Norway grants

STATE ENVIRONMENTAL FUND OF THE CZECH REPUBLIC

Working together for a green Europe

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MOSPREMA

Prediction and management of mosquito calamities for biodiversity conservation in floodplain forests

Jan Brus

Prague 4th June 2024

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LPA since **29. 10. 1990**

covers **96 km²**

consist of **25 small protected areas**

nesting of **48 bird species**

5. smallest LPA in Czechia

highest peak **345 MASL**

*MZCHÚ = maloplošné zvláště chráněné území

Mohelnice
Moravičanský j.
Moravičany
Červenka
Přovice
Bílá Lhota
Litovel
Střeň
Mladeč
Štěpánov
Náklo
Hynkov
Chomoutovské j.
Skrbeň
Chomoutov
Horka nad Moravou
Poděbrady
Křelov-Břuchotín
Olomouc

LPA boundary

forest
buildings
water body
stream or river
important town

railway
highway

0 1 2 3 4 5 km

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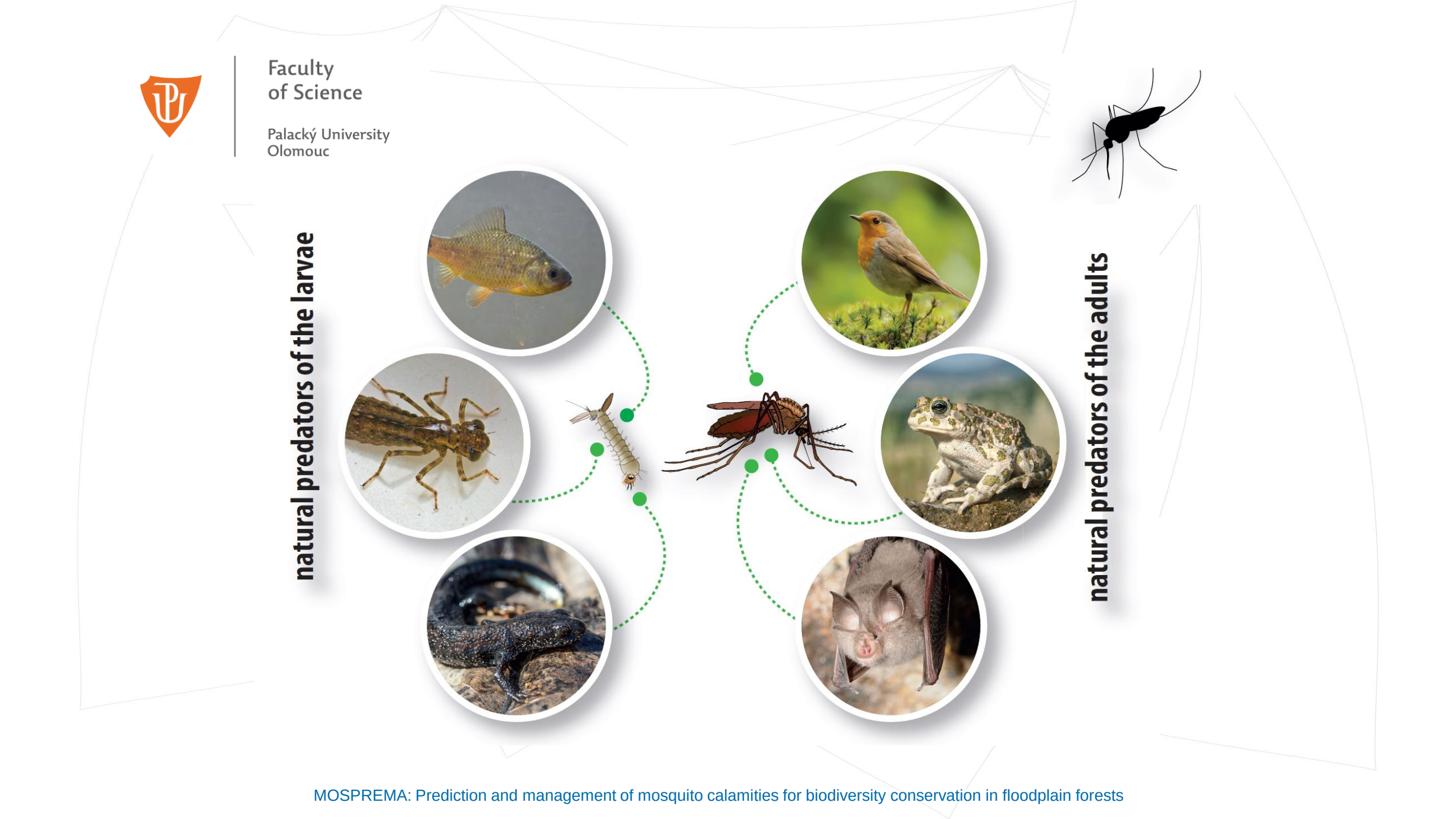






History

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MOSPREMA project

with using modern methods and contemporary knowledge to create an environment and test new procedures for integrated area management to **minimize annually recurring mosquito calamities**

special emphasis on **preserving the biodiversity** of the area of interest of the **Litovelské Pomoraví** Protected Landscape Area and its immediate surroundings

Consortium

department of geoinformatics

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Palacký University Olomouc

LITOVEL

iale-cz
česká společnost pro krajinnou ekologii

NTNU

Olomoucký kraj

maptiler

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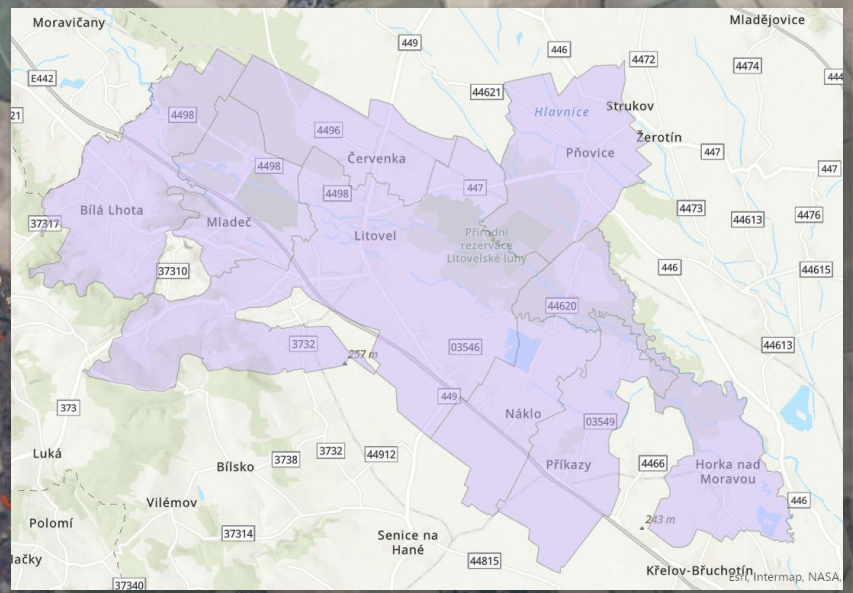
population in the area: **20 000**
cadastre area: **147 sq km**
currently mapped pools: **239 ha**
number of monitored pools: **over 1000**



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Remote sensing data collection, monitoring and aerial applications

- **Airborne Laser Scanning**
  - crucial information about the area
  - distribution, size and shape of mosquito hatcheries
  - modelling of flooding, no-flow depressions
  - **orthophoto images in the period without foliage**
- creation of flood maps and map data for targeted spraying applications in large flooded areas by drones

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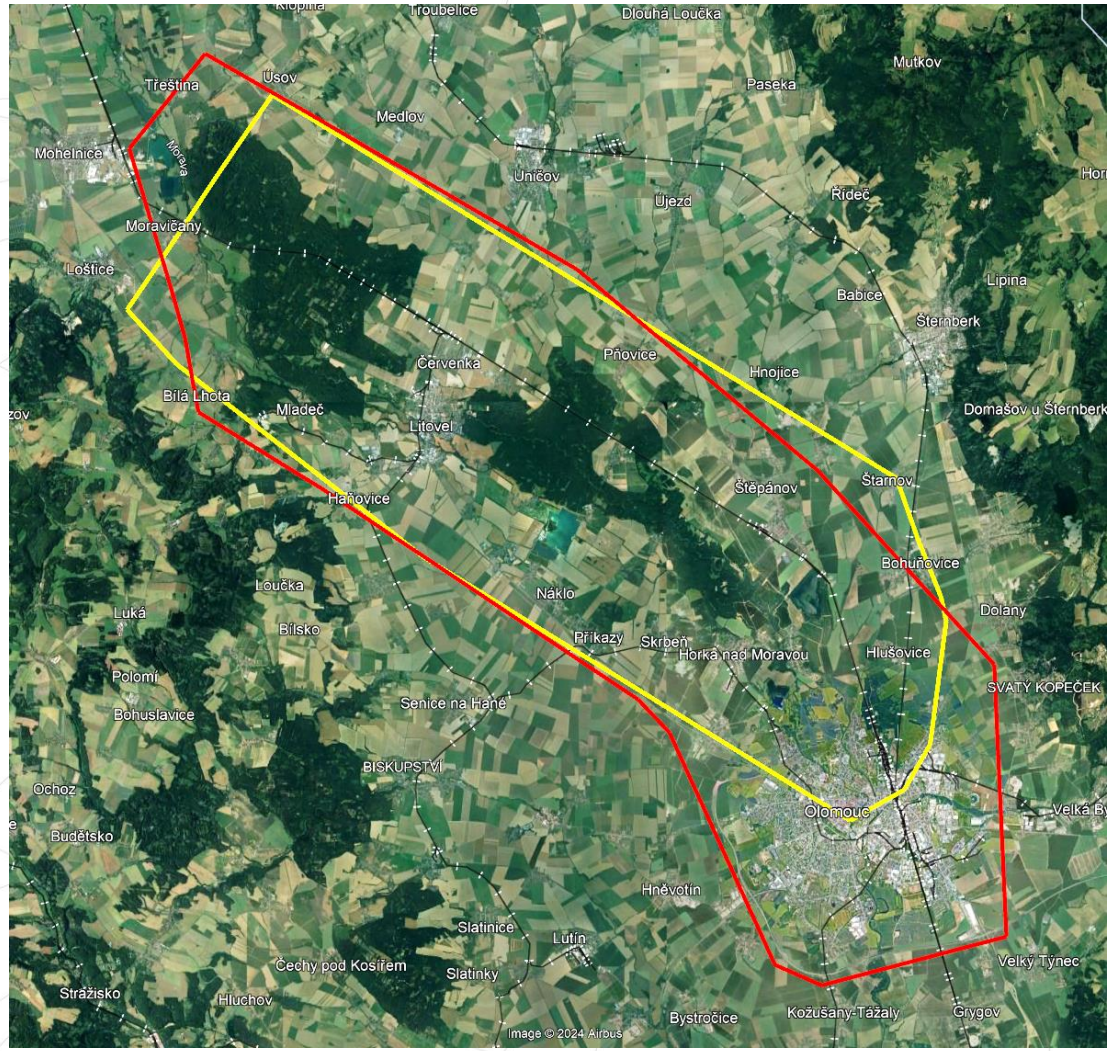
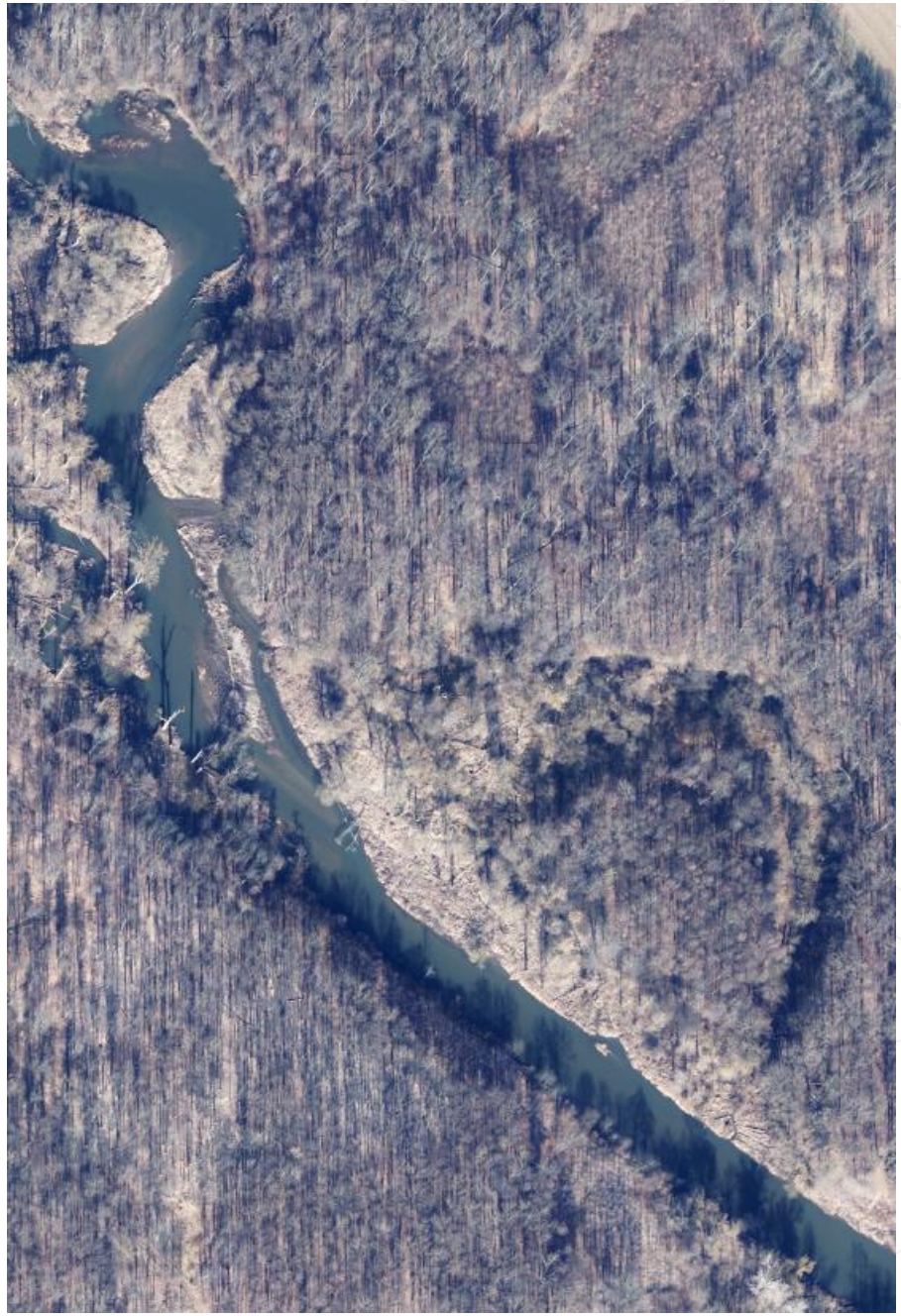


- two campaigns
- period without vegetation
- winter / Spring 2023
- winter / Spring 2024
- laser scanning
- orthophoto mosaic 10 cm/px
- number of points of the last bounce min. 20 per m^2



MOSPREMA: Predikce a management kalamitních stavů komárů pro zachování biodiverzity v lužních lesích

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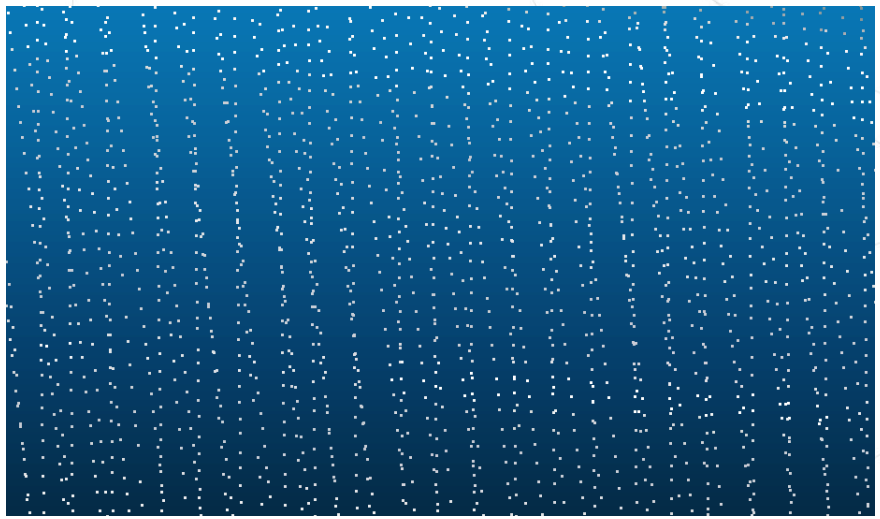
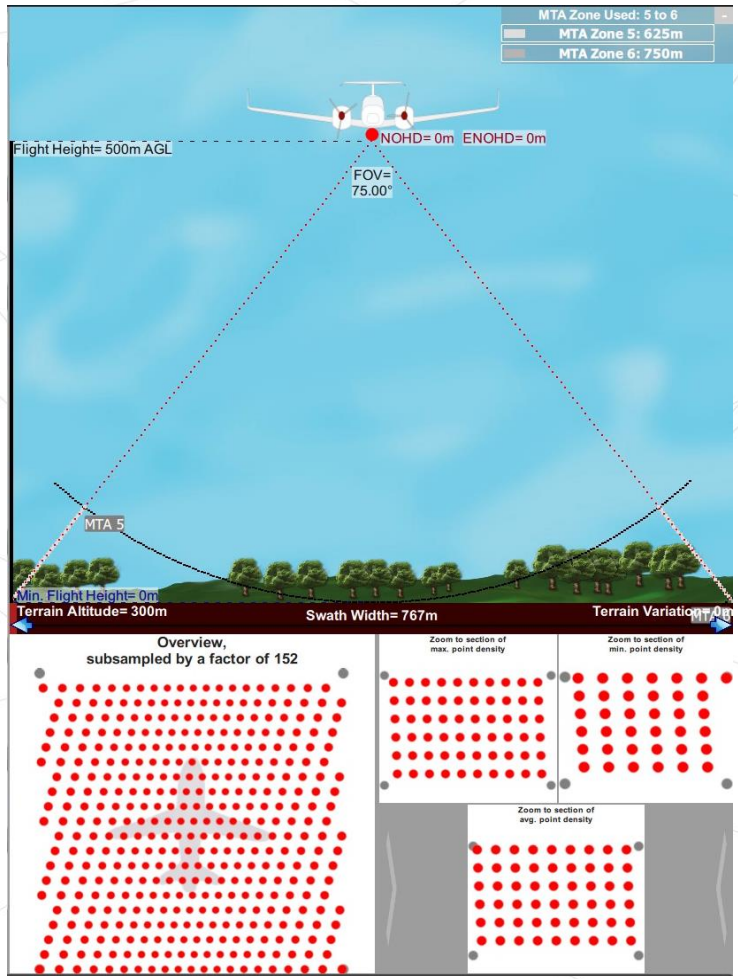
Laser Scanning (LiDAR)

- 03 / 2023
- 04 / 2024





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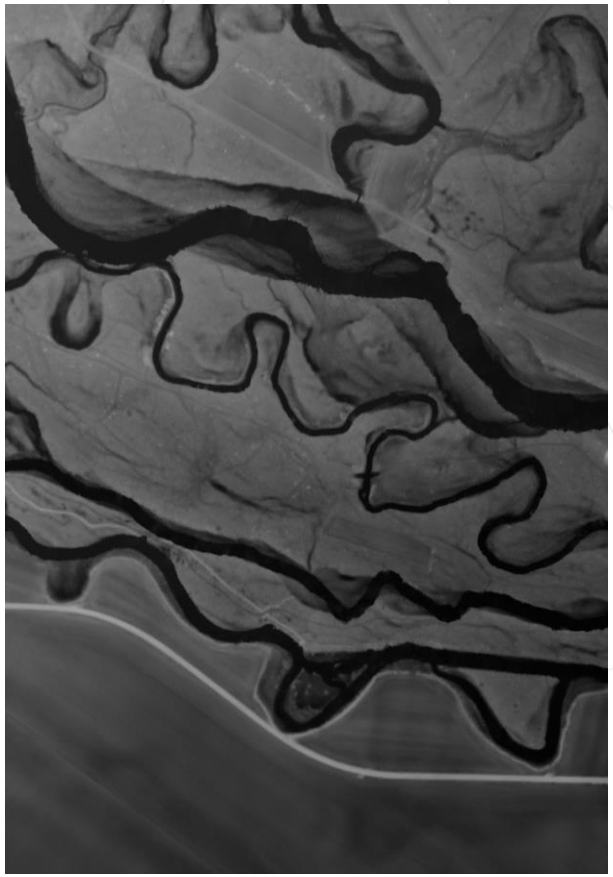
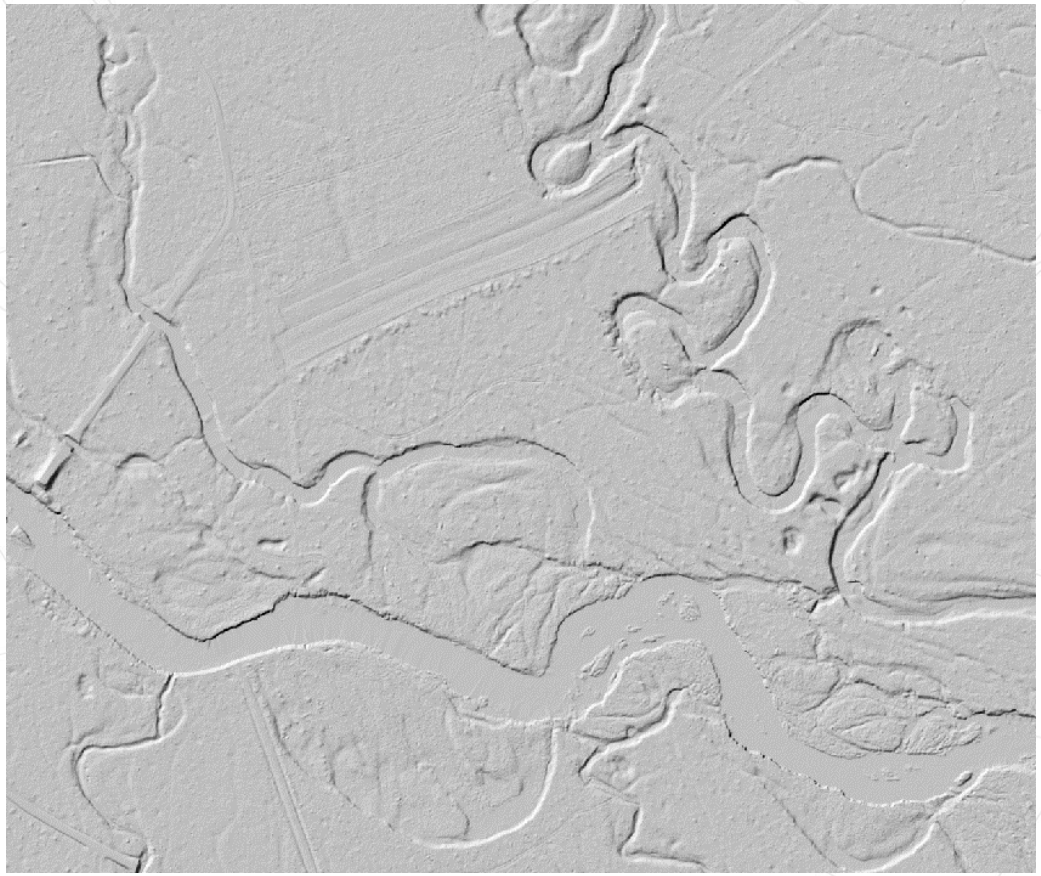
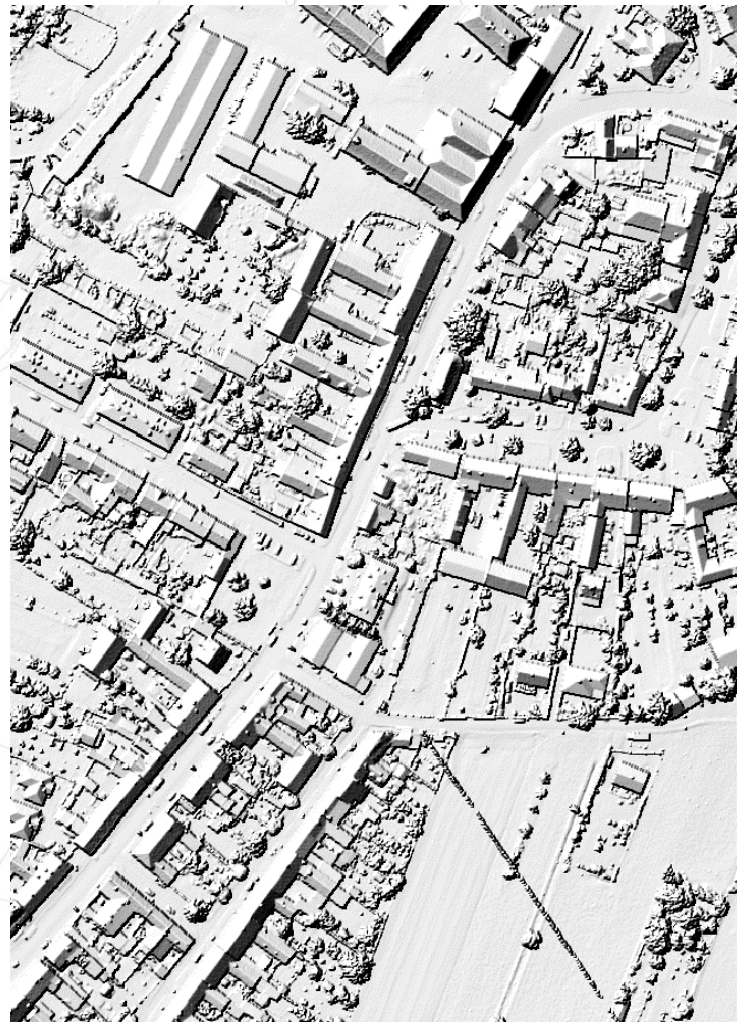
Laser Scanning (LiDAR)

– DTM + DSM, 50 cm / px







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Supplemental Laser Scanning (LiDAR)

- DJI MATRICE 300 RTK
- Zenmuse L1 (LiDAR + images)
- vertical accuracy up to 5 cm
- horizontal accuracy up to 10 cm (without GCPs)

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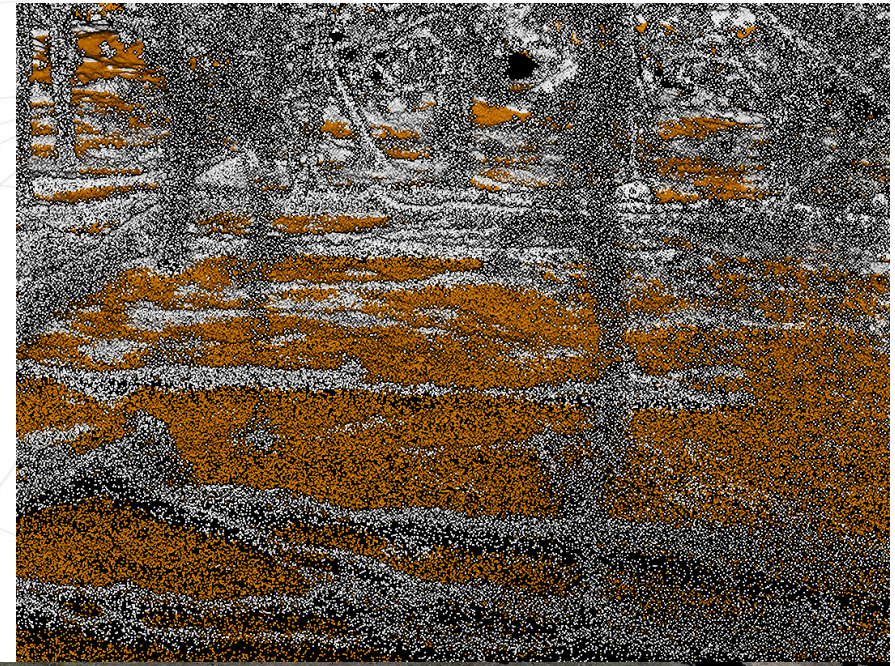

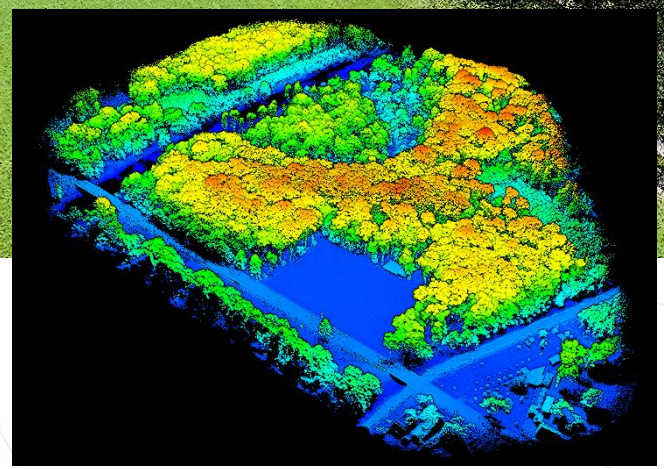

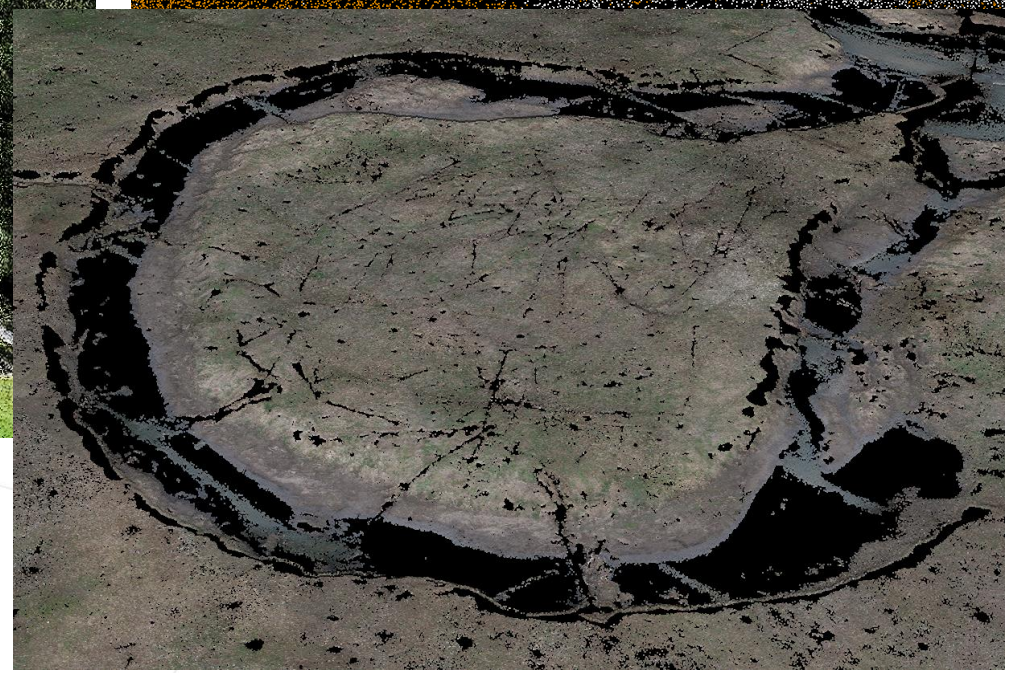

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Drone – a key element

- can carry up to 30 kg of spray
- 8 sets of special valves and 16 nozzles
- can be sprayed in a perimeter of up to 9 meters
- the gauge monitors the level of fluid in the tank and sends the information to the control unit
- theoretically, up to 16 ha per hour can be treated

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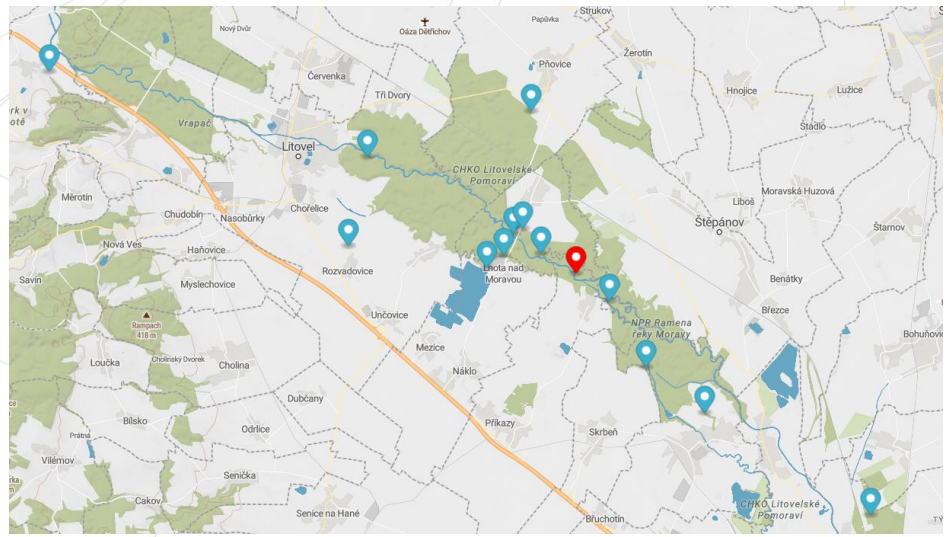
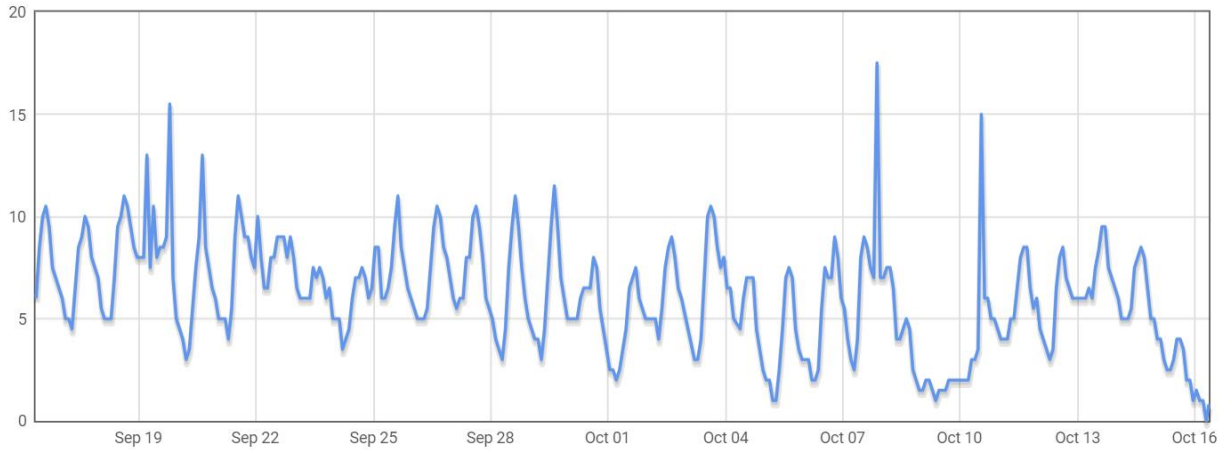
Advanced Sensor Network

- **Sensors** an irreplaceable addition to the system
  - water temperature and water level - key information
  - sensors have lasted in the field (due to education)
  - even in the forest there's a signal
  - spiders and insects like sensors
  - sensor in key pools – link to flood model
  - precipitation

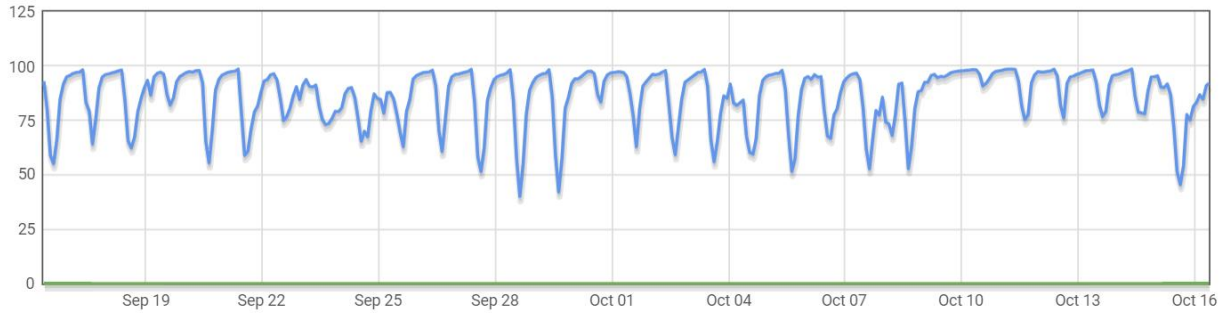


Water level of pool [cm]



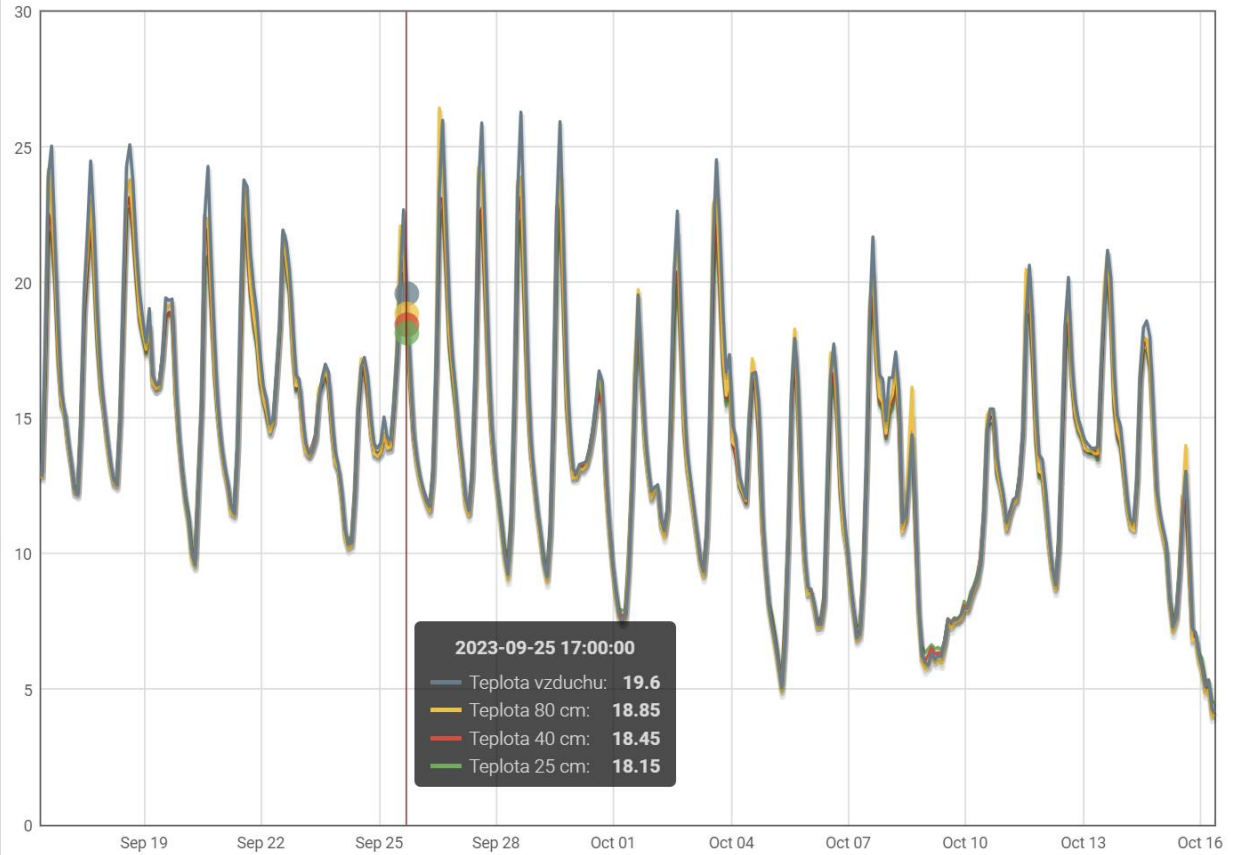
	min	max	avg	latest
Výška [cm]	0	17.5	6.1	1

Air and soil temperature [%]



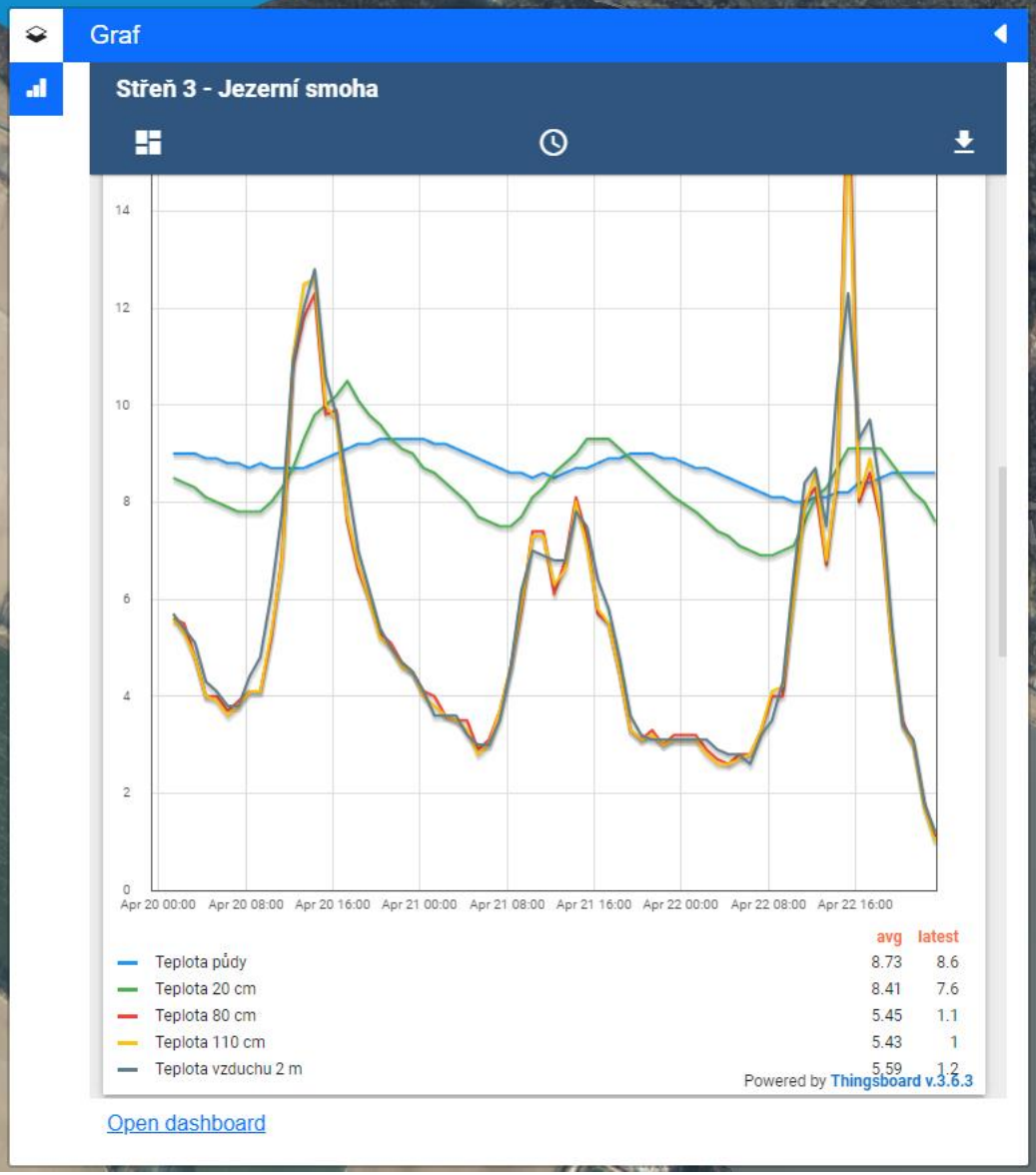
	avg	latest
Vzdušná vlhkost	86.13	92.3
Půdní vlhkost	0	0

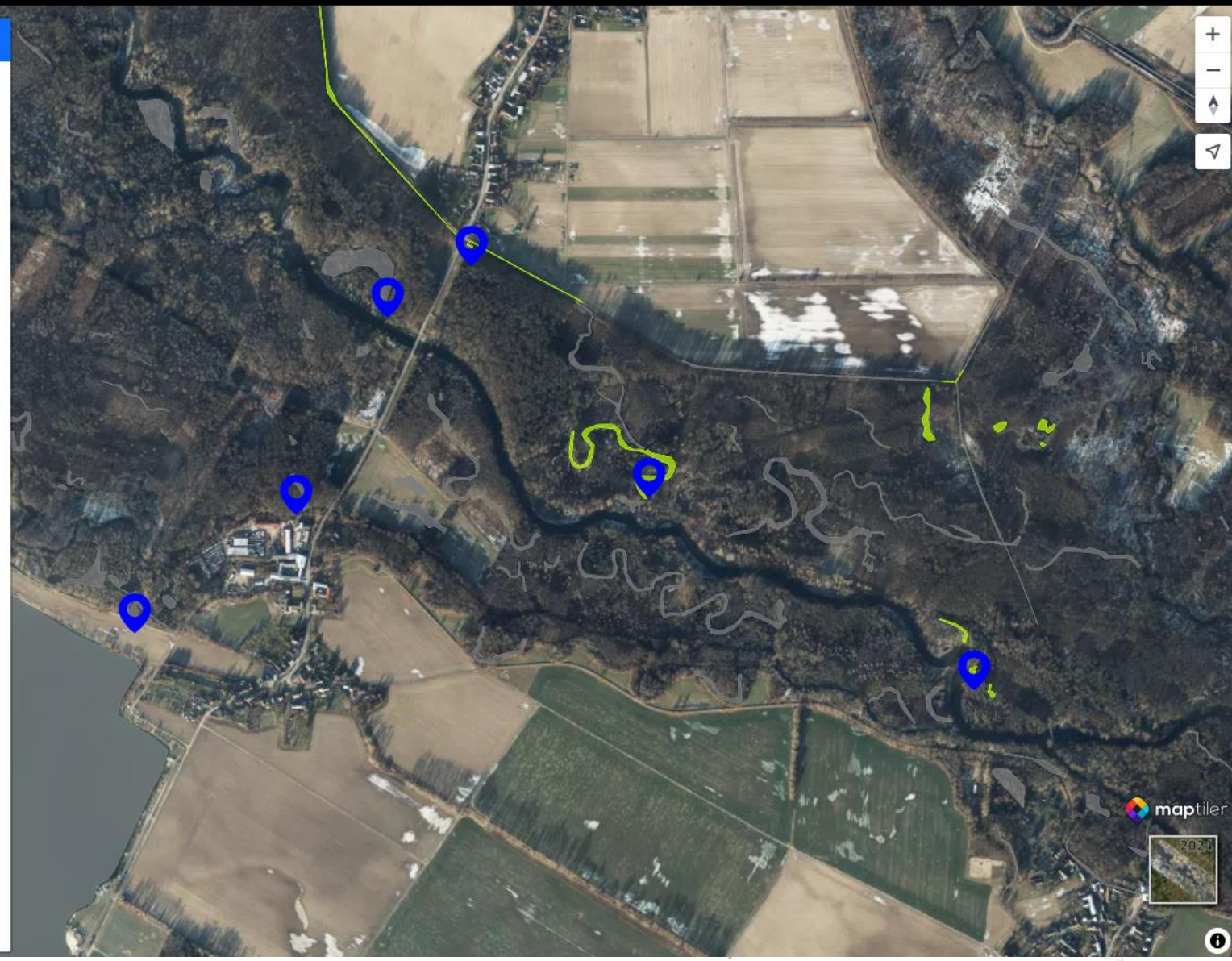
Temperature [°C]



	avg	latest
~~Teplota půdy~~	19.4	19.4
Teplota 25 cm	13.84	4.5
Teplota 40 cm	13.94	4.2
Teplota 80 cm	14.06	4.1
Teplota vzduchu	14.39	4.1

MOSPREMA


Graf
Střeň 3 - Jezerní smoha
14
12
10
8
6
4
2
0
Apr 20 00:00
Apr 20 08:00
Apr 20 16:00
Apr 21 00:00
Apr 21 08:00
Apr 21 16:00
Apr 22 00:00
Apr 22 08:00
Apr 22 16:00
avg latest
Teplota půdy 8.73 8.6
Teplota 20 cm 8.41 7.6
Teplota 80 cm 5.45 1.1
Teplota 110 cm 5.43 1
Teplota vzduchu 2 m 5.59 1.2
Powered by Thingsboard v.3.6.3
Open dashboard


maptiler

Hydrobiological and zoological survey

- the potential impact of larvicide on the fauna of pools and adjacent terrestrial ecosystems was evaluated
- regular field survey of mosquito populations directly in pools
  - Custom 3D Printed Bowls (Dipper)
- CO_2 traps for monitoring and regulation (inspiration beyond borders)
- **detailed monitoring required – cannot be fully automated**

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Dipper + telescopic rod

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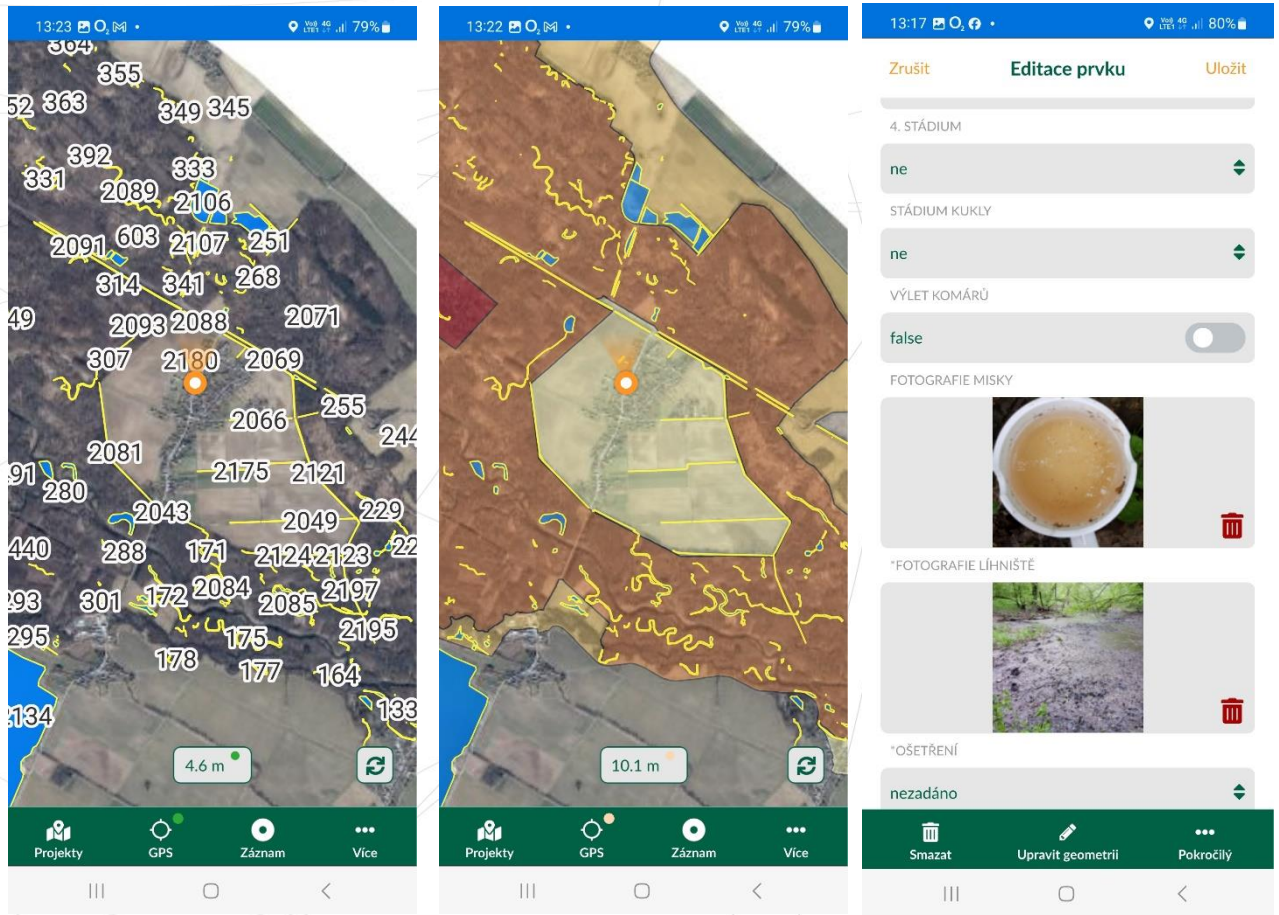
Mergin Maps App



- online and offline
- maps in the field
- GPS for navigation
- real-time updates
- ready-to-use form
- editable and non-editable fields
- automatic counting of the age of the record and the Vectobac application

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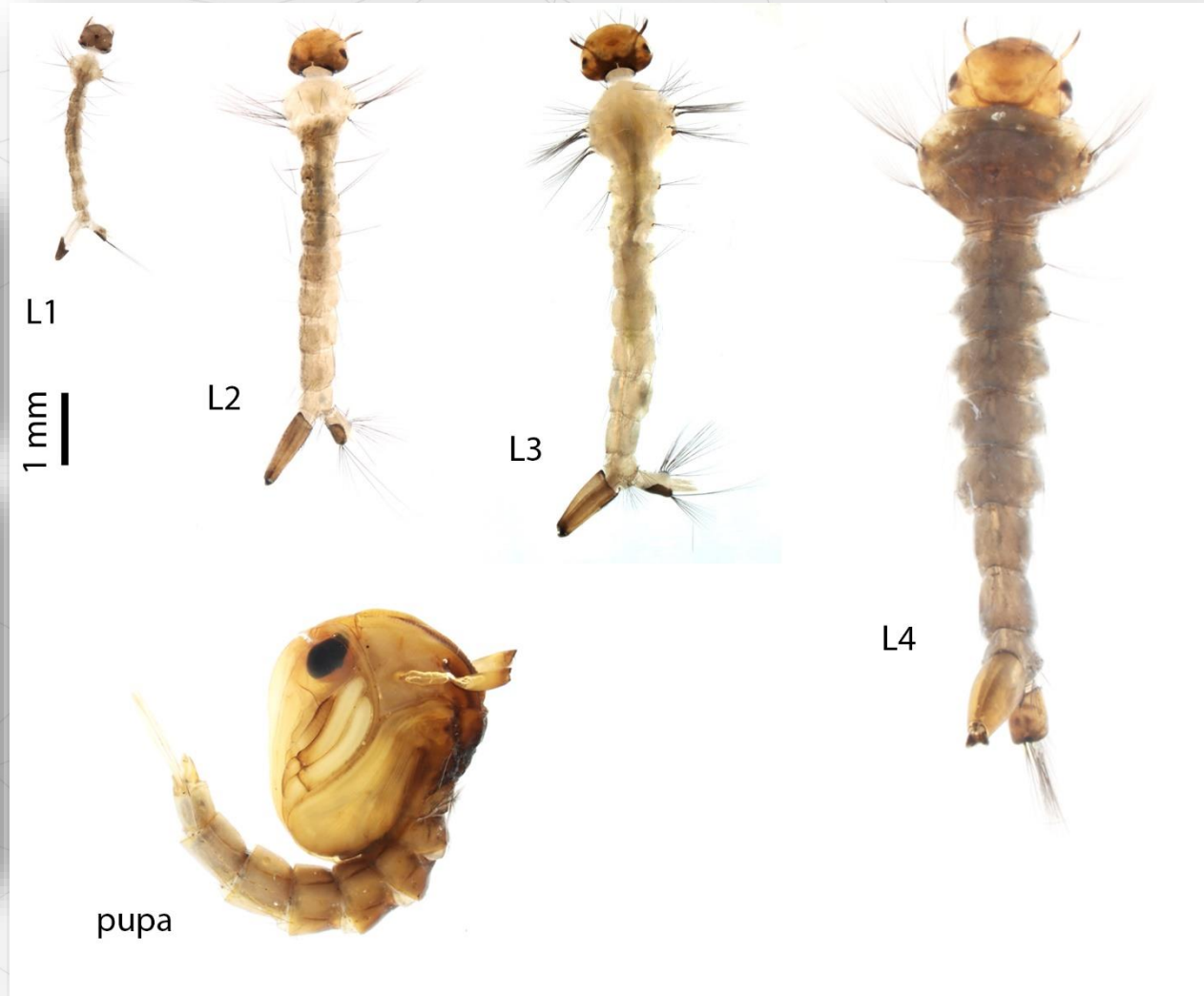

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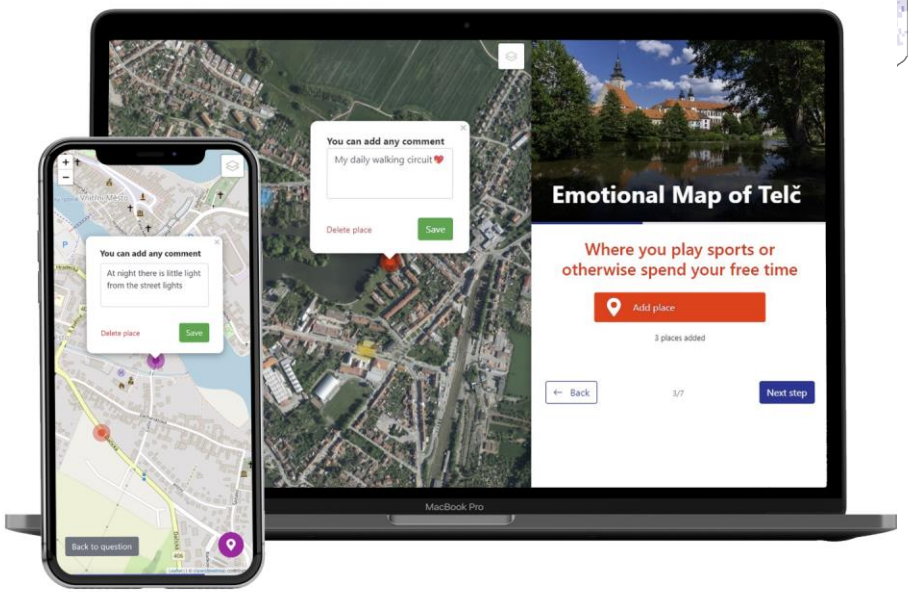
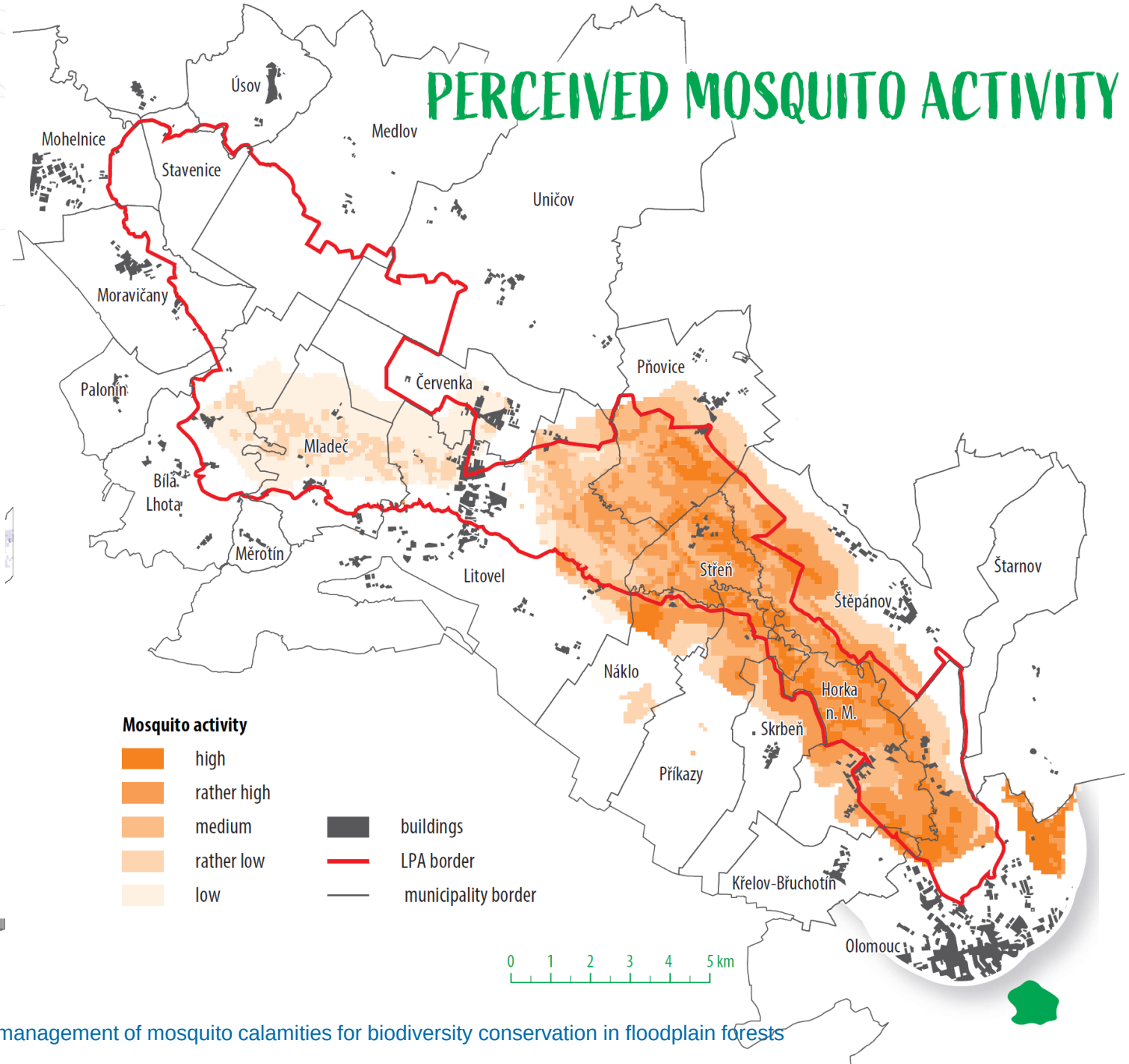
Emotional maps

What are the spatial preferences in your city?



PERCEIVED MOSQUITO ACTIVITY



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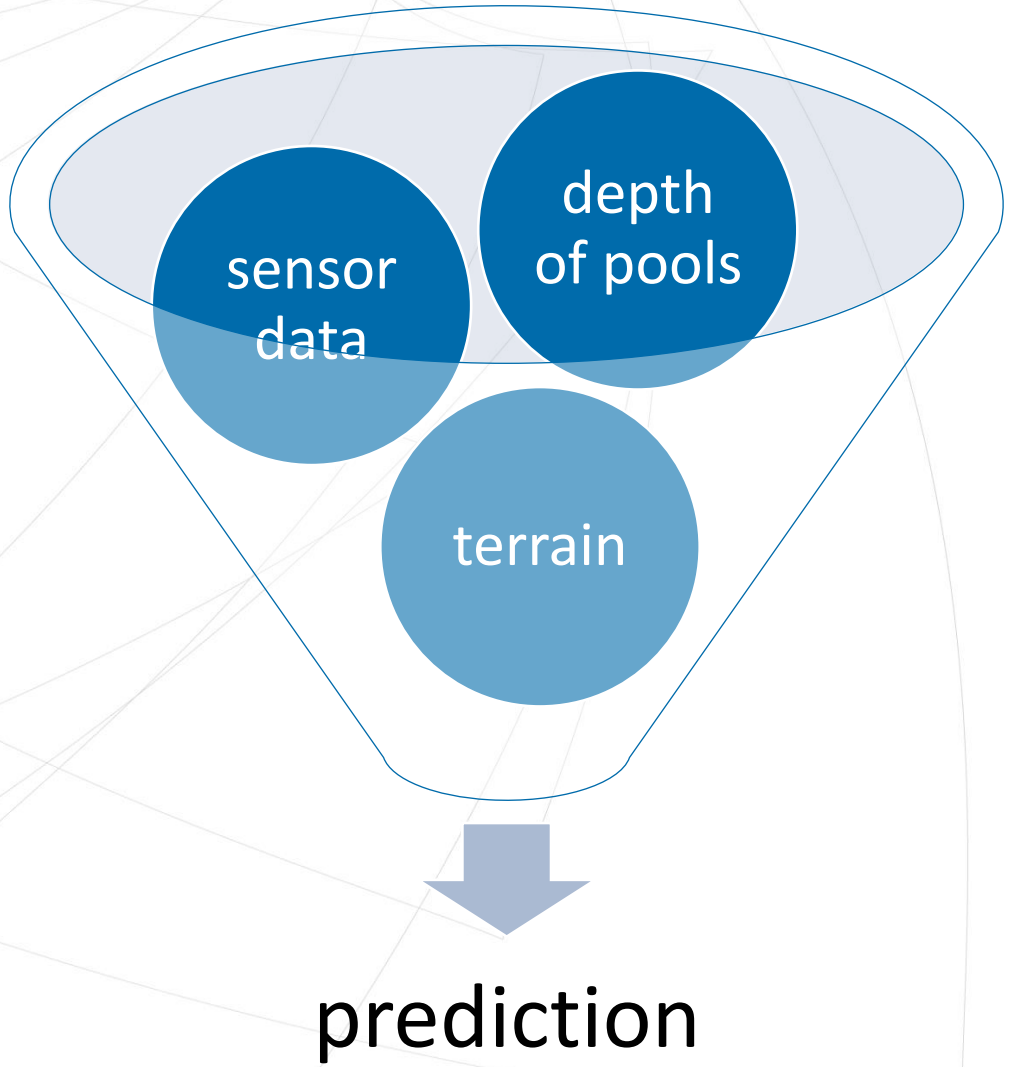
Prediction modelling

- **model for automatic flood determination**
- **flood modelling**
  - **high-quality DEM is key factor**
- integrated management of mosquito calamities
- virtual model of the territory




Statistiky - senzory
Výška hladiny tůně: 9 cm
Vodní stav řeky: 55 cm
Vlhkost vzduchu: 27,8 %
Teplota vzduchu: 29,4 °C
Teplota ve výšce 25 cm: 28,5 °C
Teplota ve výšce 40 cm: 28,3 °C
Teplota ve výšce 80 cm: 28,3 °C
Statistiky - weatherbit.io
Datum: 07.07.2023 14:38
Oblačnost: 0 %
Směr větru: 20°
Rychlost větru: 7.09 km/h
Množství srážek: 0 mm/h
Množství sněhu: 0 mm/h
Viditelnost: 16 km
Východ slunce: 02:54
Západ slunce: 18:53

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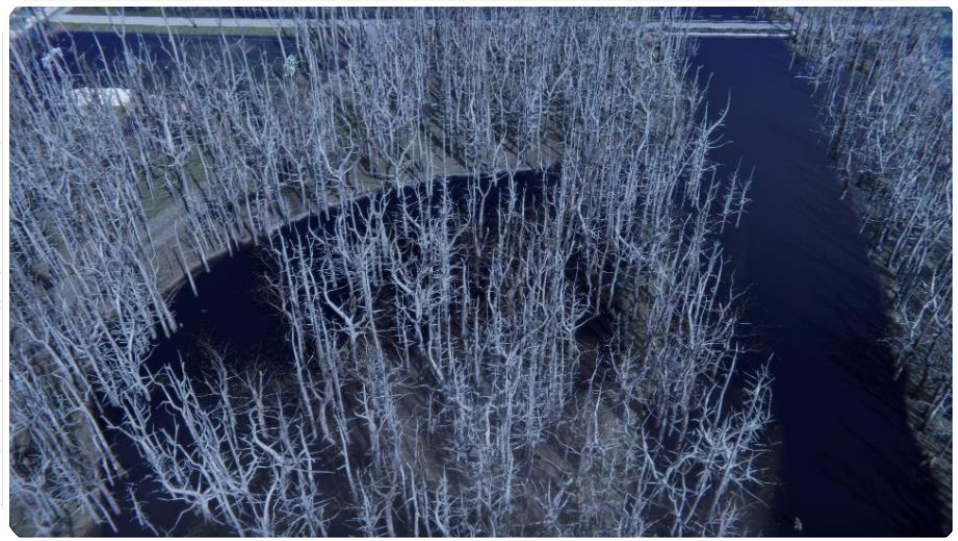

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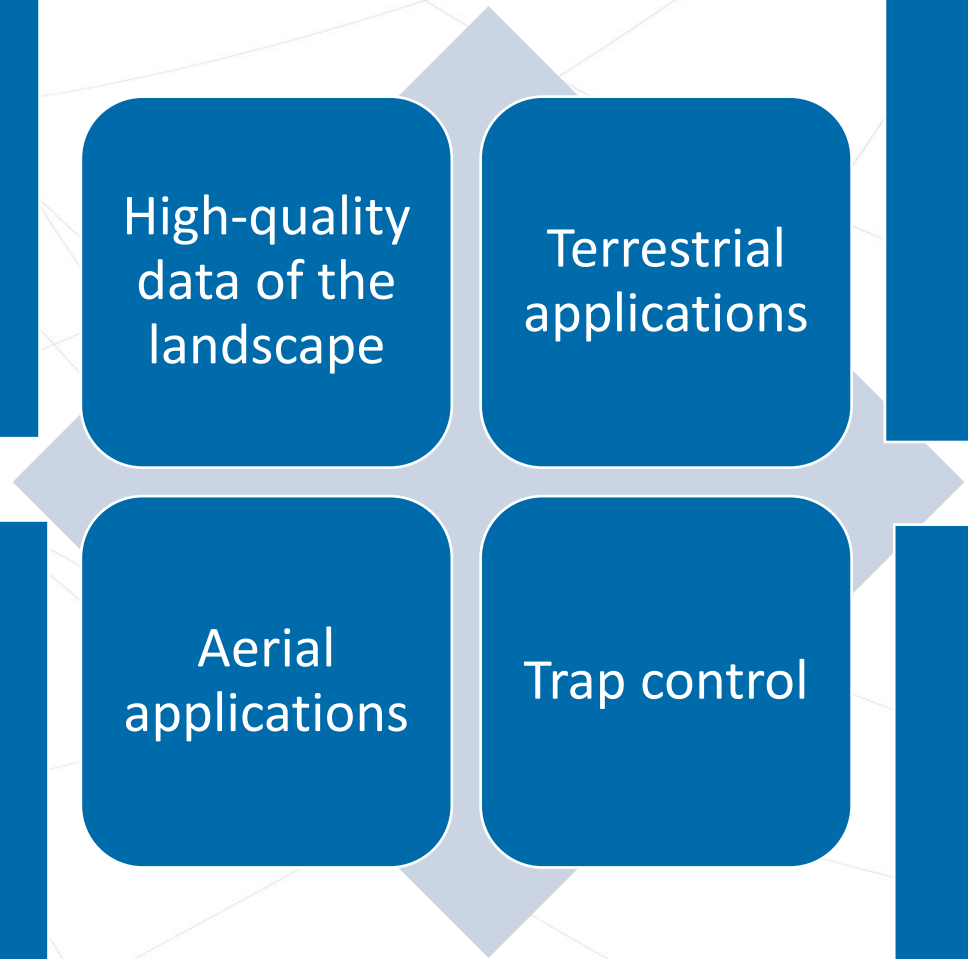
Synergy of local authorities

Long-term activity



Educational campaigns - monitoring

Educational campaigns - public

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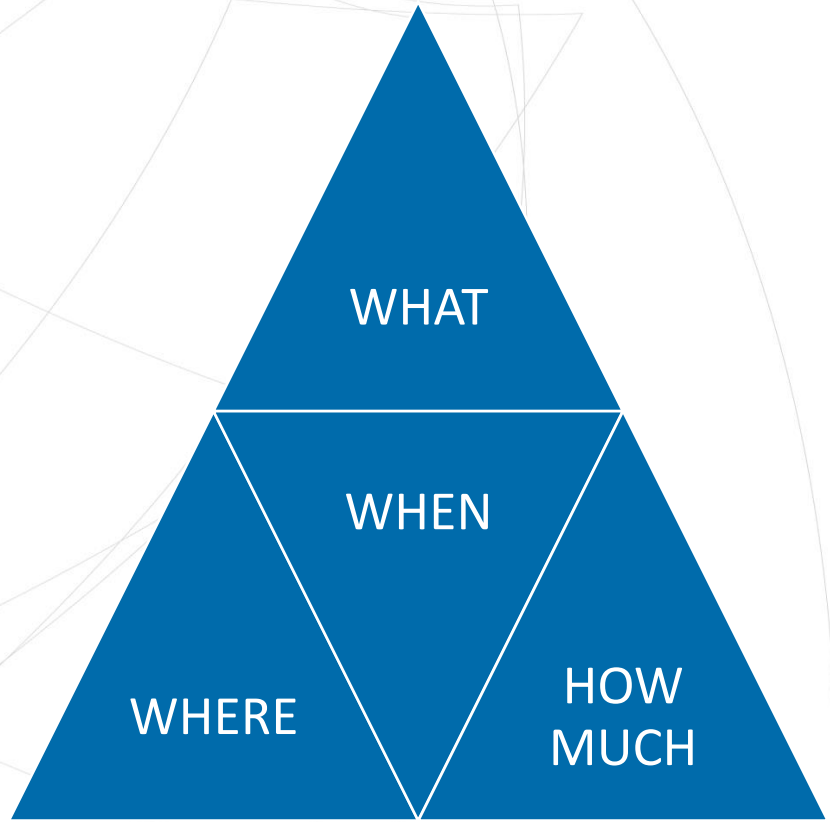
Main benefit of the project

- the resulting information system is using for planned precisely targeted ground and air applications
  - fewer Vectobac
  - less demands on human resources
  - exact scenario
  - coping with calamities
- transfer of information about applications to PLA representatives (database export)



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Summary

- scientific research project
- norwegian partner brought major contribution to the project
  - experience with modelling, climate change and public relations
- a major benefit for all of us

even though it is always territorially specific, the basic framework will still be the same – **possible transfer**

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Summary 2.0

- finding a way to manage calamitous situations
- you can't do it without municipalities and synergy!
- unfortunately, you can't do it on your knees either – necessary finances
- education is necessary and crucial
- a common approach across the Czech Republic **is necessary and needed**
  - counties, municipalities

Norway grants

STATE ENVIRONMENTAL FUND OF THE CZECH REPUBLIC

Working together for a green Europe

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THANK YOU

especially to

Norway
State Environmental Fund of the Czech Republic

Prague 4th June 2024