IMPACT OF RIVER RESTORATION ON THE SOIL ENVIRONMENT: INITIAL LOCALITY SURVEY

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INTRODUCTION

Wetlands such as wet meadows, marshes, ponds, and river channels play a crucial role in riverine ecosystems and in water retention within the landscape (Štěrba et al. 2008). During the past century, millions of hectares of wetland areas have been drained in order to increase their productive capacity. However, these interventions have been shown to negatively affect the water balance of the Central European landscape, especially the components of the small water cycle, which is exacerbated by global climate change. Currently, several objectives outlined in the European Union's Biodiversity Strategy for 2030 and the Water Framework Directive aim to restore at least 25,000 kilometres of riverbeds by 2030 and to achieve a "good status" for all river bodies by 2027. This restoration process begins in springs and headwater areas, as stream restoration is recognized as a valuable strategy for climate-change mitigation and carbon storage in waterlogged soils (Lininger and Lave 2024).

OBJECTIVE

The main objective of the project is to evaluate the transformative changes in agricultural soils after river restoration as well as to demonstrate that a well-designed functional talweg in a headwater area can significantly improve moisture conditions.

MATERIAL AND METHODS

The river restoration and our research are conducted at the new experimental headwater area (approx. 90 ha of area) of Slavětínský stream (k.ú. Slavětín u Slavonice), South Bohemian Region. The first year of the project solution was targeted to project design, sensors installation and random grid soil sampling before the watercourse rebuilding, which is planned to be implemented during the spring/summer 2026. Monitoring will be suspended in the spring of 2026 prior to the building works. The sensors will then be reinstalled into the soil profile during the final implementation phase. Design of continual soil moisture and temperature measuring is based on the following three types of revitalization sections accompanying the riverbed rebuilding itself:

(a) watercourse without any complementary element (control),
(b) watercourse with planted vegetation
(c) watercourse with the pool.

In spring 2025, soil samples were primarily collected from a random point grid (Fig. 1) located along the watercourse, within three land use management types:

- pasture (N = 12),
- field (N = 34), and
- unmanaged and future restoration area (N = 21).

At each point, samples were taken from the 0–30 cm topsoil and the 30–60 cm subsoil layers. At every third grid point, undisturbed soil cores were also collected (N = 46). Sampling will be repeated in the project's third year, one year after implementation. The analyses include the soil hydro-physical properties, such as soil bulk density, water type and soil texture (Fig. 2). Other soil analyses targeted to the humus conditions will include determined the soil organic matter, total carbon (their fractions) and total nitrogen, soil salinity and acidity.

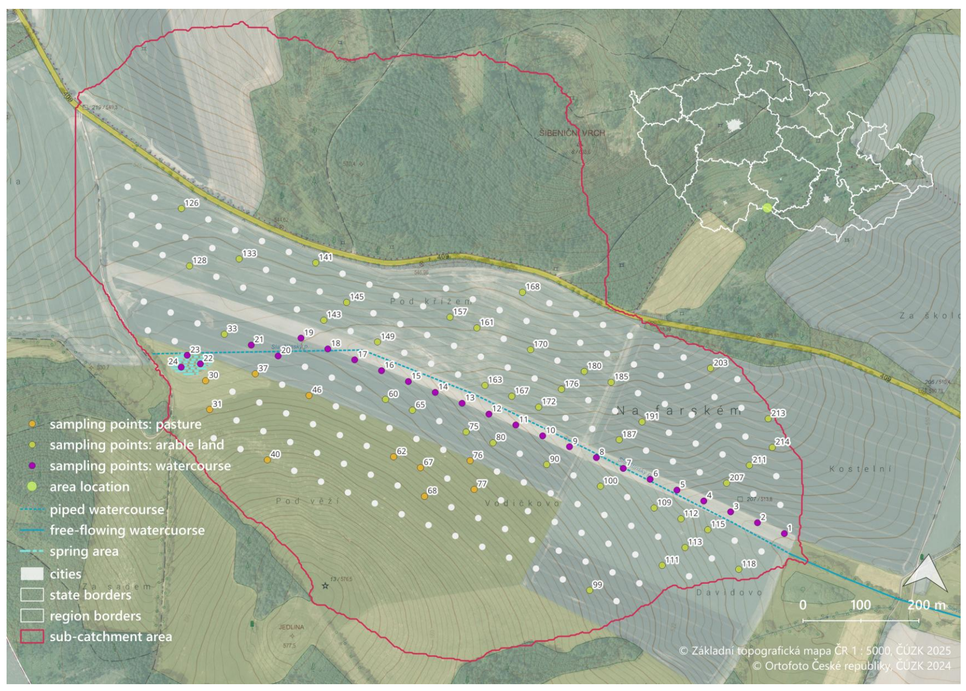

Figure 1 Localization of the research area with random sampling point grid

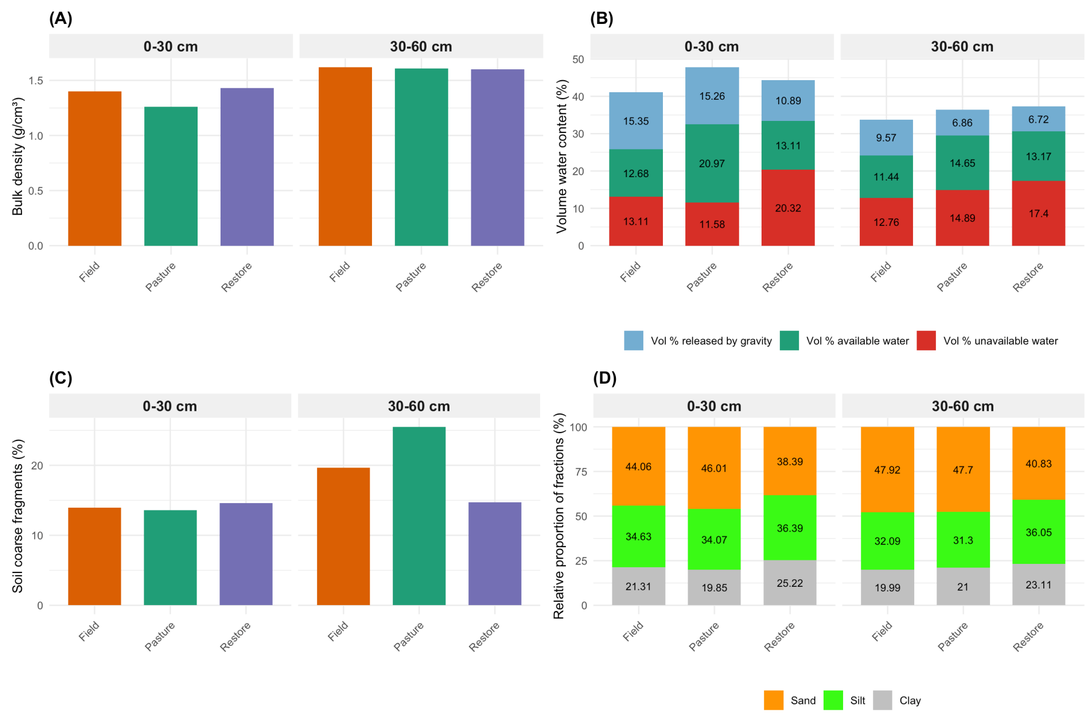

Figure 2 Comparison of (**A**) soil bulk density, **(B)** water types, **(C)** soil coarse fragments, and **(D)** soil texture across land use types (Field, Pasture, Restore) and soil layers (0–30 cm, 30–60 cm) of study headwater area. Average values are shown in all sub-plots.

CONCLUSIONS

In the first project year, initial design, start of soil moisture measuring and soil sampling were carried out. In the next year, the restoration will be implemented, as well as installation of other sensors and following soil analyses. The first results will be evaluated next year.

ACKNOWLEDGEMENT
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