T. G. Masaryk Water Research Institute

The T. G. Masaryk Water Research Institute (TGM WRI), a public research institution, was established as one of the first scientific institutes in the independent Czechoslovak Republic.

The Institute was established as the State Hydrological Institute by a resolution of the Ministerial Council of 9th December 1919.

After 1989, the Institute was transferred to the newly established Ministry of the Environment and from 1993 it began to function as its contributory organization.

As a public research institution, TGM WRI was established by Provision No. 12/06 of the Ministry of the Environment on the issuance of a charter of a public research institution dated 12th December 2006. The Institute was entered into the Register of Public Research Institutions of the Ministry of Education, Youth and Sports on 1st January 2007.

Visegrad Fund

The project is co-financed by the Governments of the Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

Brno Branch Office

The workplace was established in 1949

Departments:

- Dep. of Water Management
- Dep. of Water Quality Protection
- Dep. of Hydrochemistry
- Dep. of Hydrobiology
- Dep. of Informatics and Operation

About 40 person in staff

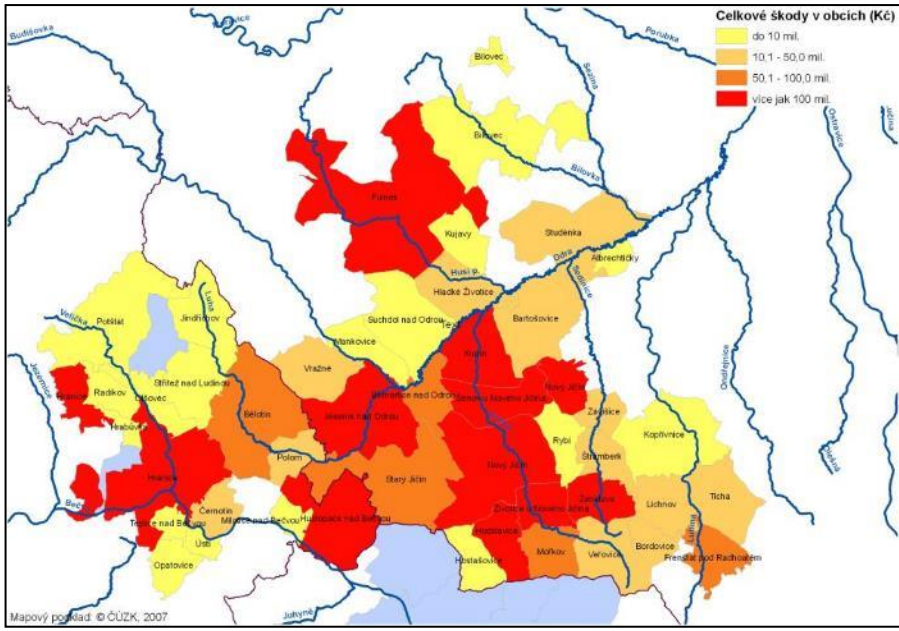
https://www.vuv.cz/en/

Brno, 29. 8. 2024

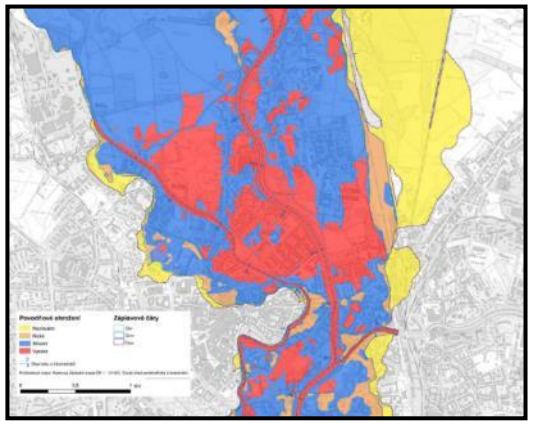
Dep. of Water Management

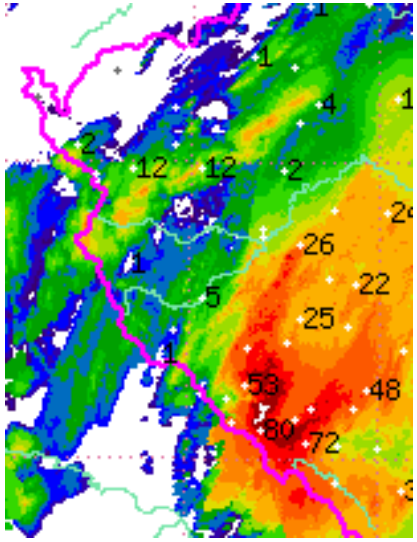
VÚV TGM BRNO

1 – Methodical workplace for evaluating and managing flood risks



- Methodological support of the planning process according to Directive 2007/60/EC in the conditions of the Czech Republic
- Development of methodological procedures for creating maps of flood danger and flood risks
- Development of a method for estimating the risk of flooding from torrential rainfall
- Designs of complex systems of measures / effectiveness evaluation procedures

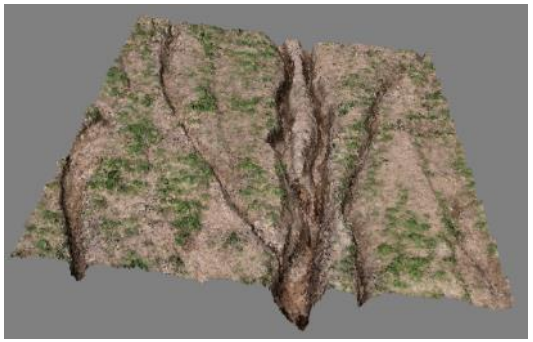




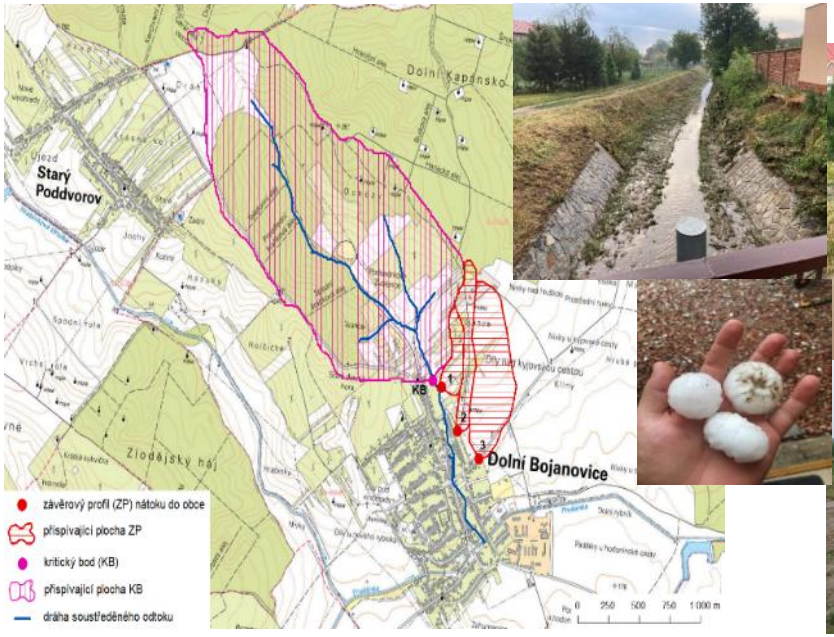
Dep. of Water Management

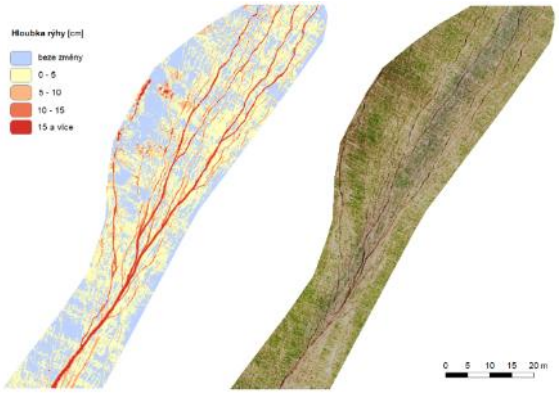
1 – Methodical workplace for evaluating and managing flood risks

- Development of analyzes aimed at clarifying the expression of the impacts of extreme hydrological phenomena (floods from torrential rainfall, manifestations of erosion, etc.)
- Development of photogrammetric methods for recording and monitoring manifestations of extreme hydrological phenomena (erosion, floods from torrential rainfall, drought), search for other possibilities of use in hydrology (monitoring of biota in streams, reservoirs)
- **Efects:** Supporting the process of planning preventive measures to protect against the negative effects of floods; Accurate quantification of impacts is an important part of evaluating the effectiveness of proposed measures.



Dolní Bojanovice 21. 6. 2021 – 169 mm / 2 hours

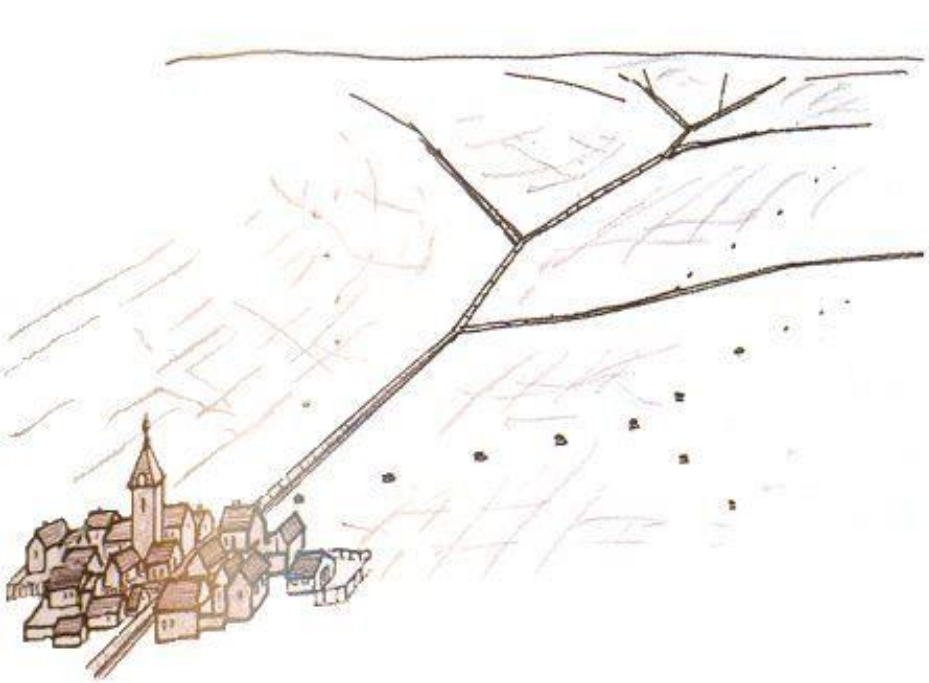


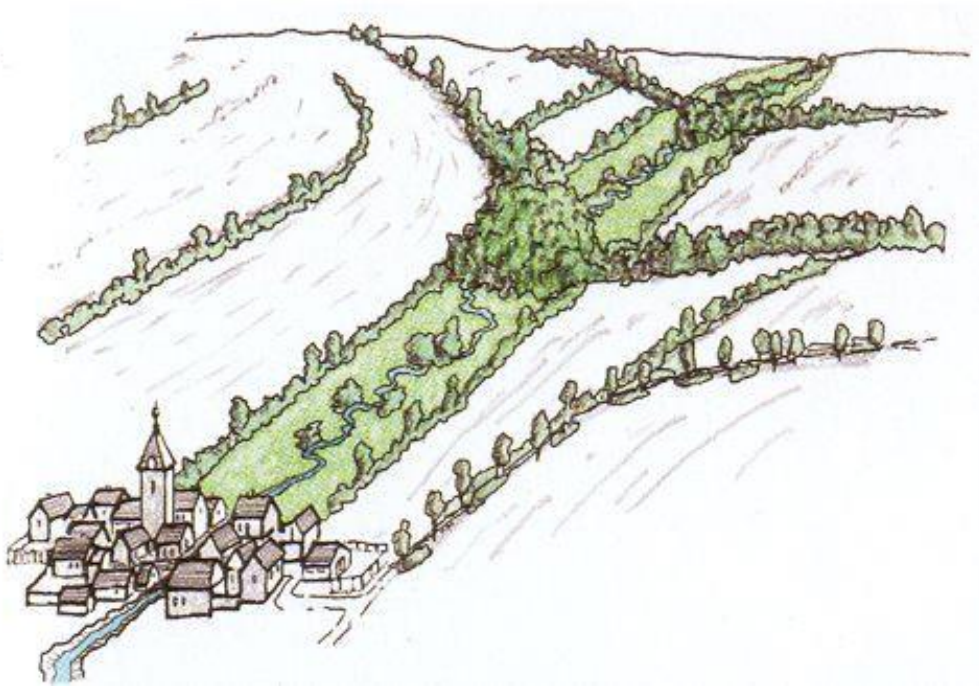


Brno branch

1 – Design of integrated protection in the watershed - a comprehensive system of measures

- The principle of the measure – catch the water where it fallsagainst the negative effects of floods; Accurate quantification of impacts is an important part of evaluating the effectiveness of proposed measures.





Brno branch

1 – Catalog of measures for retaining water in the landscape

Catalog target:

- present possible solutions and outline their use in the territory, including a description of their possible effects on the environment and society
- methodological aid for proposals for a system of measures in the adaptation of the territory to manifestations of extreme hydrological situations - drought and floods
- model measures - a uniform approach in the preparation, design and processing of effective systems of measures within the hydrological unit
- continuity of the map application Type measures

Catalog sheet

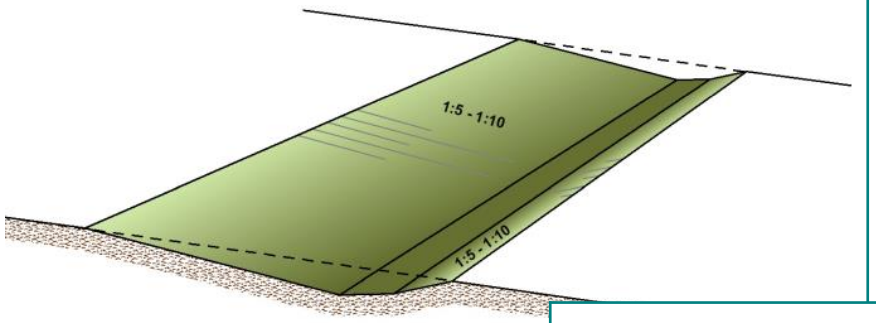
Measures	Biotechnical
Type of measures	**Ditch**
Detail types	Záchytný; svodný; zasakovací
Description	Průleh je mělký, široký příkop s mírným sklonem svahů, založený zpravidla s malým podélným sklonem (popř. nulovým), kde se povrchově stékající voda zachycuje a vsakuje, nebo je postupně odváděna. Prvek může být spojen s nízkou zemní hrázkou/mezí či travnatým pásem. Tím lze zvýšit celkovou účinnost prvku a vzniká prostor pro výsadbu vegetace. Průleh bez hrázky/meze je přejezdný pro mechanizaci. Dimenzování průlehů se provádí pro dané N leté průtoky na základě hydrotechnických a hydraulických výpočtů a odpovídá požadavkům na funkci (Janeček a kol., 2012).
Technical parameters	• Příčný profil – trojúhelníkový, parabolický, lichoběžníkový - sklon svahů 1:10 až 1:5. • Max. hloubka – 100 cm. • Min. hloubka – 30 cm. • Podélný sklon do 3 %, u svodných průlehů je podélný sklon dle sklonu terénu. Podélný profil u svodných průlehů při dodržení maximální profilové rychlosti do 1,5 m/s umožňuje celozatravněný profil průlehu v případech s vyšší profilovou rychlostí je třeba navrhnout opevnění dna nebo i stěn průlehu. • Záchytné průlehy se navrhují na pozemcích o sklonu do 15 % a zpravidla zatravněné.

Catalog sheet

Type of measures	**Průleh**			
Implementation conditions	Použití je vhodné v případě neúčinnosti či nemožnosti realizace nižších typů opatření (organizačních a agrotechnických opatření) nebo je lze použít za účelem rozčlenění krajiny. Jsou však finančně nákladnější. Doporučená je především realizace za účelem ochrany osob a majetku.			
Possible problems	Opatření vyžaduje zábor zemědělské půdy, řešení majetkoprávních vztahů a zpracování projektové dokumentace.			
Interaction/synergy	Záchytný průleh musí být doplněn svodným technickým opatřením (průleh, příkop) zaústěným do recipientu. Při doplnění všech typy průlehů o organizační a agrotechnická opatření dojde k navýšení výsledného efektu opatření a i k jeho samotné ochraně (nezanášení). Zvýšení efektu je možné dosáhnout i doplněním průlehu o další technický prvek (mez, hrázka, zasakovací pás) nebo o polní cesty či ozelenění v bezprostřední blízkosti průlehu nebo i jinde na svahu. K navýšení účinku lze doplnit plošnými agrotechnickými a organizačními opatřeními na ploše svahu.			
Costs	Průměrné náklady na průleh se zatravněným profilem bez doprovodné výsadby - cca 1 500 Kč/bm.			
Time point of view	Příprava a realizace	krátkodobá	0-3 let	
		střednědobá	4-6 let	
		dlouhodobá	7 a více let	x
	Rychlost efektu	krátkodobá	0-3 let	x
		střednědobá	4-6 let	
		dlouhodobá	7 a více let	

Catalog sheet

Cross section / floor plan



Vzorový řez průlehem

Examples

Záchytný průleh v k. ú. Lhotka u Zlína (okres Zlín) (zdroj: VÚV TGM, v.v.i.)

Catalog sheet - Evaluation of the effects of measures

Type of measures	Průleh
Detail type	Záchytný
Characteristics	Prvek zachycující a dále odvádějící odtok ze svahu do svodného prvku nebo přímo do recipientu, navržený s mírným podélným sklonem.
A) Impact on the water amount	Záchytný průleh má pozitivní vliv na zvýšení vsaku vody do půdy, zpomalení povrchového odtoku (tak, aby nenabyl unášecí síly schopné odnášet zeminu) a snížení jeho objemu, přerušení délky svahu či dráhy odtoku a zvýšení vsaku vody do půdy. Zároveň dokáže zachytit odtok při vyšších srážkových úhrnech přívalových srážek a ochránit před zatopením objekty pod nimi níže po svahu.
B) Impact on the stream hydromorphology	Záchytný průleh má mírně pozitivní vliv na hydromorfologii vodních toků: brání vnosu jemných půdních částic a anorganických sedimentů do vodních toků, čímž pozitivně ovlivňuje velikostní strukturu sedimentu a životní prostředí vodních živočichů.
C) Impact on the water quality	Zlepšují vodní režim v půdě, mohou přispět ke zlepšení jakosti povrchových vod v důsledku omezení vnosu jemných půdních částic erozí a omezení vnosu na ně vázaného fosforu a dalšího znečištění.
D) Impact on the water ecosystems	Záchytné průlehy zlepšují vodní režim v půdě a omezují důsledky eroze - pozitivní pro vodní organizmy.
E) Impact on the landscape and terestrial ecosystems	Hlavními vlivy na krajinu jsou zvýšení a posílení biodiverzity, zlepšení možností migrace živočichů, příznivý vliv na zadržení vody v krajině, protierozní funkce a v neposlední řadě zvýšení estetické hodnoty krajiny.
F) Socio-economical impact	Vede k omezení degradace půdy a tím i ke snižování spotřeby umělých hnojiv pro zachování výnosů. Zvyšuje estetický ráz krajiny. Pracovní příležitosti v rámci realizace a následné údržby. Při situování na svahu nad zástavbou zajišťuje protipovodňovou ochranu objektů před zatopením ležících níže po svahu.
N) Economic costs for implementation and maintenance	Je zde nutné vynětí pozemku z půdního fondu případně výkup pozemků, náklady na vyhotovení projektové dokumentace pro stavební povolení, realizace stavby, následná údržba (odtěžení sedimentu, údržba travního porostu a případné výsadby, u průlehů s vyššími sklony údržba a opravy opevnění).

MEASURES ON AGRICULTURAL LAND





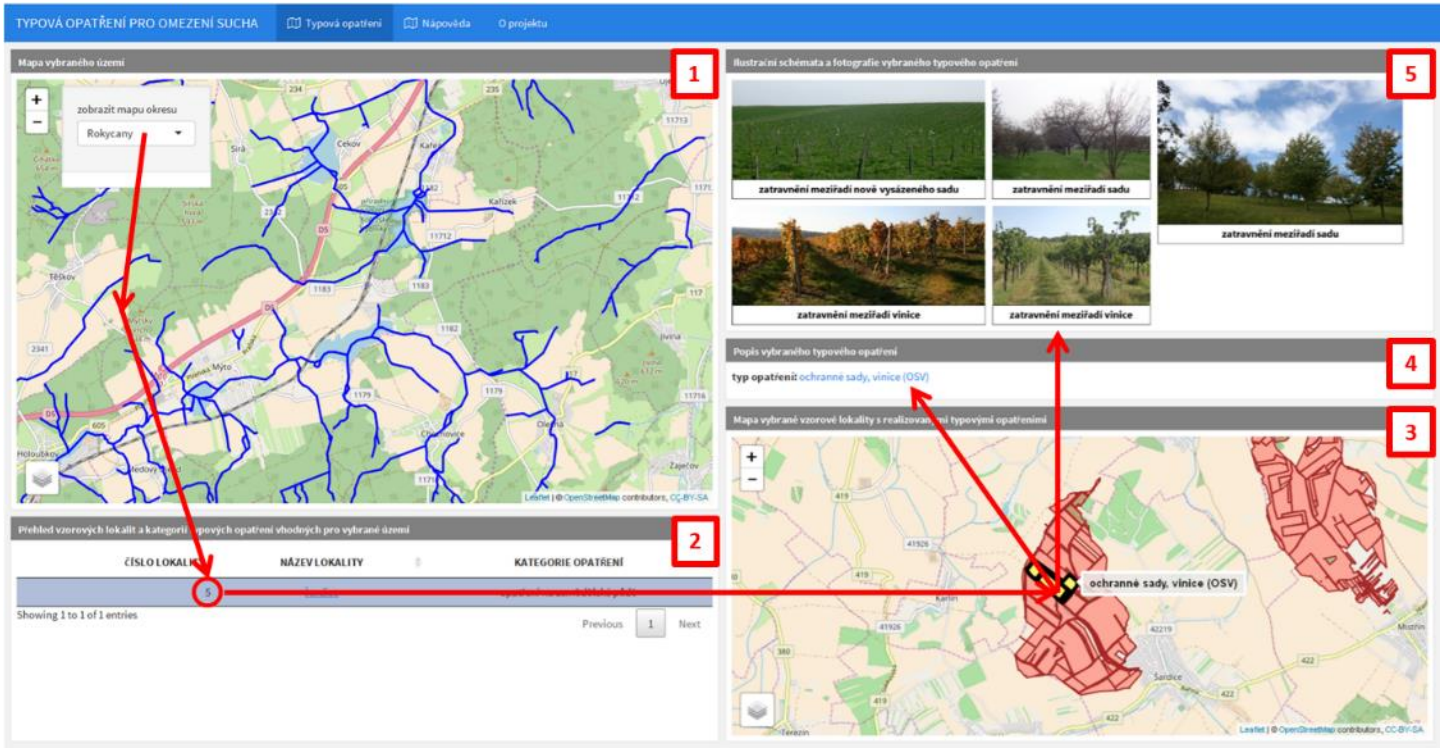
AGROFORESTRY MEASURES



BIOTECHNICAL MEASURES

- Infiltration ditches
- stabilization of concentrated runoff paths
- hedgerows, borders, terraces
- windbreaks

Web application „Model measures for retaining water in the landscape



http://www.suchovkrajine.cz/vystupy/katalog-opatreni

http://vodavkrajine.cz/

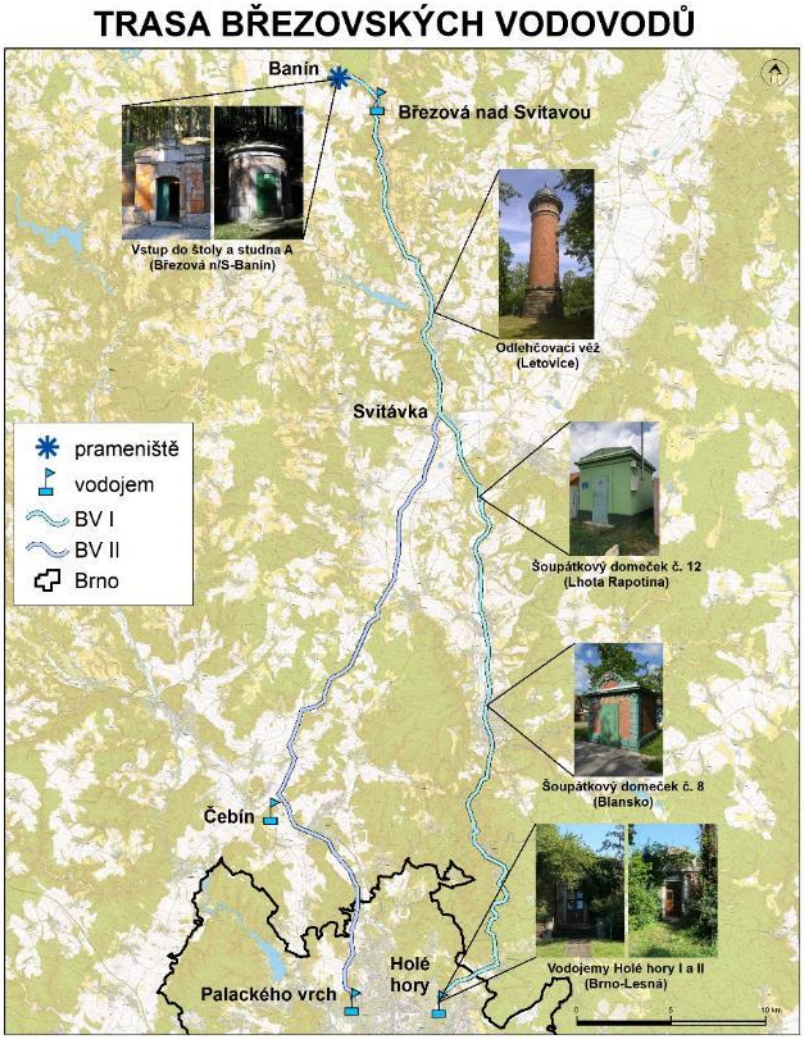
http://suchovkrajine.cz/

Dep. of Water Management

2 – Protection of underground sources of drinking water

- Most sources of drinking water in the Czech Republic are from underground water
- Advantages over surface sources:
- Relatively lower costs for setting up the source itself => well/well X water reservoir
- Better quality => lower editing costs
- Natural mineralization => support of human health
- The problem of gradually increasing concentrations of undesirable substances => nitrates and pesticides
- Insufficient protection by legislation => OPVZ II. Degrees

- Up-to-date research:
  - The goal is to reduce the negative impacts of (agricultural) management and increase the subsidization of groundwater (increasing the retention capacity of the landscape)



Courses of two main water supply systems of the Brno city

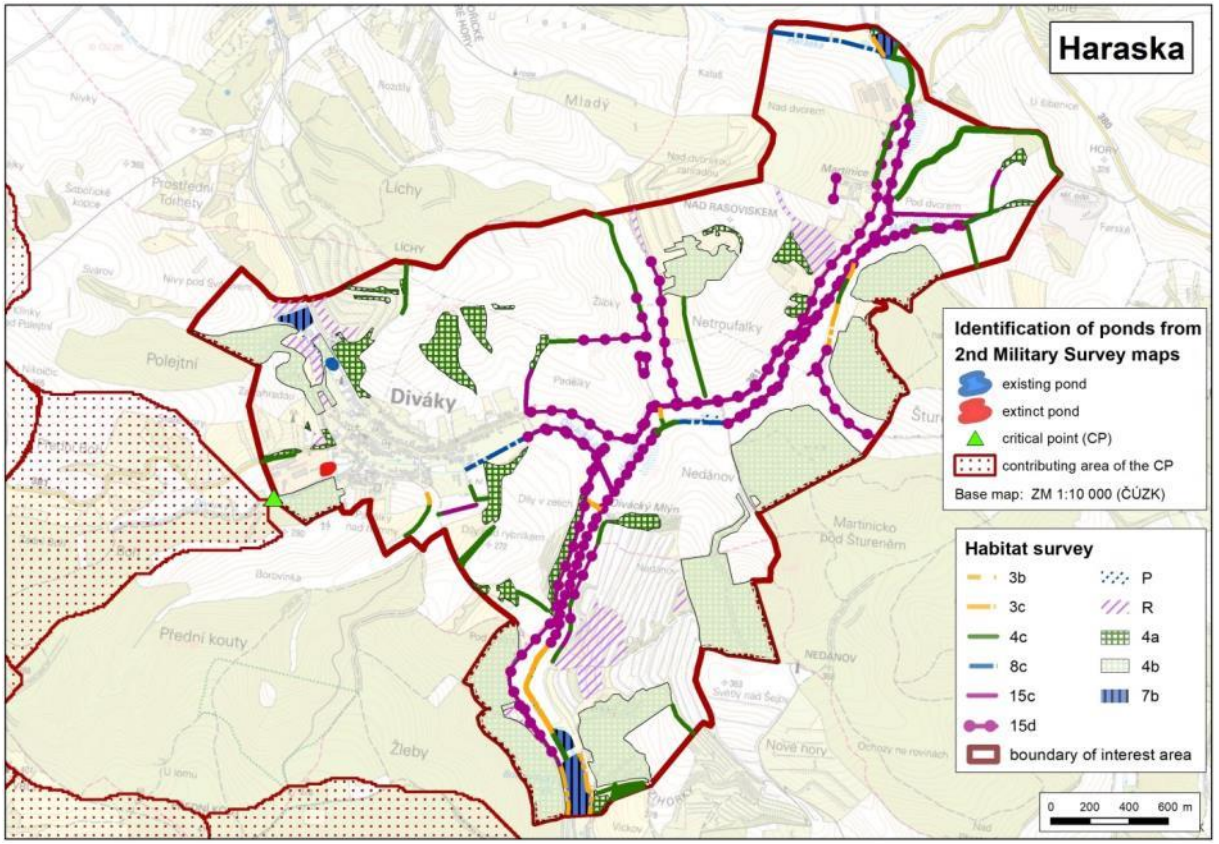
Brno branch

Landscape, water network, ponds and wetlands restoration

Landscape changes

Water bodies (ponds, wetlands) changes, including land-use changes during

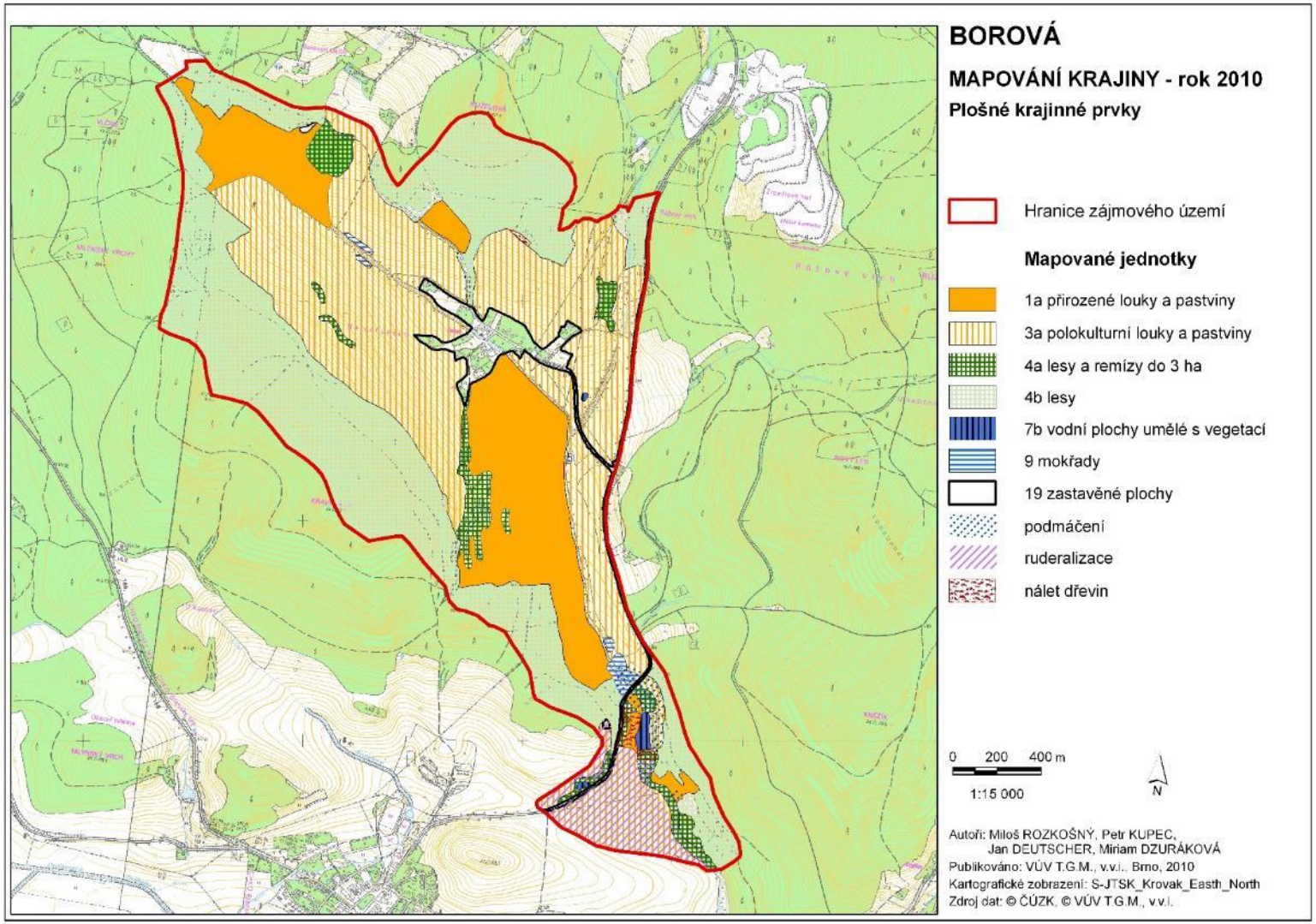
19th and 20th centuries



An example of the study of landscape changes within a small catchment of South Moravia Region.
Selected part of the Haraska stream catchment with the display of the water bodies' occurrence after the restoration works and from the 2MS maps analysis (MS = old Austrian Empire military survey, 19th century)

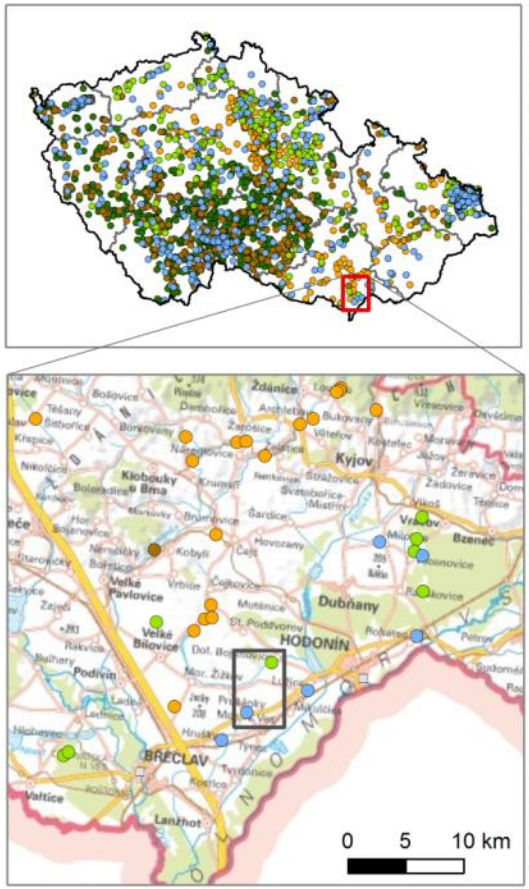
Brno branch

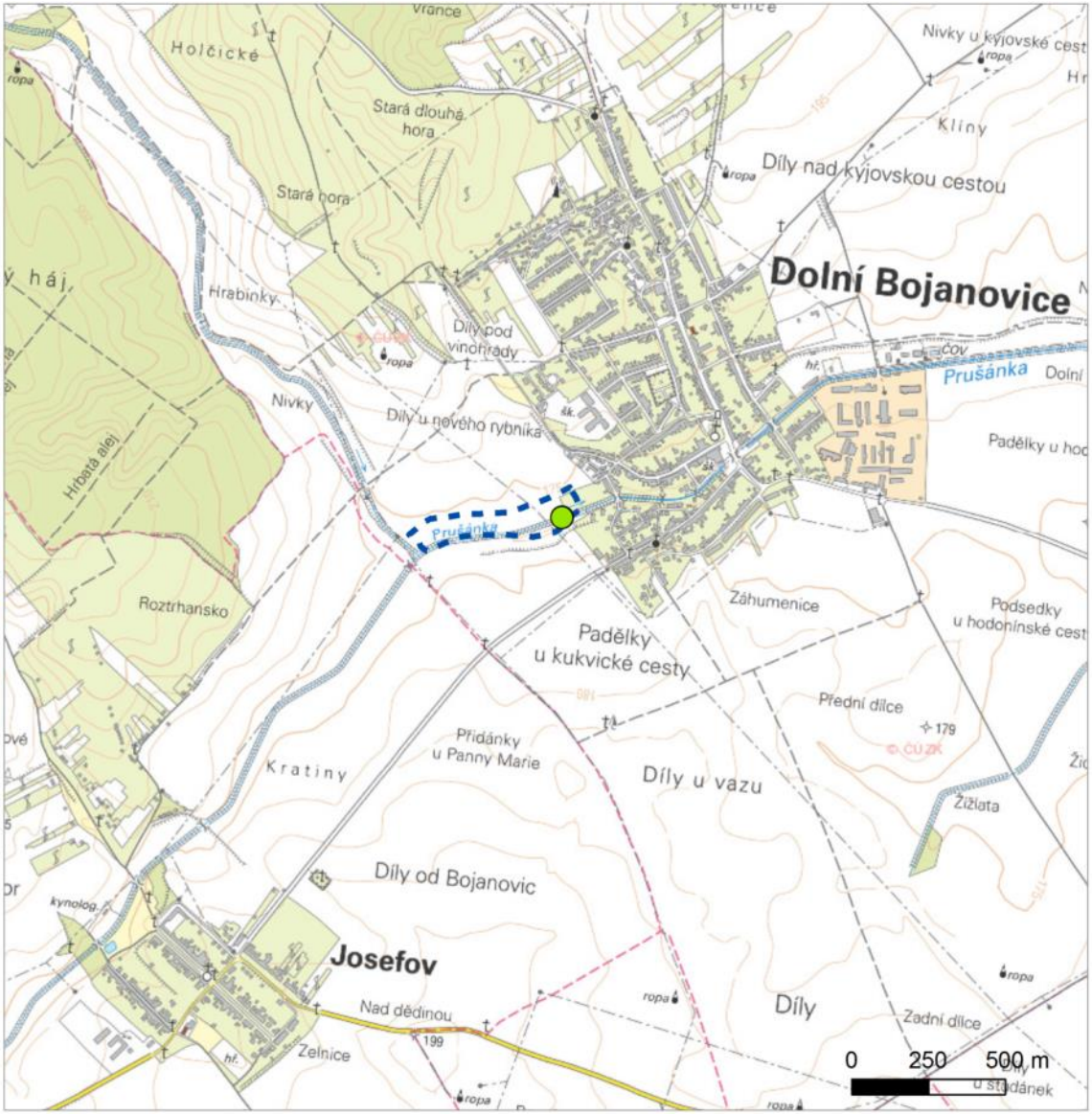
An example of the study of landscape changes within a small catchment after stream restoration works.
Selected part of the Borová stream catchment with the display mapped landscape elements (water streams, meadows, forests, water elements, wetlands, bulit-up areas).



Brno branch

An example of the study of landscape changes within a small catchment of South Moravia Region.
Case study No. 3 – location of the former “Oberer Teich” near the Dolní Bojanovice village
(MS = old Austrian Empire military survey, 19th century)

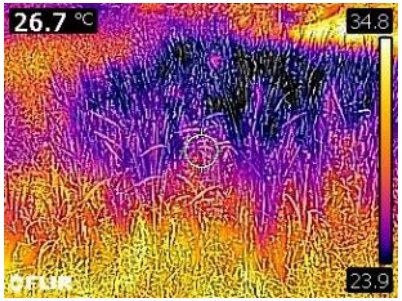




Dep. of Water Quality Protection

3 – Protection of water quality, nature-based water purification technologies

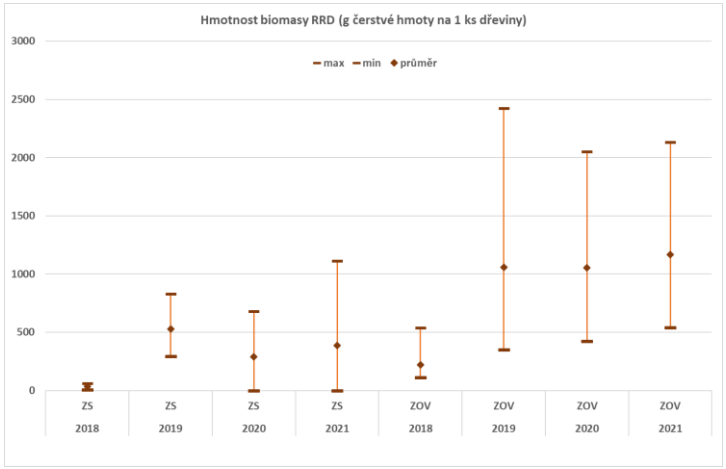
- Research, development and pilot verification of water purification technologies with a focus on natural (extensive) purification methods, artificial wetlands, constructed wetland plants; development of case studies; alternative solution; consultation
- Not only for waste water, but also for polluted surface water and surface run-off
- **Efects:** Saving energy for WWTP operation, supporting the local economy, creating wetland biotopes in the landscape, supporting a small water cycle, etc.
- **Currently, the research continues with a project with outputs for the MoE „Optimizing Extensive Wastewater Treatment Technologies to Enhance the Quality of Discharged Wastewater in Response to Rising Demands “**



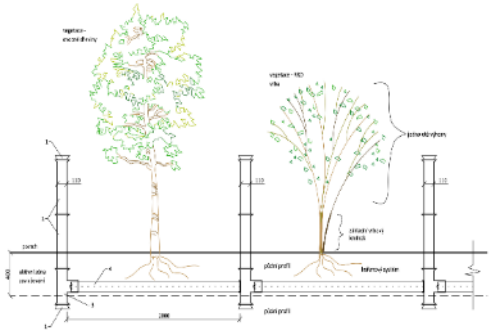
Dep. of Water Quality Protection

4 – Wastewater irrigation, water recycling, blue-green infrastructure

- Research, development and pilot verification of the implementation of green walls and facades in combination with the recycling of treated wastewater and sets for irrigation with this water; verification of the possibilities of practical implementation in the conditions of the Czech Republic, search for limits of use and operation, including monitoring of priority substances and pollutants
- Research and development in the field of water management in municipalities, cities and villages
- **Efects:** Proposals for measures close to nature for water savings, cooling of urbanized locations, water recycling, possible economic benefit of using wastewater - e.g. in fast-growing trees biomass production, etc.



About 3x more biomass thanks to WW irrigation



Dep. of Water Quality Protection

5 – Sustainable management of bio-waste

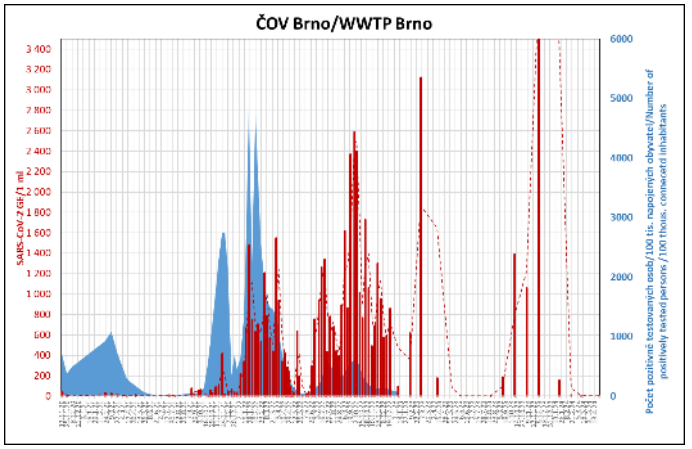
- Management of urban and municipal biowaste, reuse of composted biowaste and stabilized sludge from WWTPs
- **Efects:** Support for waste sorting, return of organic matter to the soil, sustainable maintenance of communal greenery (reducing the need for primary raw materials – peat), etc..
- Research centre CEVOOH
  - Informational and methodical support of the MoE; reports, presentations and workshops for state administration and self-government, non-governmental organizations, the public
  - The problem of pollution of input raw materials
  - The issue of using plastic bags for bio-waste during collection and sorting
  - Biomass from tree cuttings - pre-treatment and use in composting

Dep. of Hydrochemistry and Microbiology

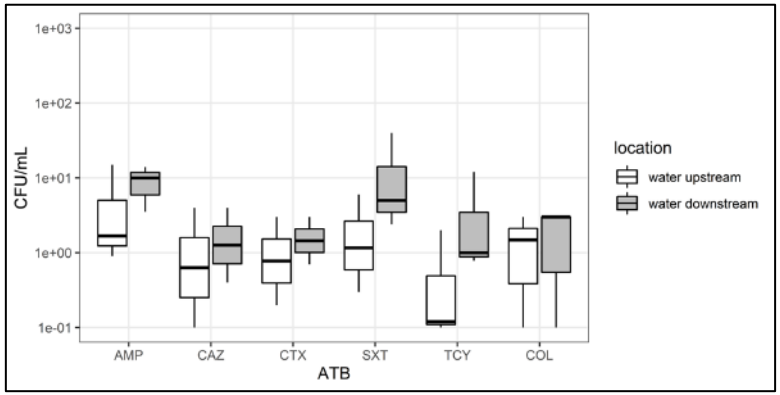
6 – Microbial contamination of water

- **Monitoring the presence of SARS-CoV-2 in wastewater**

- **Antimicrobial resistance (AMR) in the aquatic environment**
- AMR monitored in surface water and wastewater, it is monitored within the One Health system, where AMR is monitored in human and veterinary medicine and the environment
- Its monitoring in the environment is also related to revisions of European legislation, such as the Urban Wastewater Treatment Directive
  - From 2022 involved in Eionet work group for AMR of surface water
  - 2024 – first monitoring



Monitoring the presence of SARS-CoV-2 in wastewater from the Brno WWTP



Resistant strains of E. coli in Svratka under the Brno WWTP

Dep. of Hydrobiology

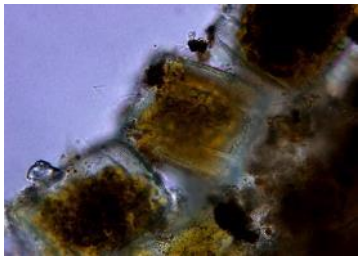
7 – Hydrobiology in environmental protection

We collect and analyze biota samples of surface flowing and stagnant water according to valid procedures, including analysis and evaluation of the obtained data.

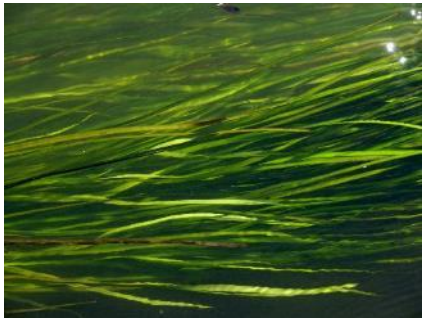
- aquatic invertebrates – macrozoobenthos




- algae and cyanobacteria - phytobenthos and phytoplankton


- aquatic plants - macrophytes

Dep. of Hydrobiology

7 – Hydrobiology in environmental protection

- Development of bioindicator methods in flowing waters based on macrozoobenthos.
- The impact of climate change on aquatic biocenoses in river systems, including the assessment of long-term changes in biodiversity
- Analyzes of changes in communities caused by stream drying; development of a national method for assessing the ecological status of drying streams according to biological quality components (BQE)
- Development of the methodology for evaluating the hydromorphology of watercourses in relation to the biological components of the ecological state
- Monitoring of measures against the negative effects of drought on aquatic ecosystems – analysis of the effectiveness of measures leading to improvement of the ecological state
- Monitoring of the state of river ecosystems and water quality in places of expected impacts (construction of expressways, discharge of wastewater with significant impact on water quality, monitoring of the impact of operation of the Dukovany nuclear power plant)
- Research and monitoring activities within the framework of the Joint Survey of the Danube, which is organized by the International Commission for the Protection of the Danube.

Efects: Obtaining information about the long-term impact of human activities on the environment, the effects of climate change on biodiversity

Assessment of the effects of anthropogenic activities on selected components of the environment (e.g. construction of transport infrastructure elements, discharge of waste water, etc.) using sampling, analysis and evaluation of surface water and stagnant water recovery samples.



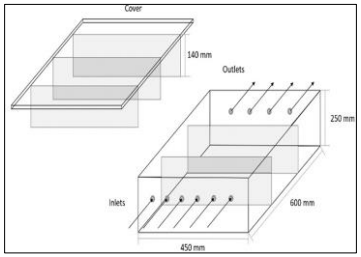

Brno branch

8 – Microplastics in the aquatic environment

The first reports of plastics in the environment date back to the 1970s. Macroplastics break down into micro- and nano-plastic particles, which is why plastic particles are detected in almost all components of the environment.

2019 - the 4th international research river expedition "Joint Danube Survey 4" took place in the Danube basin (13 countries), during which the content of microplastics (particles < 1 mm) in river water was analyzed for the first time along the entire length of the Danube, including selected tributaries using the same sampling technique and detection methods.

The highest content of SBR (tyre abrasion) was found in Sava (Serbia) and in Svratka under the Brno WWTP. The highest content of polyethylene (PE) was in Dyja near Pohansko and the other 2 profiles.

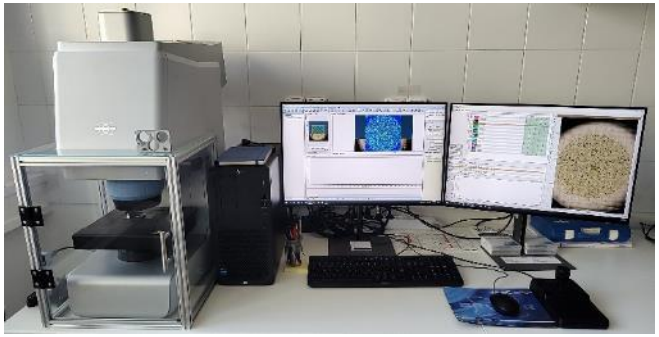


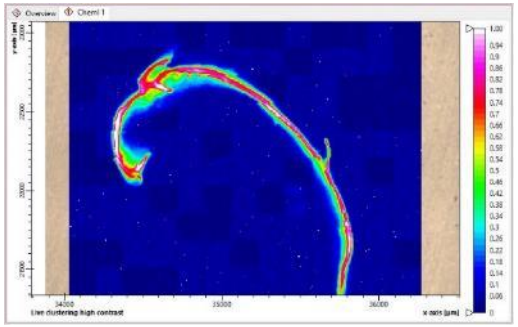
The institute have bought **microFTIR microscope** LUMOS II (fy Bruker):

- Development and optimization of methods for monitoring the occurrence of plastic particles in the aquatic environment

Use in practice: quantitative - qualitative analyzes of water samples, sediments, sewage sludge.

- Analyzes of drinking water samples - basis for increasing the efficiency of water treatment.
- Analysis of the content of microplastics in the bodies of aquatic invertebrates as a first step towards proposals for measures to reduce the amount of the PLASTICS in the environment.





PET (polyethylene terephthalate) fiber

Brno branch

9 – Water management throughout history

- Research projects focused on the history of water management structures
- Efforts to reinvent technical designs and procedures that can be applied today
- Understanding long-term and repetitive processes
- Popularization and education of the general public regarding water management and its position in the environment
- => Where everywhere and how important water is
- Stimulation of multidisciplinary discussion - nature protection + water management + energy + tourism + ecology...
- The projects also include the protection of cultural heritage, reconstruction or proposals for the new use of historic water management buildings

Where you can find more info about our work, projects & results

Information database HEIS https://heis.vuv.cz/default.asp?lang=en

The Hydroecological Information System (WRI HEIS) is the central information system of the Institute, which provides water management data and information also to external users from the national and local administration, and to professional and general public. The system is built around a database of water management information (hydrography, hydrology, protected areas related to water bodies, quantity and quality of surface water and groundwater, water use, anthropogenic impacts on water status, etc.). HEIS data are available via an internet portal (http://heis.vuv.cz) that enables direct searching and viewing of required information and data and their downloading in text and geographic formats. Other services of the portal include data availability through Open GIS Consortium (OGC) standards.

The HEIS is a component of the Integrated Environmental Information System of the Ministry of the Environment. This system has been gradually developed and operated since mid 1990s, when the first proposals were made for the data structure of the system. The internet portal of the system has been in operation since 2001, and in 2004 the system incorporated selected registers of the information system of public administration, particularly those from water management (ISVS-VODA).

TGM WRI HYDROECOLOGICAL INFORMATION SYSTEM

T.G.MASARYK WATER RESEARCH INSTITUTE, PUBLIC RESEARCH INSTITUTION

Map: Water Protection and Management

Main online map composition. You can use HVMAP or AJAX viewing mode.

INFORMATION HVMAP AJAX ?

Another data available

Another data from our database are available under "Database" link.

WMS services

Selected data from our database are available through WMS services.

Information

English version of our web pages includes only reduced content of Czech language version. If you want to see more data or information, you can switch to Czech langugae version.

Below on this site, there are links to pages of selected projects solved by TGM WRI. These pages of projects are in Czech language generally, but some of those pages are in English version available too. If you open project's page, see if language switch on the top border of newly opened window is available.

Projekt
Potrav. odpady

Efektivní a udržitelné nakládání s potravinovými odpady v obcích.

heis.vuv.cz/projekty/napo

Projekt
Řešení rybníků

Řešení rybníků a malých vodních nádrží z hlediska možnosti dodržování MZP a bezpečnosti při povodních.

heis.vuv.cz/projekty/mvnmzppovodne

Projekt
Raci / Crayfish 2022

Aplikace inovativních postupů při eradikaci invazních raků v ČR.

crayfish2022.vuv.cz

25 LET HEIS VÚV 1996-2021

Vodohospodářská 46. ročník padesátka 2019

Where you can find more info about our work, projects & results

Water Management Technical and Economical Information Journal (VTEI Journal)

ISSN 0322–8916, On-line ISSN 1805-6555

The journal Vodohospodářské technicko-ekonomické informace (VTEI) is the only peer-reviewed professional periodical in the Czech Republic that focuses on publishing research results in the field of water and waste.
The research results published in VTEI in Open Access mode relate primarily to the Czech and Slovak Republics, as well as the Central European area, but with a wider international reach, especially in the Elbe, Danube, and Oder basins.
There is no fee to publish articles.

Development in and status of surface waters in an important drinking water source area

MGR. DAVID HONEK, PH.D., ING. MILENA FOREJTNÍKOVÁ, MGR. ZDENĚK SEDLÁČEK AND RNDR. JITKA NOVOTNÁ – 14. 8. 2024

The paper discusses changes in of the basic parameters of surface water within the important drinking water source area of hydrogeological unit 232 Ústecká syncline, in the Svitava river basin. Emphasis is placed on the changes in the amount of water in the Svitava river and the changes in the basic physical and

Interpolation of selected discharge rates in ungauged fourth-order catchments in the Otava basin

ING. LUDĚK BUREŠ, ING. MAGDALENA SAMCOVÁ, ING. RADEK ROUB, PH.D., ING. LUCIE POLÁKOVÁ, ING. TOMÁŠ HEJDUK, PH.D. AND ING. MARTIN ŠTICH – 14. 8. 2024

Knowledge of catchment runoff values is the key to a wide range of engineering and scientific applications. However, direct measurements in the scope of all fourth-order catchments in the Czech Republic are not realistic. Standard methods for estimating these parameters are local regression models, rainfall-runoff models, or other interpolation techniques. Regression models provide reliable results, but the derivation of local regression equations is demanding on the amount of input and reference data. Rainfall-runoff models have their application in design activities at a local scale. Their application in the Czech Republic is not trivial and requires knowledge of precipitation distribution. Interpolation techniques provide a fast but often less reliable approach. Most of these interpolations are not primarily intended for hydrological applications;

Contacts

TGM Water Research Institute
Brno branch office
Mojmírovo nám. 16
61200
Brno
Czech Republic

Ing. Miloš rozkošný, Ph.D.

milos.rozkosny@vuv.cz

Tel. +420 541 126 318
Mob. +420 602 520 430