS also explores nature's contribution to people as well as management consequences for biodiversity by relating land use options after peatland rewetting to various EU policy objectives. Economic consequences of the land use options are quantified at field sites and projected to regional and EU levels and effects on biodiversity are evaluated. At the national level, country-specific peatland GHG emission reduction pathways and rewetting guidelines will be communicated to policy makers using direct personal contacts of consortium members as well as press releases and media coverage. As field visits with life peat coring and direct feeling of degraded and undegraded peat has been found particularly powerful in earlier projects, we seek to arrange meetings with regional/national stakeholders and media at peatland field sites, if possible PRINCESS sites or sites of other peatland projects (in AU, NO, and FI). At the EU level, key tools are a policy brief targeting the EU level and a policy event in Brussels.



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## LINKS

<https://www.biodiversa.org/1876/download>