Hydrological restoration of wetlands and streams in headwater areas

(LIFE for MIRES, Sumava National Park, Czech Republic)

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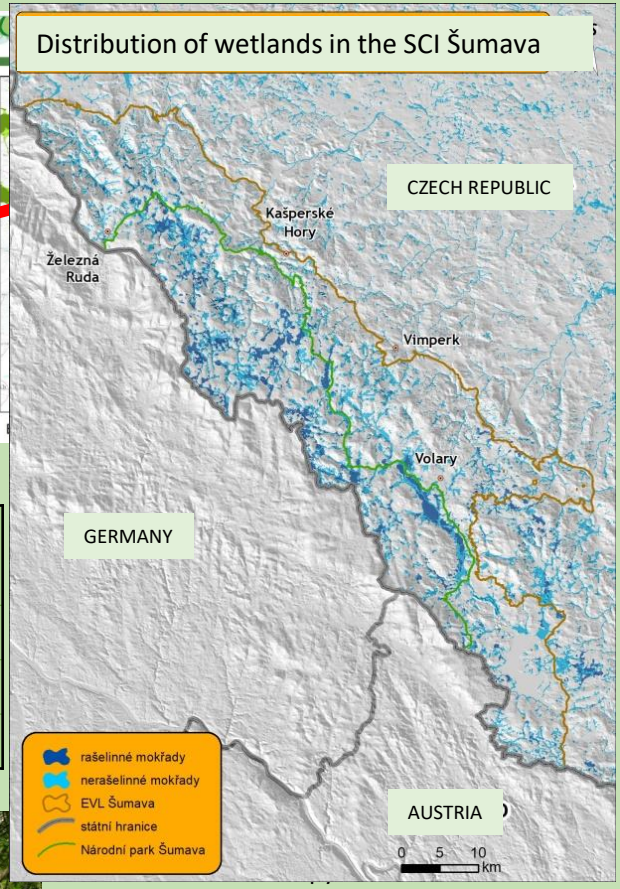
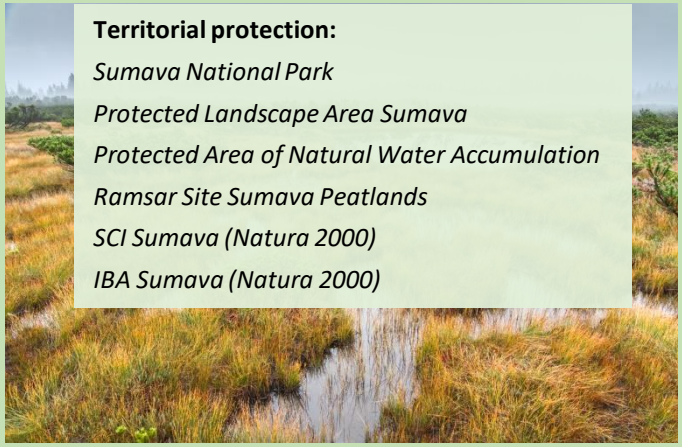
„Landscape without wetlands is landscape without water“

Šumava Mts. – important headwater area rich in wetlands and peatlands



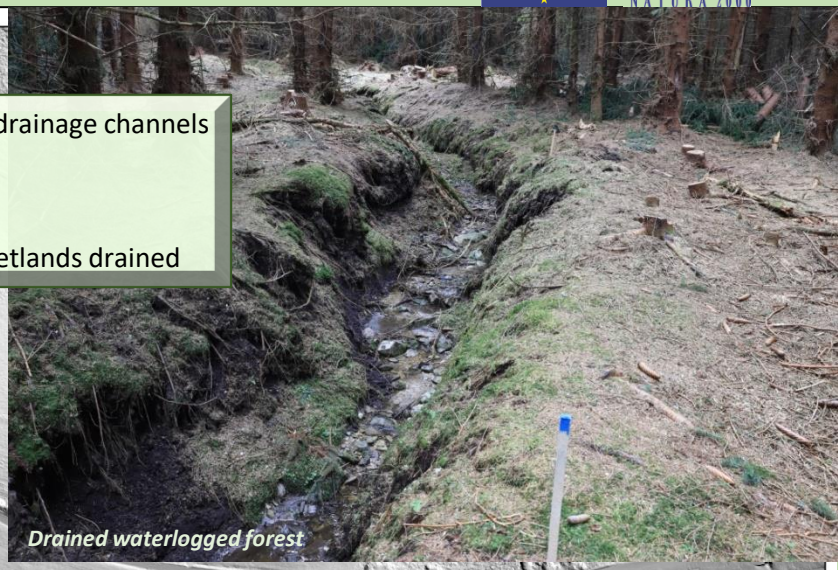


ŠUMAVA NP (70 000 ha)	**Area** (ha)	**%** NP
Peatlands	6 566	**10**
Non-peaty wetlands	14 930	**21**
Wetlands total	20 536	**31**

Landscape drainage among the most important threats

The example of drained small watershead

- about 1000 km of surface drainage channels
- piped drainage in foothills
- 70 % of mires drained
- more than 50% of other wetlands drained



Drained waterlogged forest

Drained alluvial wetlands

Drained meadow spring


LIFE for Mires project (2018-2024)
3th phase of restoration

„LIFE for MIRES“ – *3. phase of restoration*

TRANSBOUNDARY PROJECT – 4 PARTNERS

- Administration of Šumava NP – coordinating beneficiary
- NP Bavarian Forest
- BUND Naturschutz in Bayern e.V.
- The University of South Bohemia in České Budějovice

MAIN GOALS:

- **Hydrological restoration of mires and wetlands on the area 2059 hectars**
- **Improvement of habitats for black grouses (*Tetrao tetrix*)**
- **Involvement of public into mire restoration and increase of public awareness**

August 2018 - December 2024

The symbolic "Iron Curtain" near the Nové Údolí border crossing: the opening meeting in July 2019 (above) and the already restored site in November 2020 (below)

http://life.npsumava.cz/

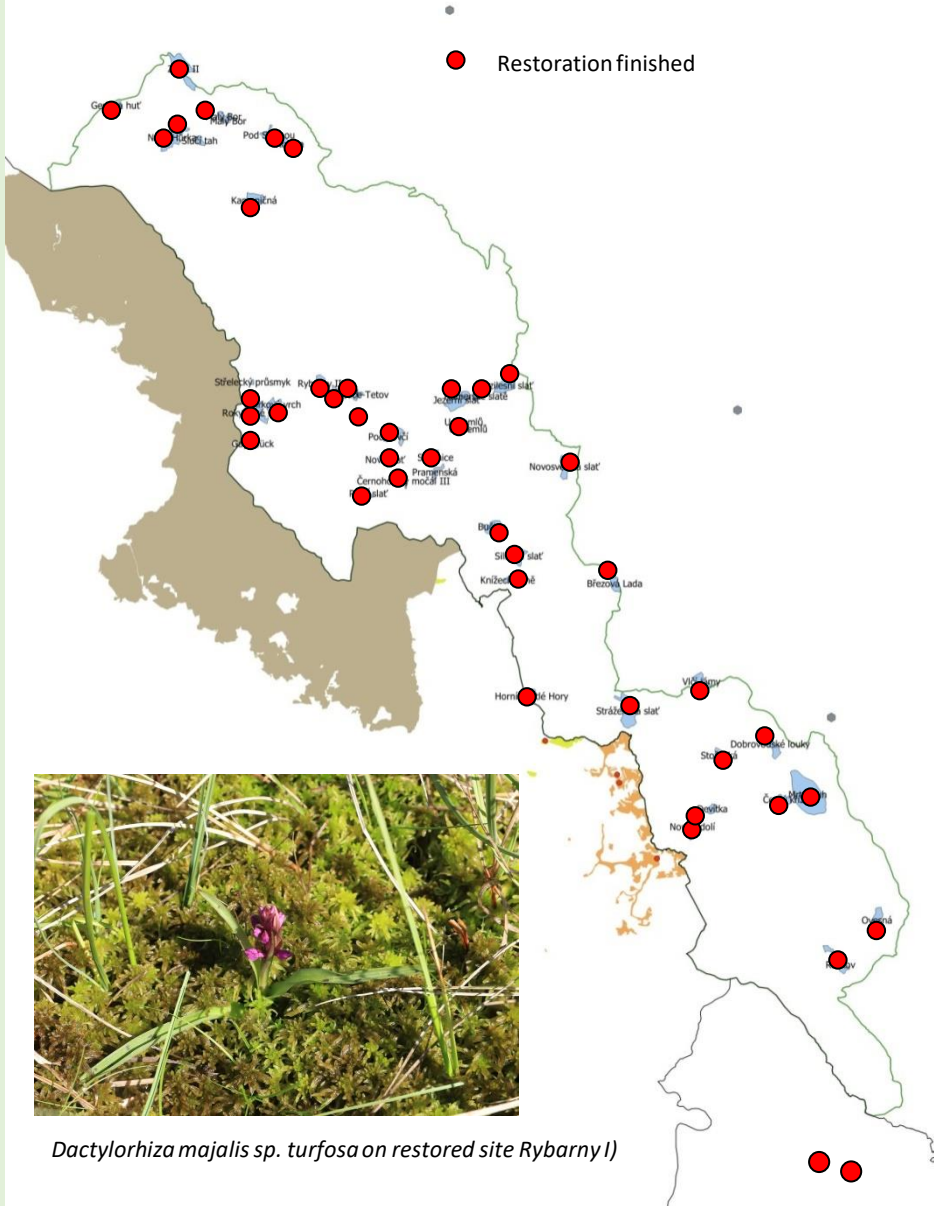
Number of project sites (CZ + GER)	47
Restored sites CZ	44
Restored area	2183 ha
Restored streams	35 km
Dammed and infilled ditches	212 km

Area of restored habitats:

- Spruce mires (91D0*) 87 ha
- Open peatbogs (7110*) 272 ha
- Transitional mires (7140) 169 ha
- Pine bog forests (91D0*) 567 ha
- Highly degraded bogs (7120) 94 ha
- Waterlogged spruce forests (9410) 450 ha

Restored natural stream, blocked channels and created small pools on the Rybarny I site

Distribution of project sites



Dactylorhiza majalis sp. turfosa on restored site Rybarny I)

- Promote water infiltration into the soil
- Increase soil water retention
- Start a functioning water regime

Regulovaný potok Korunáč, R. Plíhal, 2020

1. Microcatchment concept

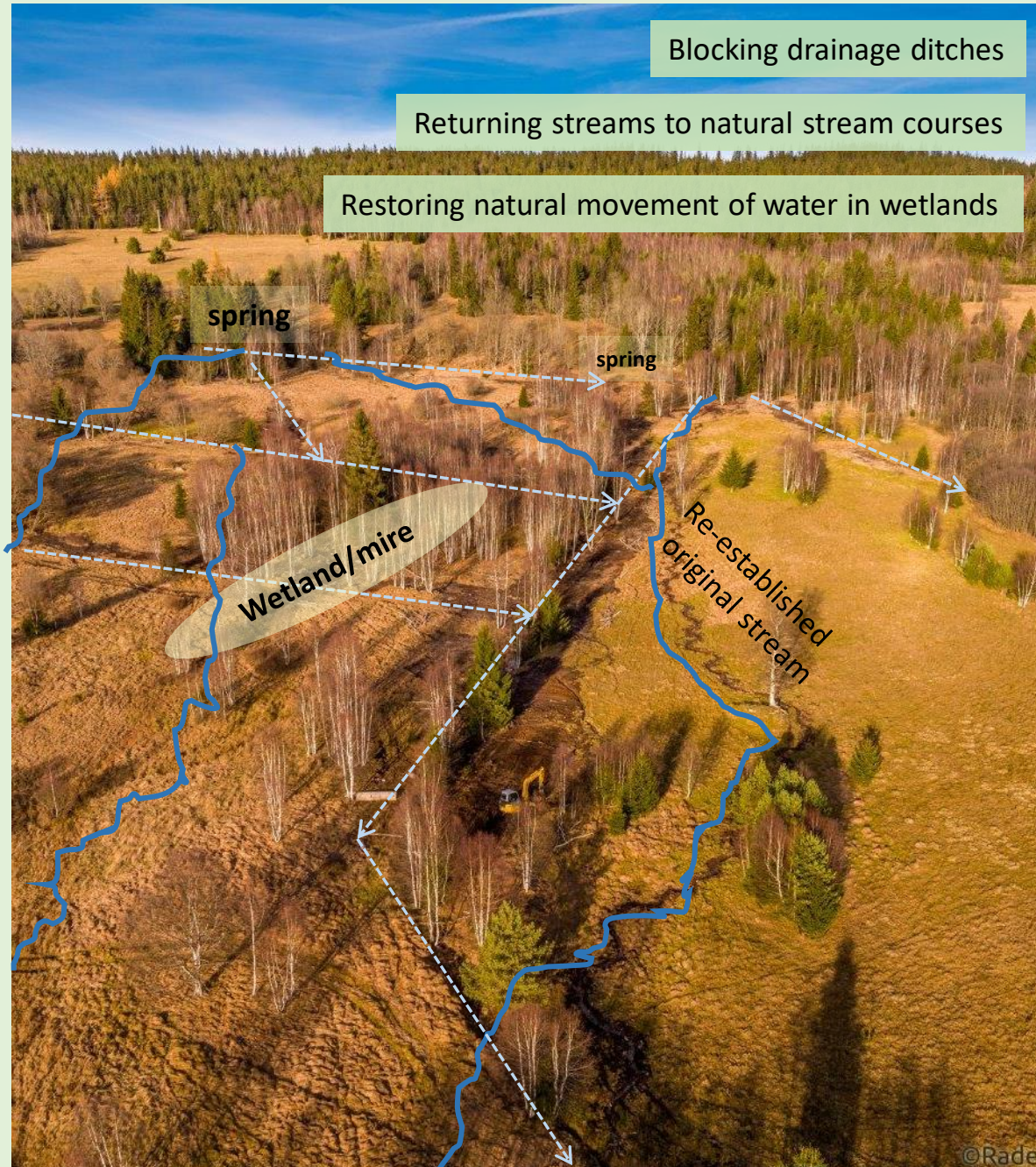
Restoration of main hydrological structures

springs – streams - wetlands

Water structures are interlinked – complex solution is necessary!

2. Concept of one-off measures

- ***f**unctional restoration, abiotic condition*



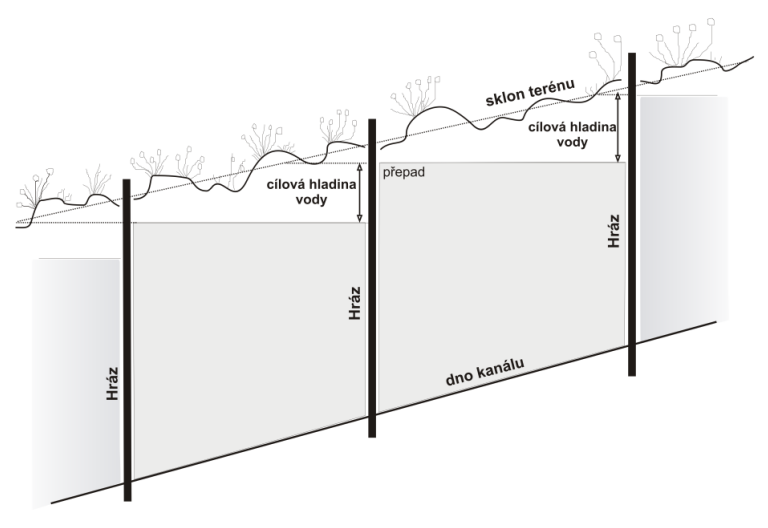
Removal of drainage ditches

- **Block! and fill! channels**

both steps are necessary – they don't work separately

Simply filling in channels on the slope promotes bottom erosion and subsurface runoff while simply damming them is easily destroyed by water erosion

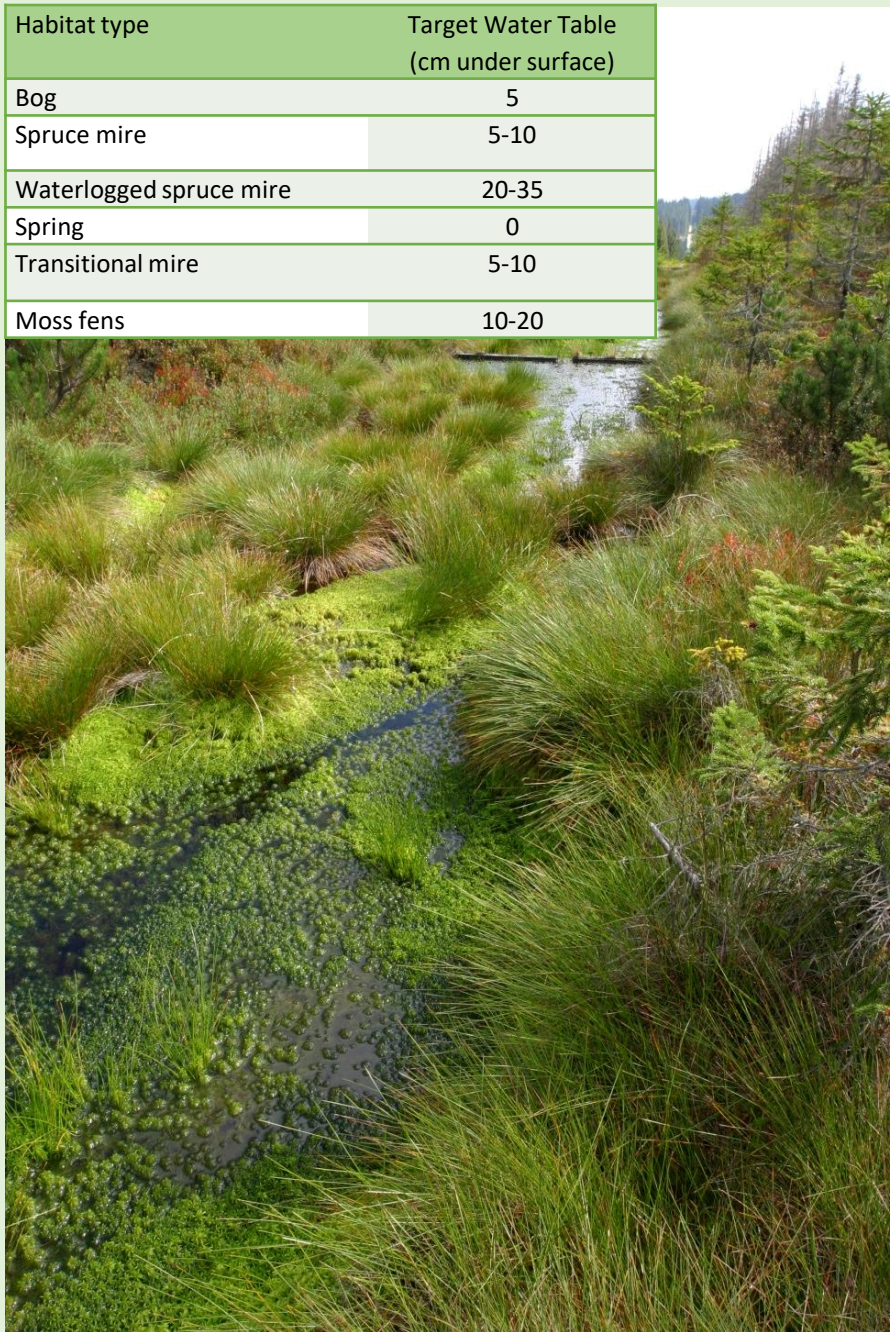
blocking is done by cascade of **woody dams**



3. Target Water Table Concept

- Returns the water table back to the level corresponding to the habitat
- As close as possible to the pre-drainage state
- Target water table determinates number and position of dams

Habitat type	Target Water Table (cm under surface)
Bog	5
Spruce mire	5-10
Waterlogged spruce mire	20-35
Spring	0
Transitional mire	5-10
Moss fens	10-20



Removal of drainage ditches

Restoration of natural stream courses

Restoration of springs

- Neglected habitats!
- High importance in landscape hydrology
- Lack of data about location and current state
- Mostly damaged by drainage (over 60%)

LIFE project developed the technology of spring restoration

Mapy a realita na příkladu pramenné oblasti Gerlova potoka

SCI Šumava*:*

- *970 spring location registered*
- *but actually 2000 spring site mapped*

Restoration of meadow springs

Large, drained and totally destroyed spring

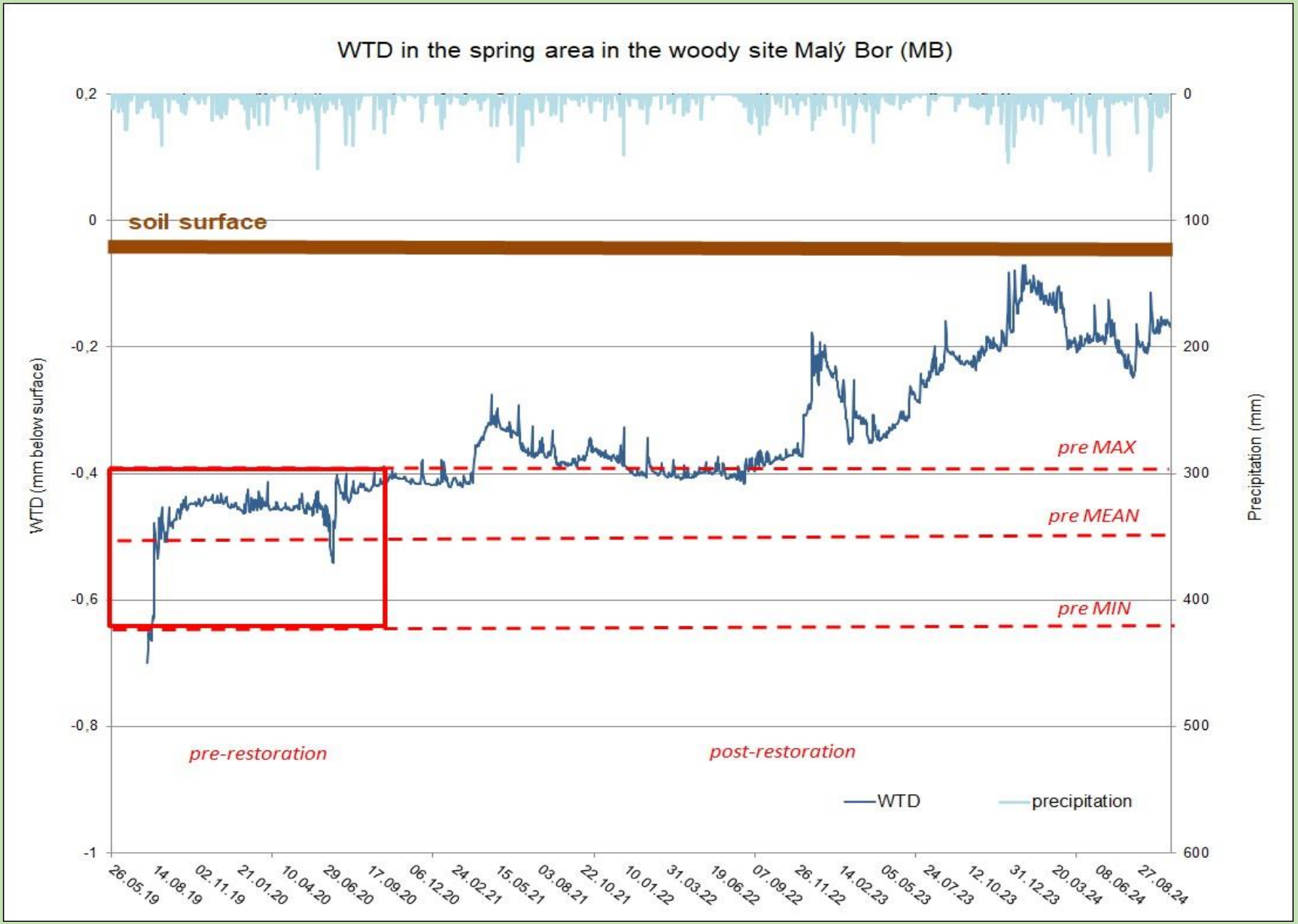
Blocking of drainage ditches by woody dams, infilling of large pits from bank soil deposits

Two months after restoration 2021

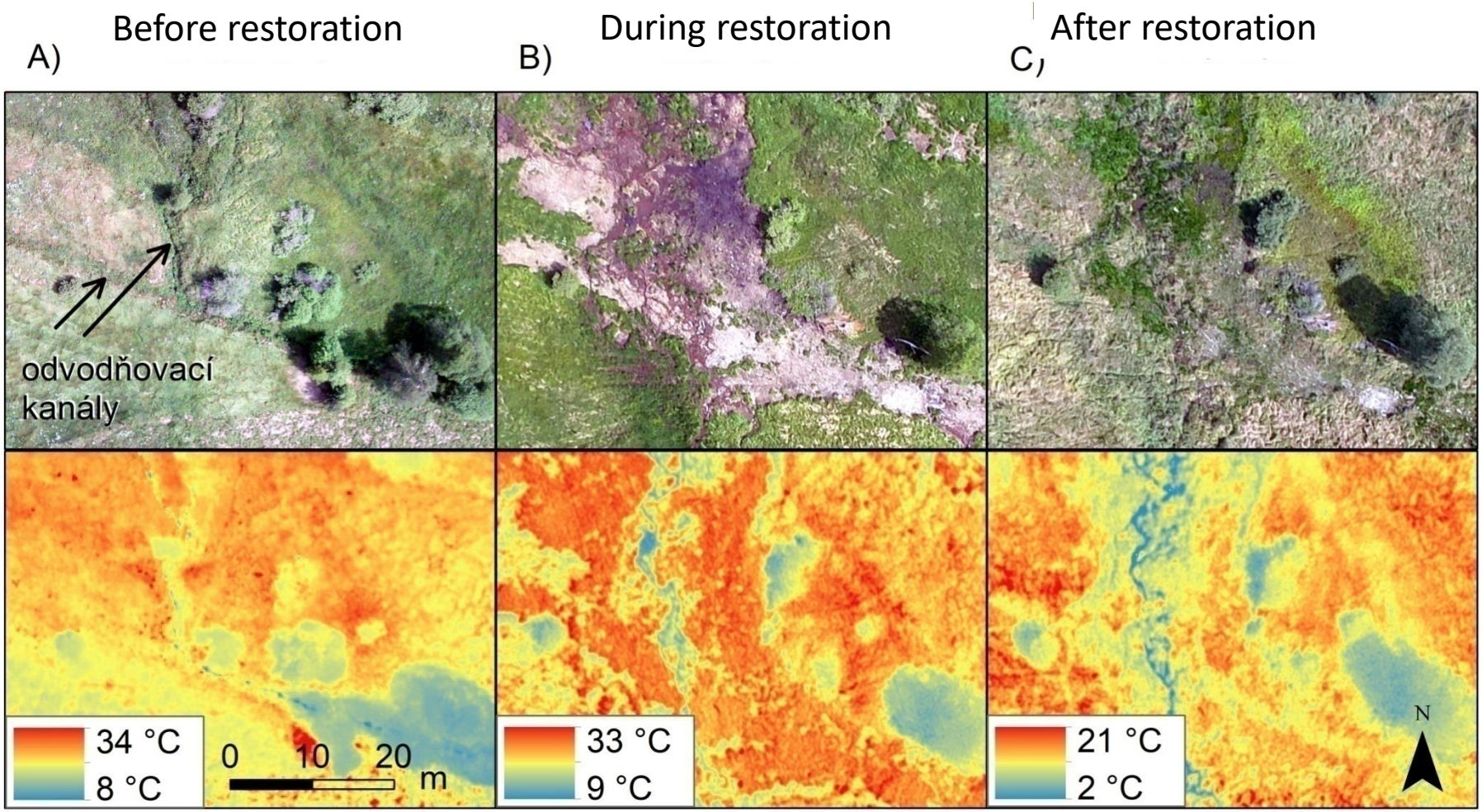
Channelized small stream before restoration (2018)

Restored stream
early after restoration (2021)

Position of the water table in spring habitat after restoration

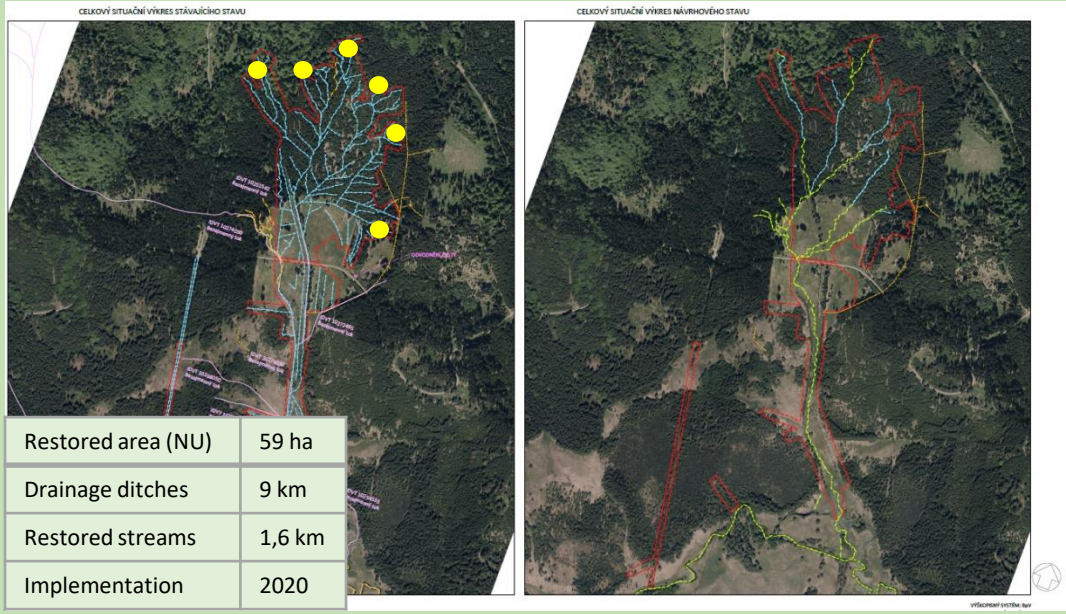


Cooling effect of wetlands – surface temperatures reduced by up to 10^0C after restoration



M. Hais – the University of South Bohemia in České Budějovice

Restoration of forest springs



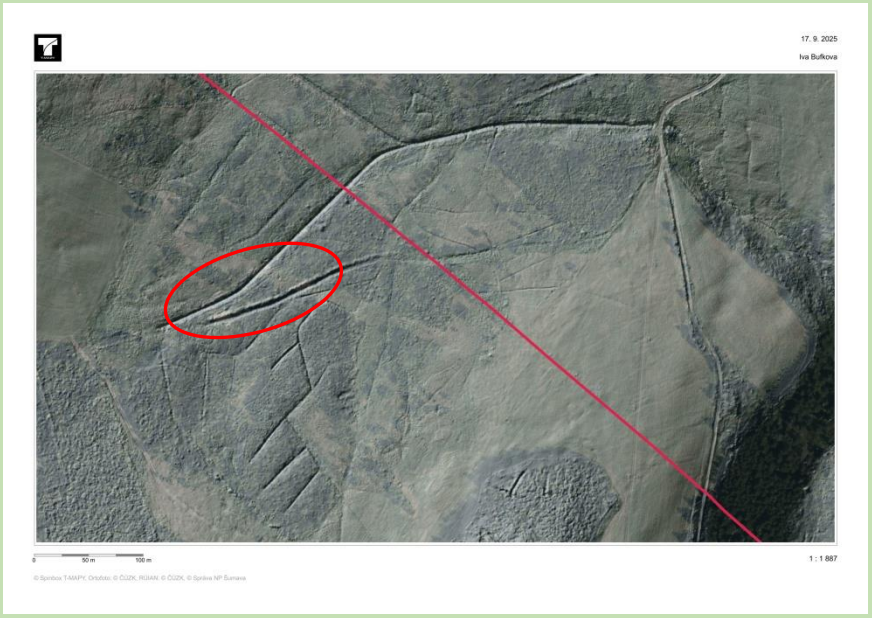
Restored area (NU)	59 ha
Drainage ditches	9 km
Restored streams	1,6 km
Implementation	2020


Spring before restoration 2019

Restoration 2020

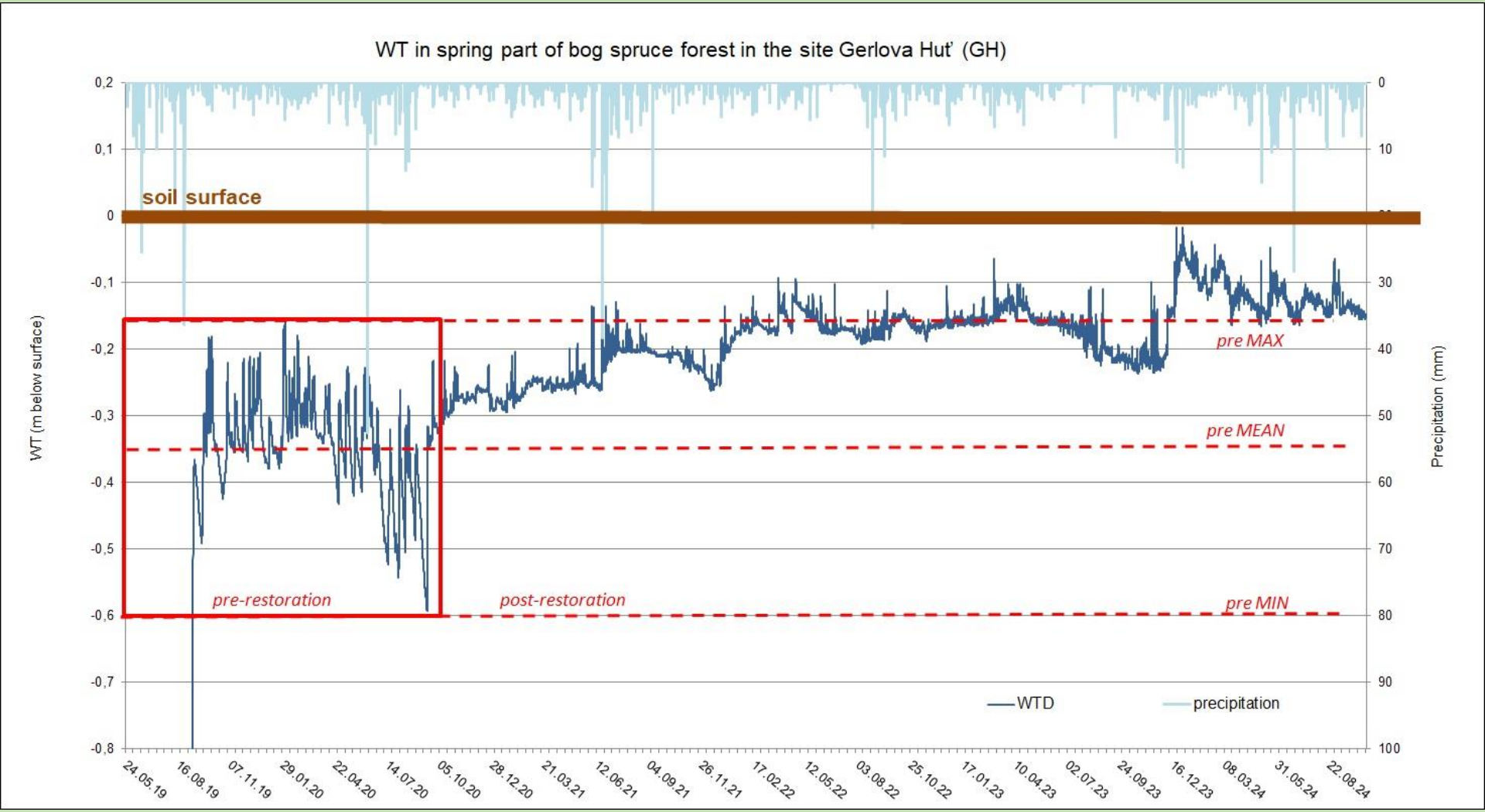

Restored spring 2022

Restoration of springs in bog forests

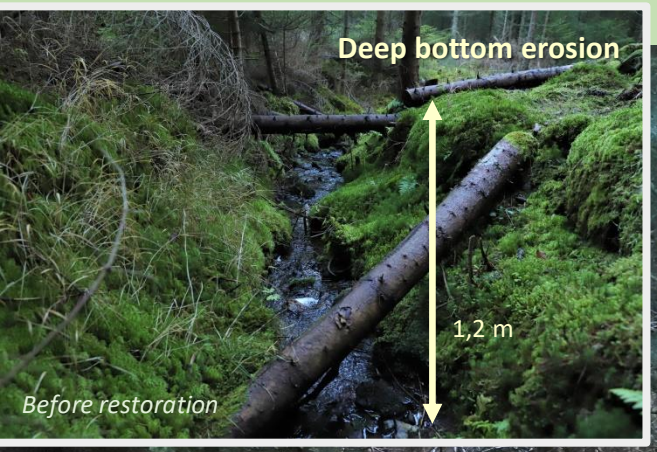


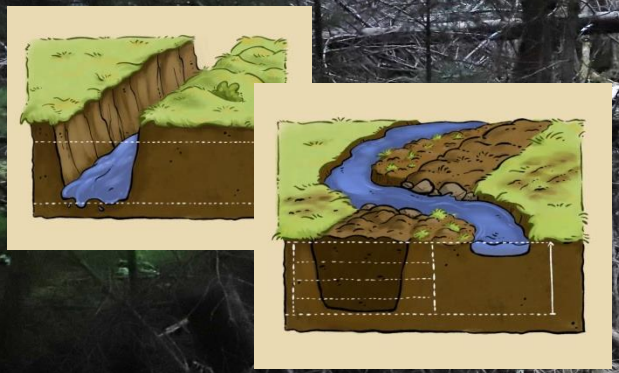
Position of the water table (WT) in forest spring after restoration

- Increasing and stabilisation of water table (WT)
- Reducing of water table fluctuation



Restoration of natural stream course in the erosion groove



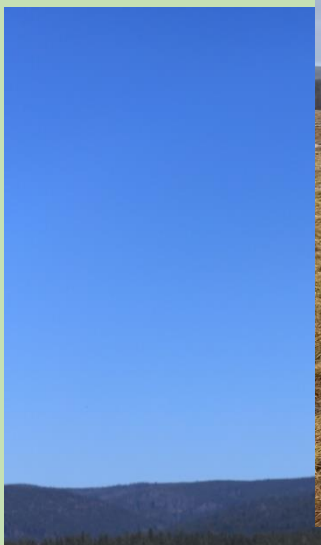


0,2-0,3 m

After restoration

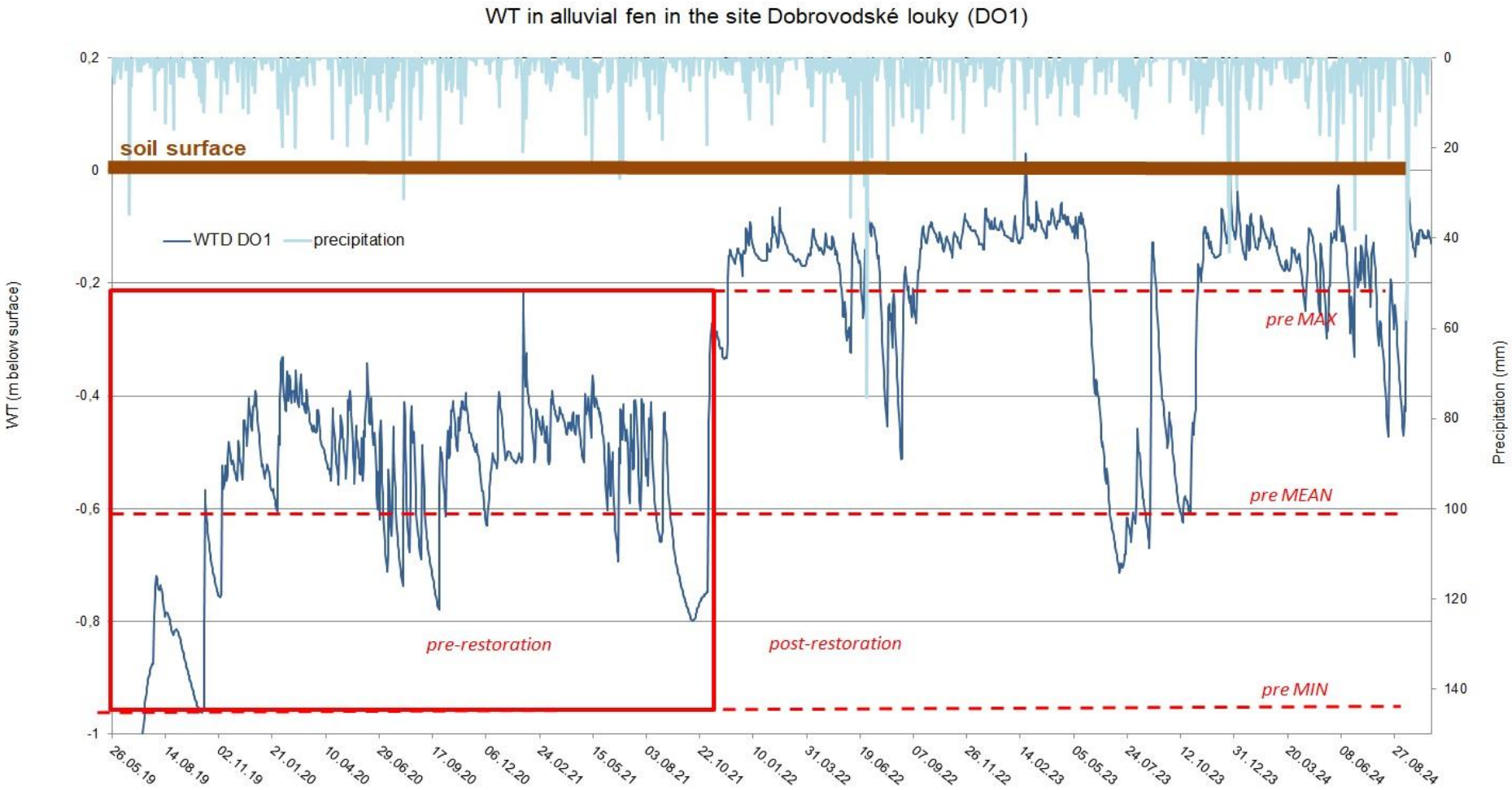
Site Nová Hůrka – spruce bogs and wet spruce forest

Piped drainage and streams in agriculture land

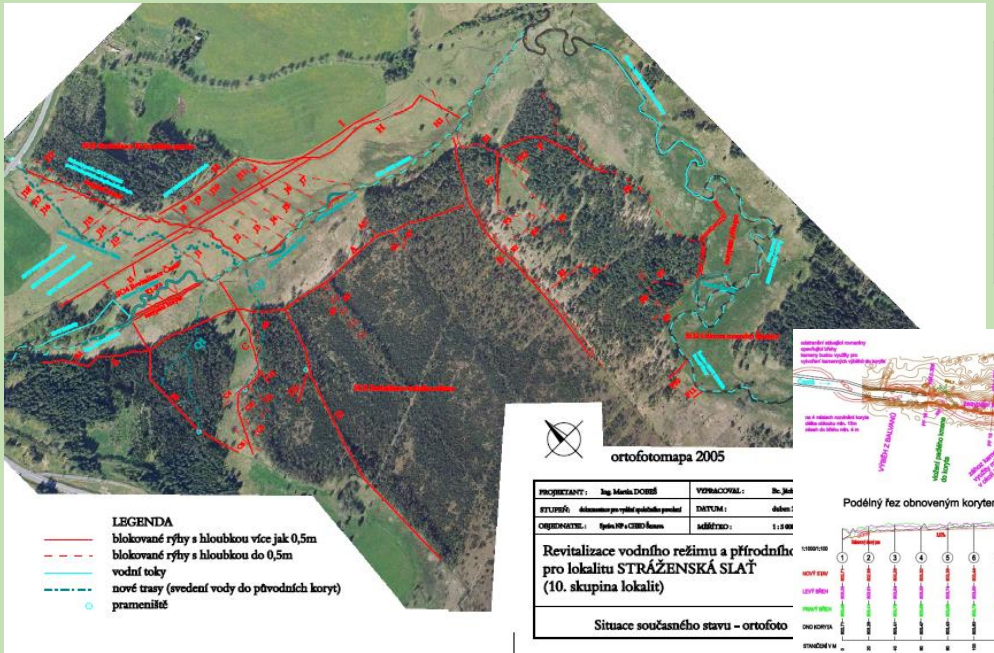


Small water pools as by-product of removed pipes – biodiversity!

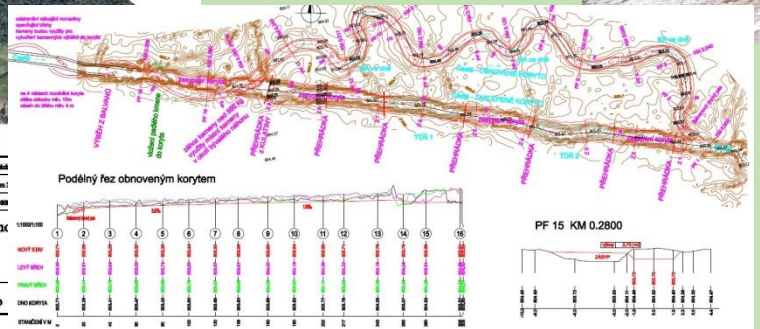
Position of the water table (WT) in alluvial wetlands after restoration



Restoration of larger streams and floodplains



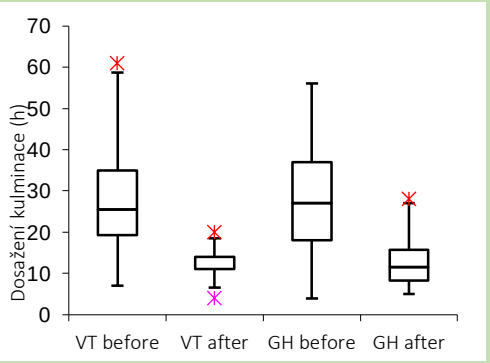
Stráženská slať site	
Restored area (STR)	135 ha
Drainage ditches	6,5 km
Restored streams	1,1 km
Implementation	2023

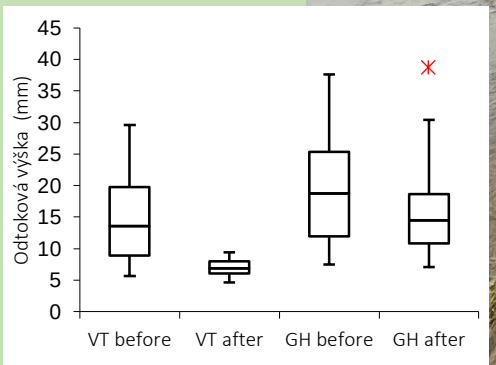



BIGGEST
BIGGEST

Stream restoration as effective flood control measures:

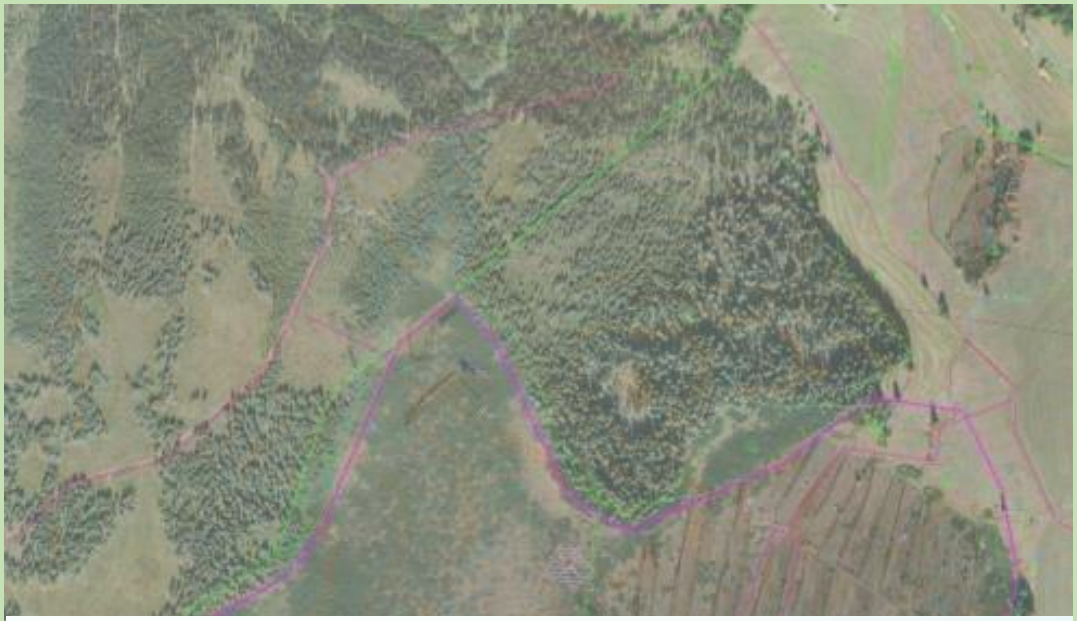
- *earlier peak flows*
- *peak flows are lower than before restoration*



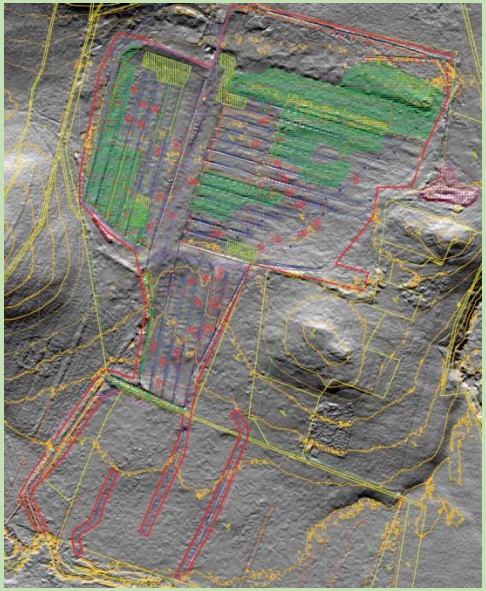


Restoration of drained and manualy extracted raised bog

Jezerní slať bog	**96 ha**
Drainage ditches	1,6 km
Restored streams	0,1 km
Implementation	2022



Vlčí jámy – *mined peatbog*



Area	**46 ha**
Blocked ditches	9 km
Implementation	2021
Costs	61 122 EUR

RESTORATION MEASURES:

- **Blocking of ditches**
- **Surface treatment** – pools, etc.
- **Vegetation spreading**
- **Mulch material**
- **Tree felling**
- **Active management of Illecebrum**

Hydrological restoration in figures

Summary of hydrological restoration for the years 1999 - 2024	
Restored area	2685 ha
Restored streams	41 km
Eliminated drainage ditches	256 km

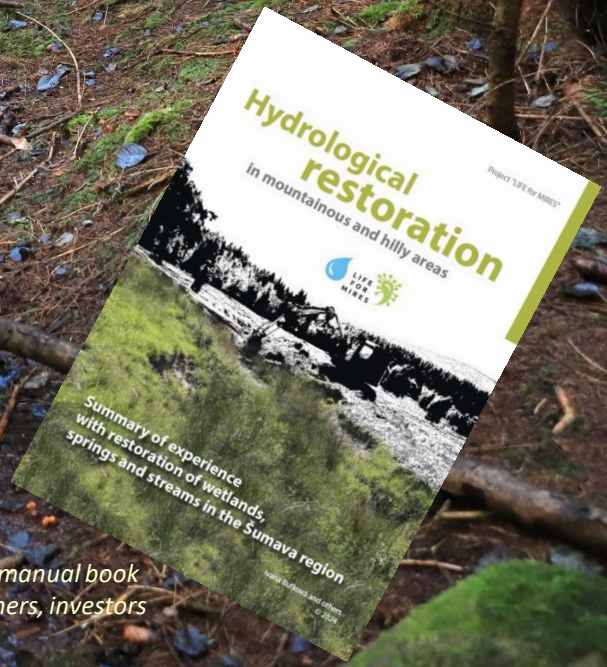
BENEFITS:

- **Enhanced water accumulation in landscape**
- **Drought mitigation measures**
- **Flood protection**
- **Reduced overheating of the landscape**
- **Reduced emissions of GHG (CO2)**
- **Increased biodiversity**

Managed forests

Meadows and pastures

Collaboration with foresters, farmers ...



practical manual book for designers, investors

Intensive collaboration with public

- > Voluntary actions „Days for mires“ (combined field work with excursions)
- > Tutorial programme for schools and textbook about water and wetlands (CZ and GER)
- ➢ Popular educative film about wetlands
- ➢ Pictured popular book „Water lost and returned (CZ-EN-GER)

About 1800 people helped with restoration works

Pictured popular book

Textbook for school

Fun brochure for families with children

Excursions
Meetings and discussions

Thanks´ for attention

Landscape without wetlands
is landscape without water