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GLOBAL CHANGE
RESEARCH INSTITUTE CAS

Monitoring and predicting wildfires in Czechia

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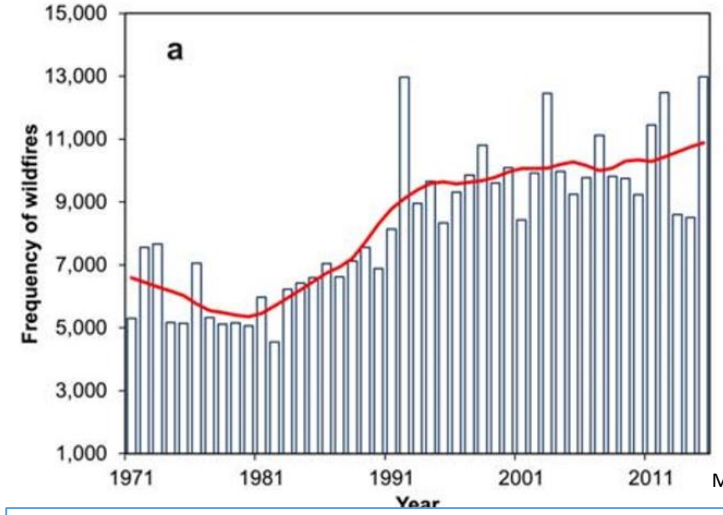
Motivation

PAST & PRESENT

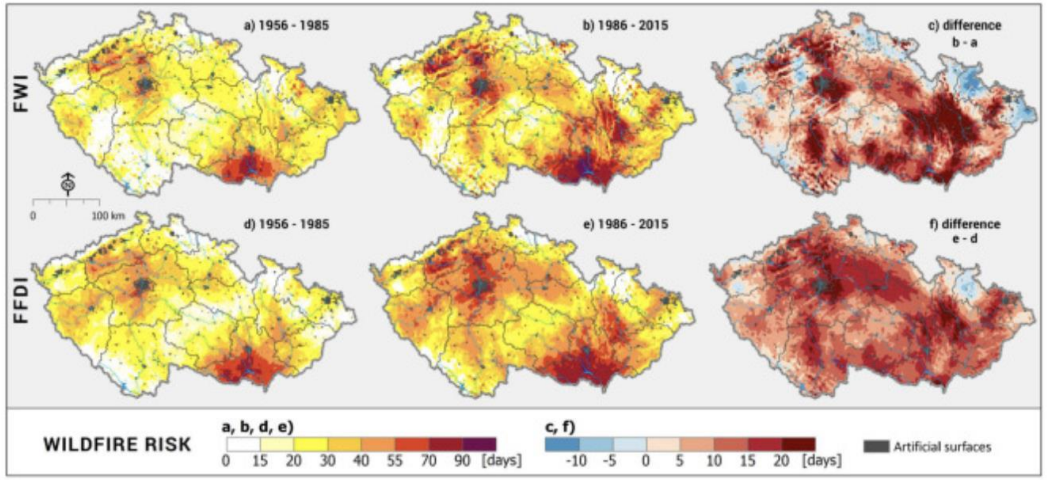
Rising frequency of wildfire occurrence



Mozny et al., 2021

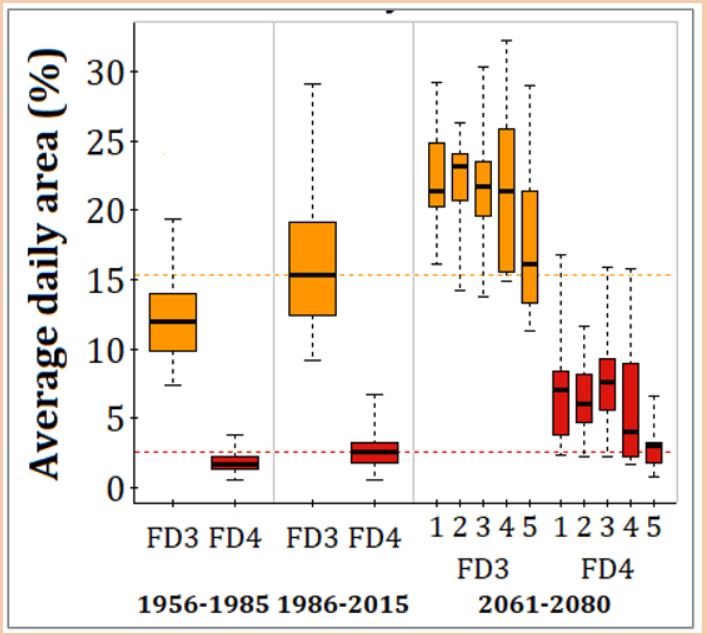
Largest recorded wildfire (>1000ha) in 7/2022

Increasing values of fire weather (up to 20 more days with high values)



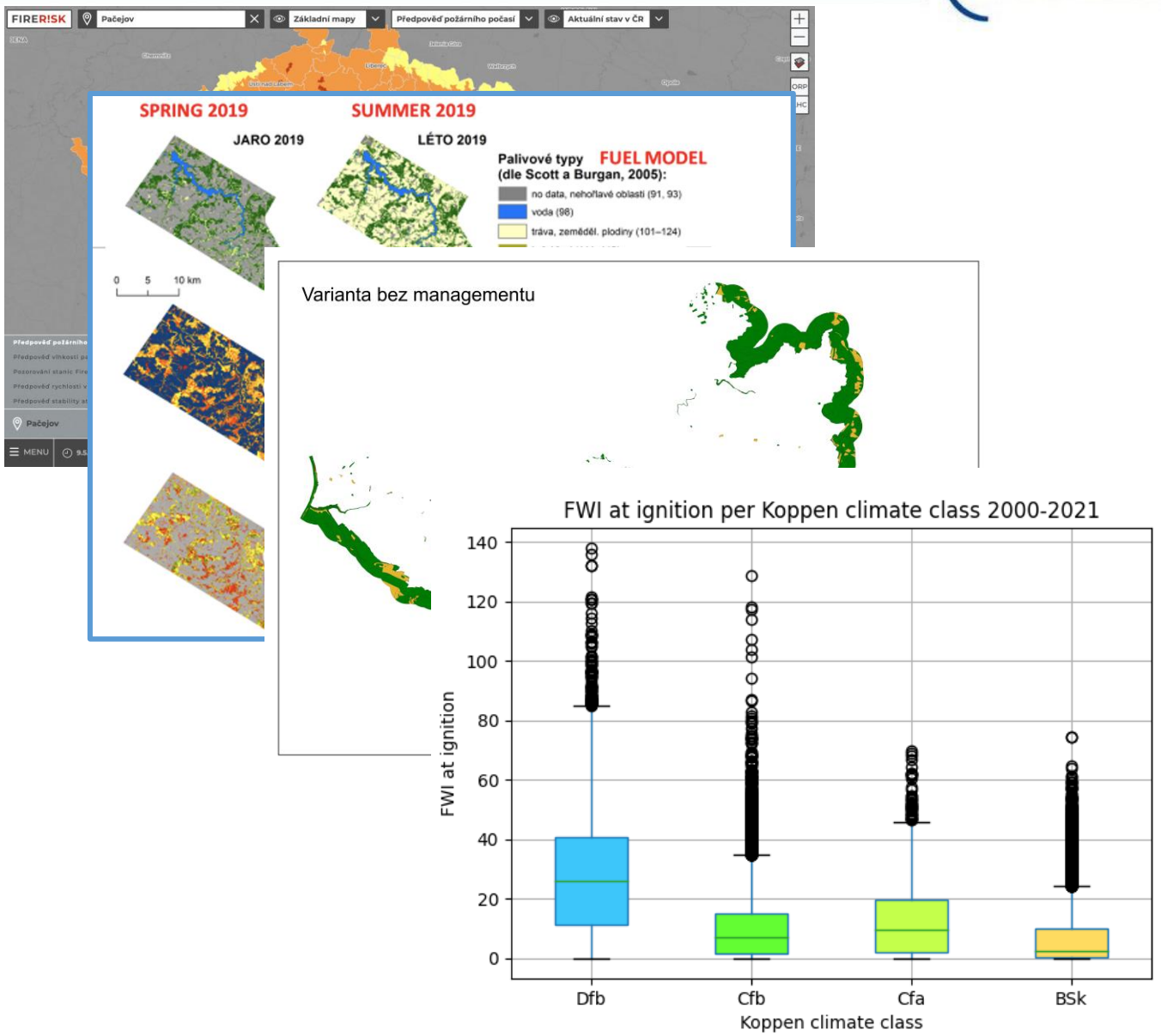
FUTURE

More area affected by conducive fire weather



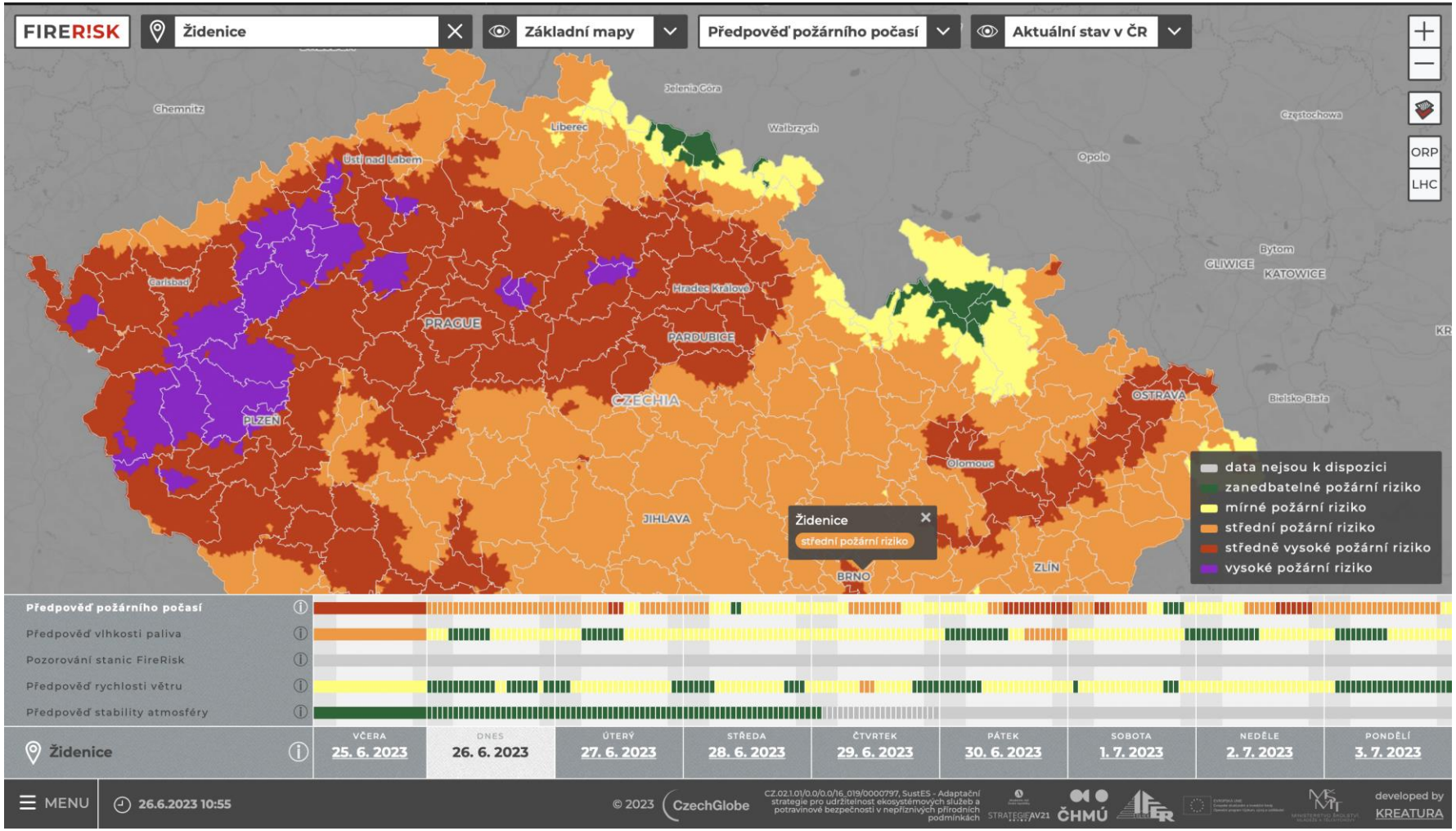
Wildfire research activities

- Operational wildfire danger monitoring and prediction
- Wildfire behavior modelling – Bohemian Switzerland case study/validation
- Landscape wildfire susceptibility index – collaboration with Institute of Forest Ecology Research
- Future occurrence of large wildfires – climate analogues



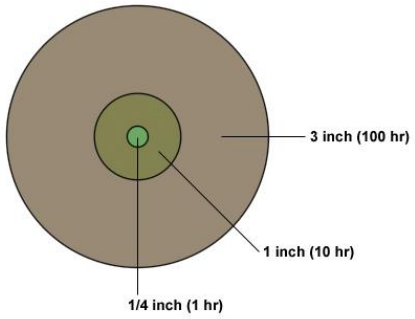
Fire weather conditions – FireRisk.cz

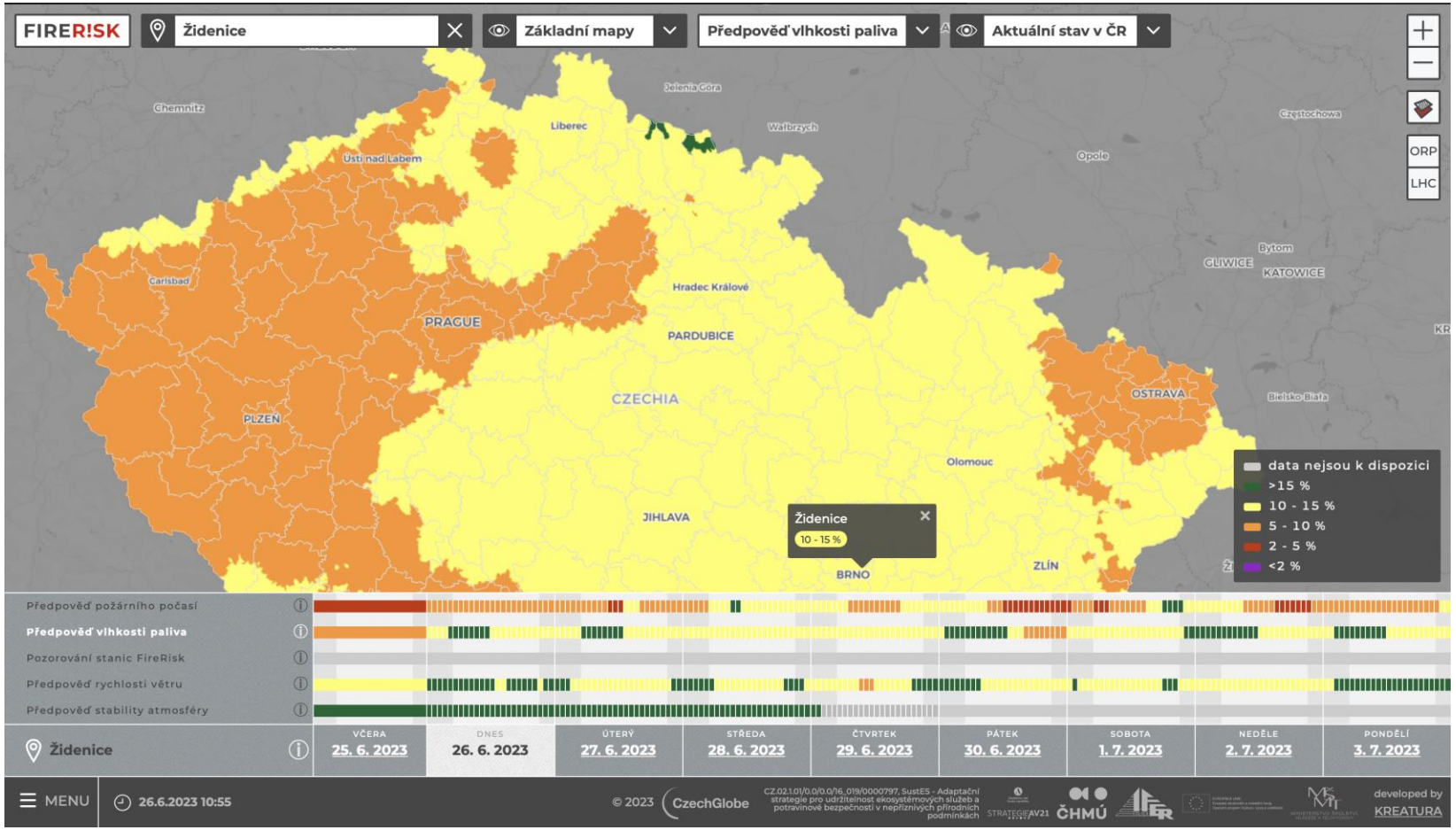
- Hourly calculation of FWI and FFDI at 500m
- Daily values correspond to max hourly values
- Median of FWI and FFDI per cadaster
- Worse of the two indices is taken as a resulting value
- Monitoring – updated 4 times a day – combination of multiple forecasting models



Fuel moisture calculation

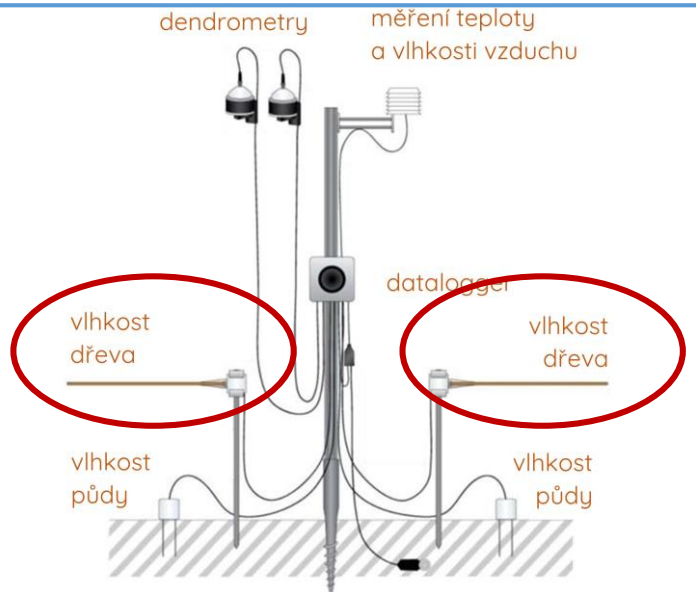
- Calculation based on meteorological variables (temperature, relative humidity)
- Correction based on snow cover and sum of precipitation
- Prediction based on the same input as fire weather

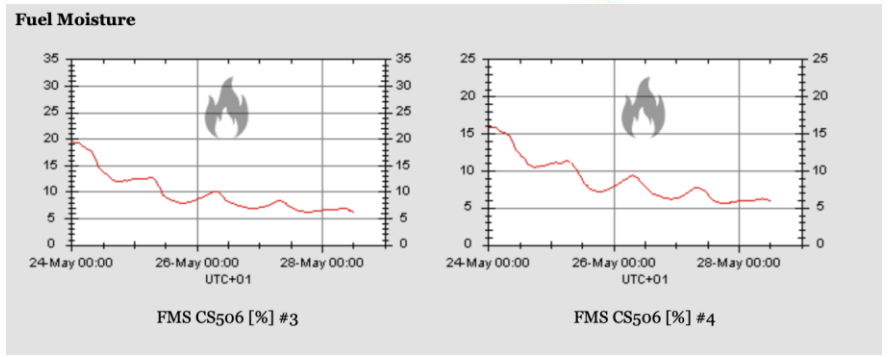


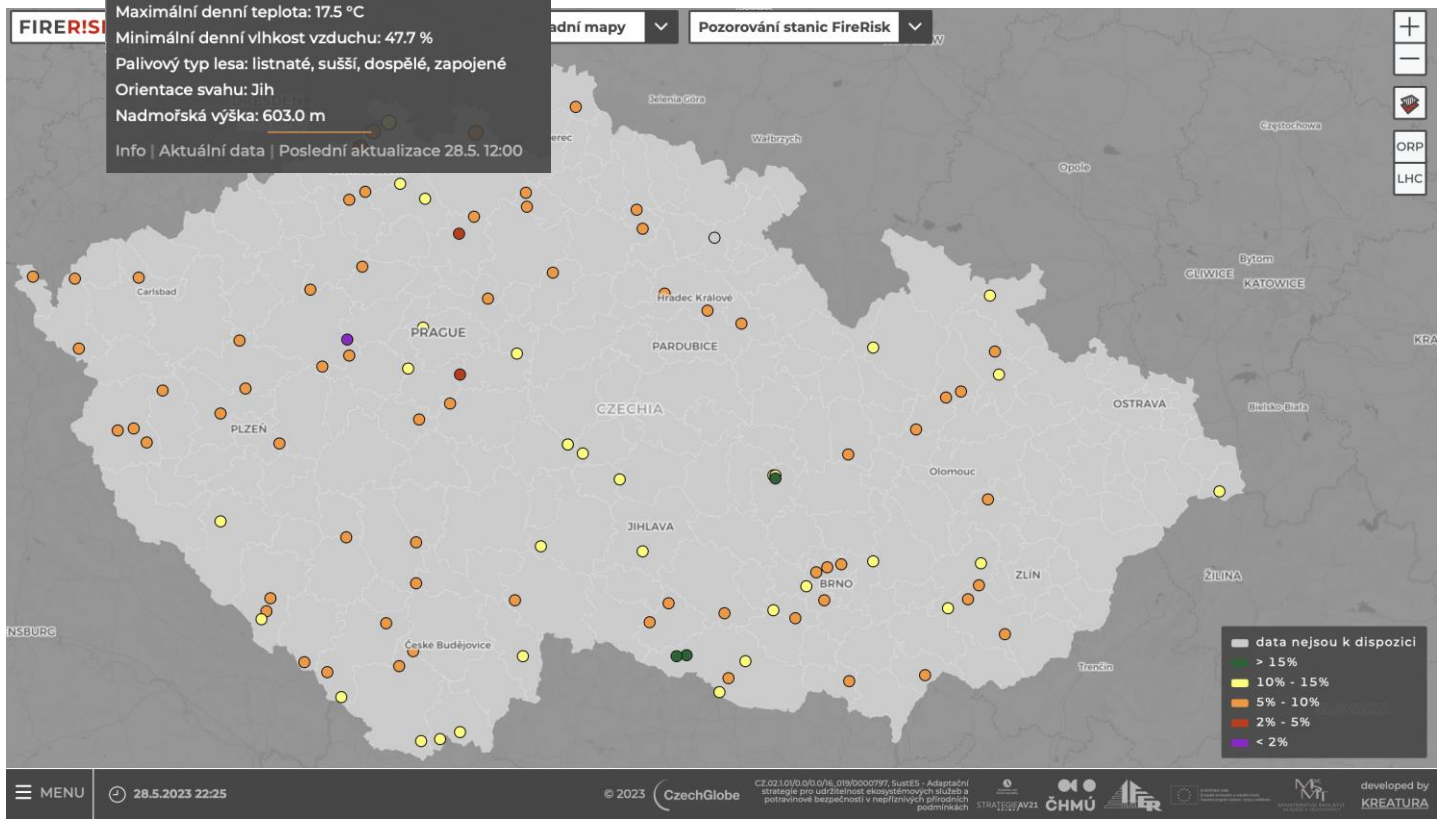


Fuel moisture measurements

- A network of stations located at various at-risk locations
- 10-hr fuel moisture measurements
- + dendrometers, soil moisture, air temperature and humidity
- Measuring since last year (1 fire season on record)

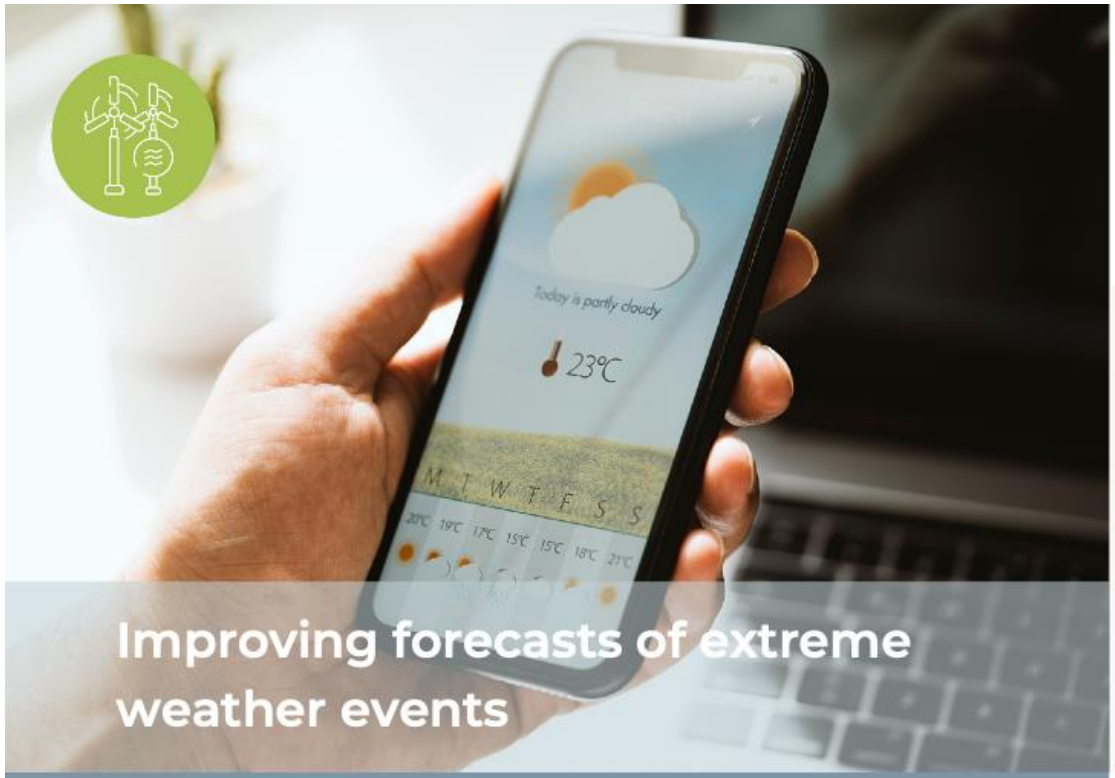






Clim4Cast – Central European project

CzechGlobe



Improving forecasts of extreme weather events

Climate change increases the risk of severe weather events in central Europe. Increasing resilience to droughts, heatwaves and fires is urgent but tools that monitor and predict these phenomena are widely missing. The Clim4Cast project establishes a new weather forecast tool, which will be integrated into existing national monitoring platforms of seven countries. Concrete action plans to set up regional response mechanisms are also developed.

interreg-central.eu/projects/clim4cast

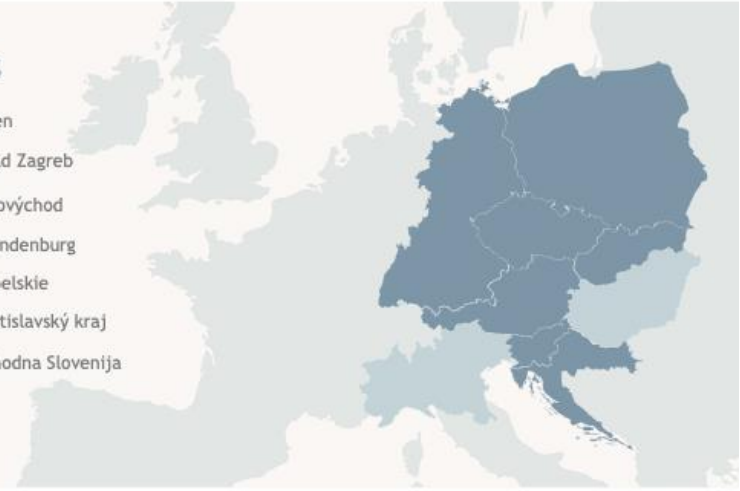
Interreg CENTRAL EUROPE

Co-funded by the European Union

Clim4Cast

COUNTRIES & REGIONS

AUSTRIA	Wien
CROATIA	Grad Zagreb
CZECHIA	Jihovýchod
GERMANY	Brandenburg
POLAND	Lubelskie
SLOVAKIA	Bratislavský kraj
SLOVENIA	Zahodna Slovenija



1.91 million €
Project budget

80%
ERDF co-financing

8
Partners

3
Pilots

03.2023
Start date

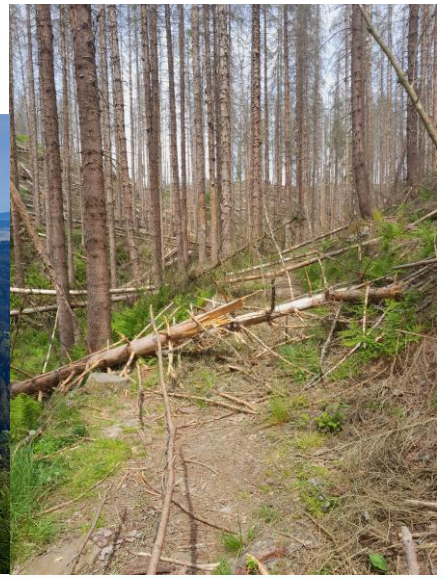
02.2026
End date

Information based on application form | December 2022

Wildfire behavior modelling

7/2022 - the largest wildfire in CZ (1000ha)

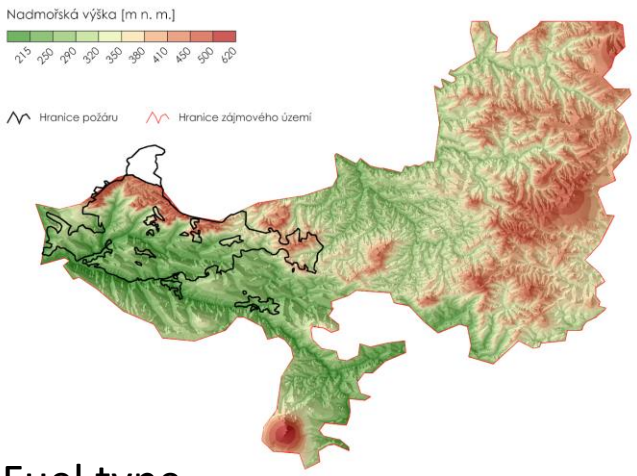
- NP Bohemian Switzerland
- Complex terrain, bark beetle kill areas, WUI areas
- Big media and public attention
- Fall 2022 - visiting USDA FS Fire Sciences Lab to calibrate FlamMap (FarSite) to Czech conditions
- Objective: recreate observed wildfire behavior and perimeter



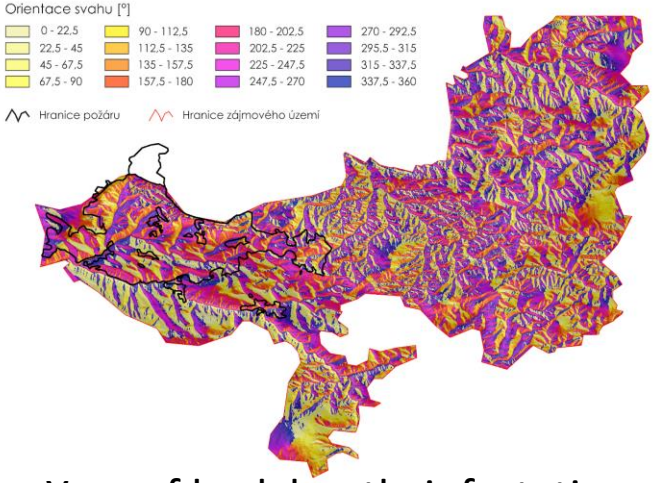
FarSite - recreating observed wildfire behavior

- 8 geospatial layers at 5m resolution – elevation, slope, aspect, fuel type, canopy cover, stand height, crown base height, crown bulk density
- Development of crown parameters (CC, SH, CBH, CBD)
  - LiDAR data + expert knowledge
  - No existing accessible in-situ observations
- Investigating possible weather data sources and their adjustments – station data vs. modeled data – what station best represents the conditions?

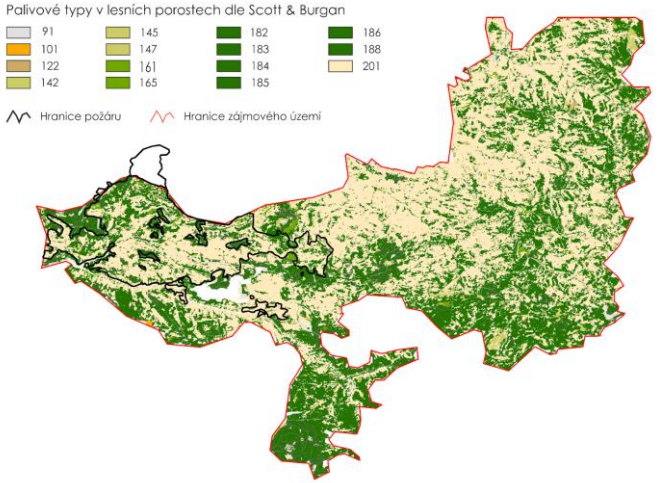
Elevation



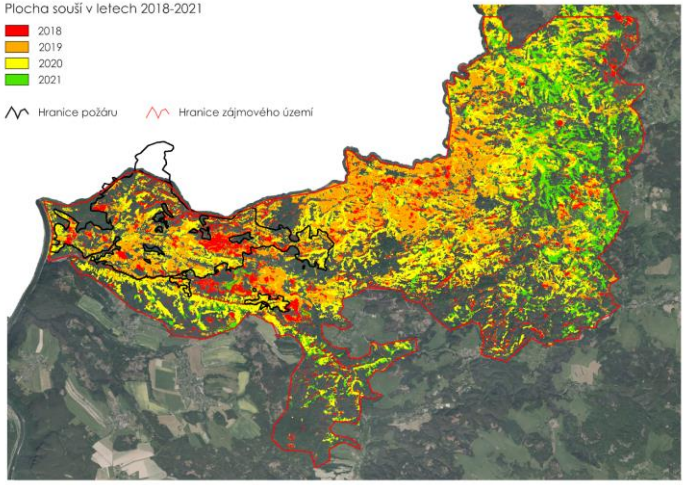
Aspect



Fuel type



Year of bark beetle infestation



Forest fuel type development (IFER)

Site risk

Forest vegetation

Altitudinal zones

Edaphic categories

LVS	0	1	2	3	4	5	6	7	8	9
Charakteristika	Napříč LVS písky, hadce, skály aj.	Nižší polohy cca ≤ 400 m n. m. prům. teplota >8°C, srážky < 650 mm/rok		Střední polohy cca 400 - 600 m n. m. prům. teplota 6-8°C, srážky 650-800 mm/rok		Vyšší polohy cca 600-900 m n. m. prům. teplota 5-6°C, srážky 800-1050 mm/rok		Horské polohy nad 900 m n. m. prům. teplota <5°C, srážky > 1050 mm/rok		
evážně výrazné sucho, zahřevné	0.9	0.9	0.9	0.7	0.5	-	-	-	-	-
ahy, hřbety, substráty, ztížené hašení	0.9	0.9	0.9	0.9	0.7	0.5	-	-	-	-
írně sucho, trávy	-	-	0.7	0.5	0.5	0.3	-	-	-	-
trémní terény a svahy	0.5	0.7	0.7	0.5	0.5	0.3	0.3	0.1	0.1	0.1
:hlé šíření ohně,	0.5	-	-	0.5	0.3	0.3	0.3	0.1	0.1	-
lmi obtížné hašení	-	0.5	-	0.3	-	0.3	-	-	-	-
	-	0.5	0.5	0.3	0.3	0.3	0.1	0.1	0.1	-
ponované svahy rychlé šíření ohně,	-	-	-	0.3	0.3	0.3	0.1	0.1	0.1	-
:ký terén, obtížné hašení	0.6	0.7	0.7	0.5	0.5	0.3	0.3	0.1	0.1	-
										-
udé a kyselé půdy	0.6	0.7	0.7	0.5	0.3	0.3	0.3	0.1	0.1	-
sucha hořlavá přízemní vegetace	0.6	0.7	0.7	0.5	0.3	0.3	0.1	0.1	0.1	0.1
žné terény	-	0.5	0.5	0.3	0.3	0.3	0.1	-	-	-
	-	0.5	0.5	0.3	0.3	0.3	0.1	0.1	0.1	-
rné půdy	-	0.5	0.5	0.3	0.3	0.1	0.1	0.1	-	-
evážně bylinná méně hořlavá getace, obvykle běžné terény	-	0.5	0.5	0.3	0.3	0.1	0.1	-	-	-
	-	0.5	0.3	0.3	0.3	0.1	0.1	0.1	-	-
lejené půdy (gleje)	-	-	0.1	0.1	0.1	0.1	0.1	0.1	-	-
část roku zvýšená půdní vlhkost, omě „V" zpravidla rovinaté terény – ně únosné		0.3	0.1	0.1	0.1	0.1	0.1	0.1	-	-
	0.3	0.2	0.2	0.1	0.1	0.1	0.1			
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-
dmáčené půdy	0.1	0.1	-	0.1	0.1	0.1	0.1	0.1	0.1	-
ale zvýšená půdní vlhkost,	0.1	0.1	-	0.1	0.1	0.1	0.1	0.1	0.1	-
odvodněné										
lvodněné rašeliny, iko podzemních požárů	0.2	-	-	0.2	0.2	0.2	0.2	0.1	0.1	0.1
hy	-	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-
U trvalá vlhkost, listnáče	-	0.1	0.1	0.1	0.1	0.1	-	-	-	-

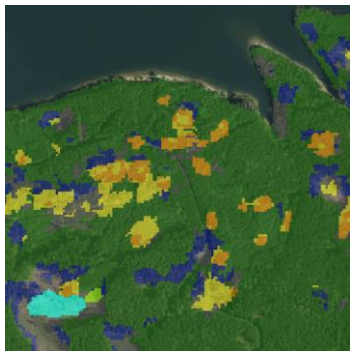
Nedávný stav po současnost

Stupnice (riziko vzestupně)

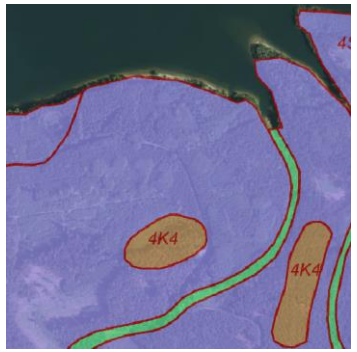
0,1 nízké
0,3 mírně zvýšené
0,5 střední
0,7 vysoké
0,9 velmi vysoké
- SLT nevyšlišen

1 b 1 9

Tree species		Moisture state		Growth phase		Canopy cover	
0	Unspecified	a	Drier	0	clearcut	4	Sparse
1	Pines	b	Wetter	1	1-10 yrs	7	Intermediate
2	Coniferous			3	11-30 yrs	9	Closed
3	Broadleaved			6	31-60 yrs		
				9	over 60 yrs		

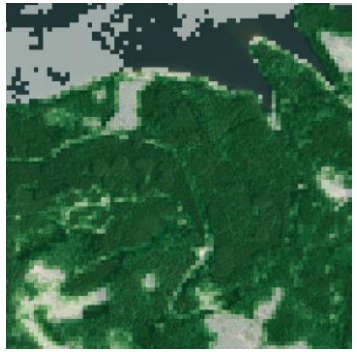


Resolution: 10 m



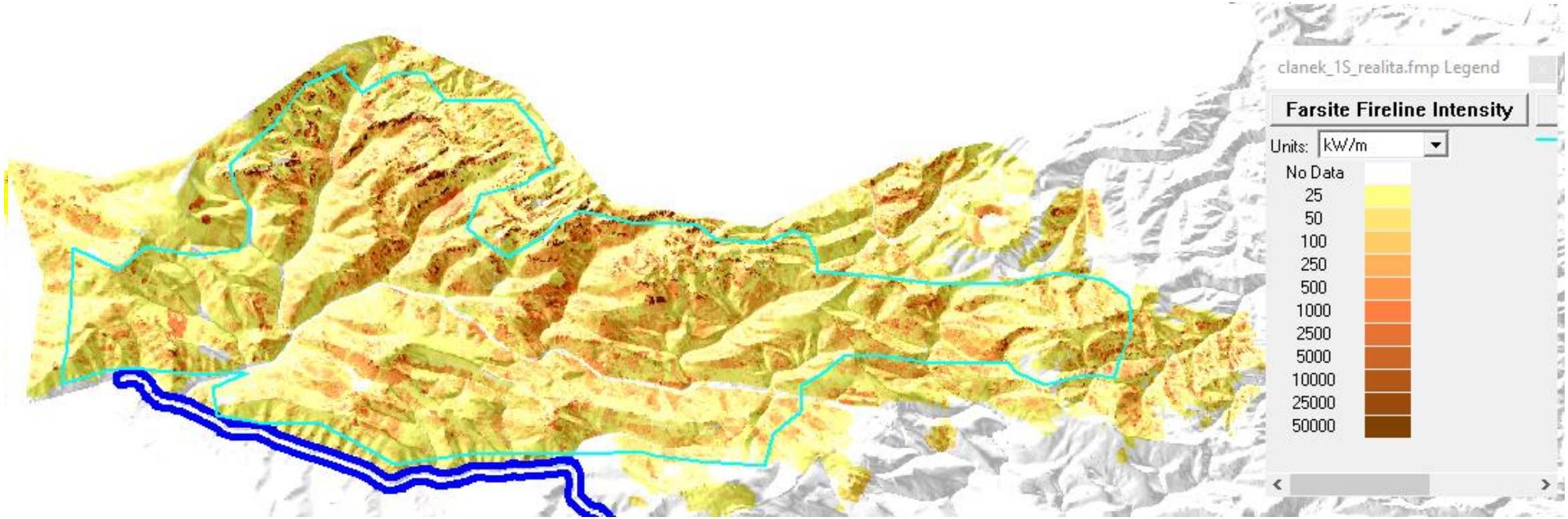
vector

5 m

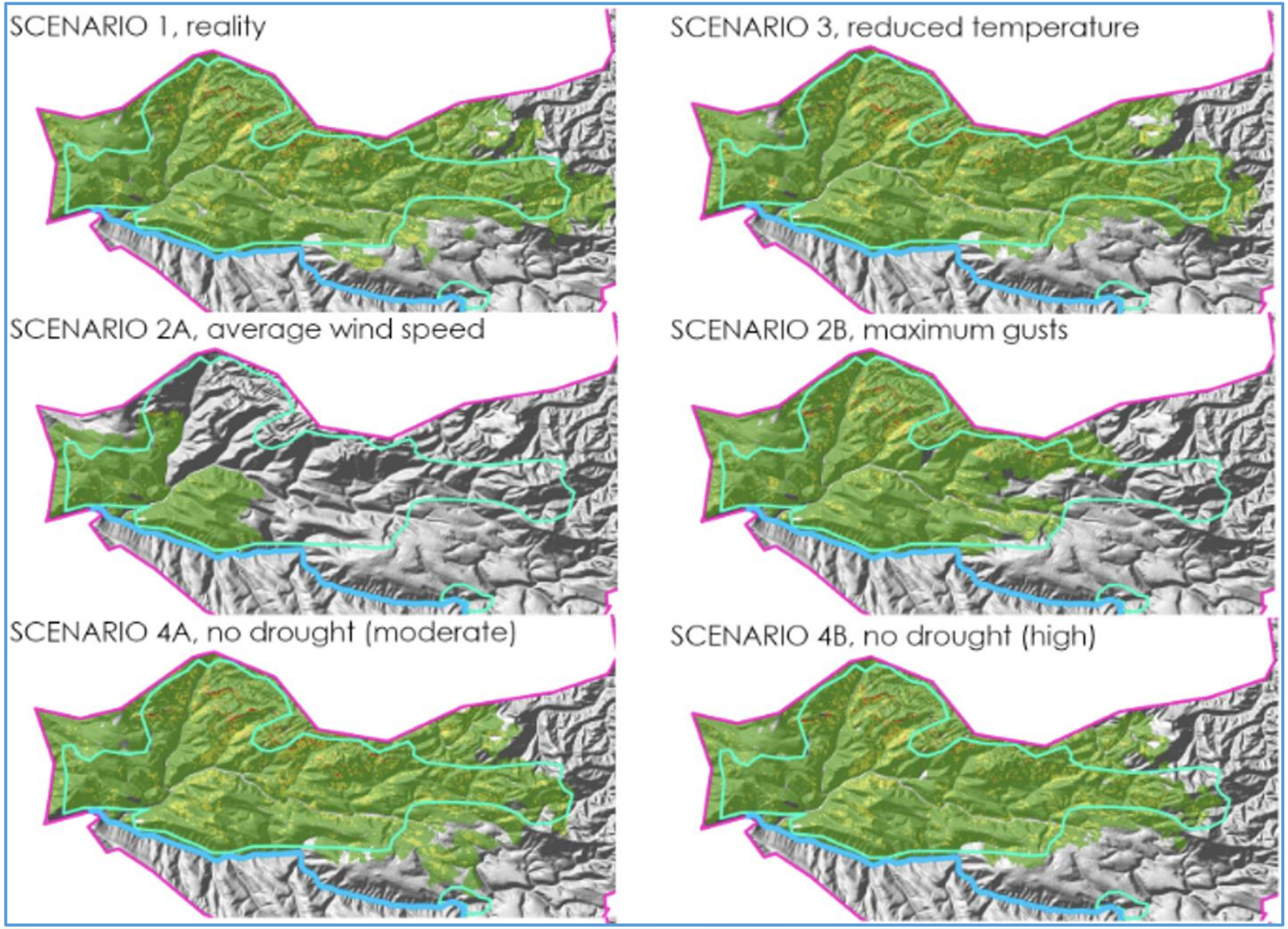


20 m

FarSite - recreating observed wildfire behavior

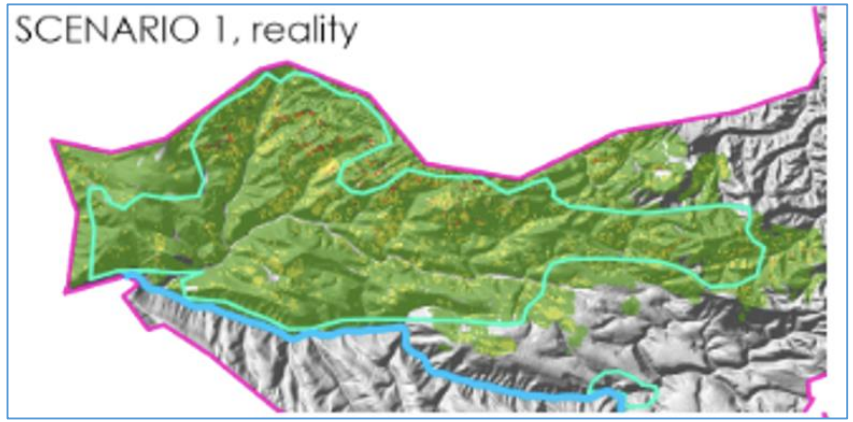


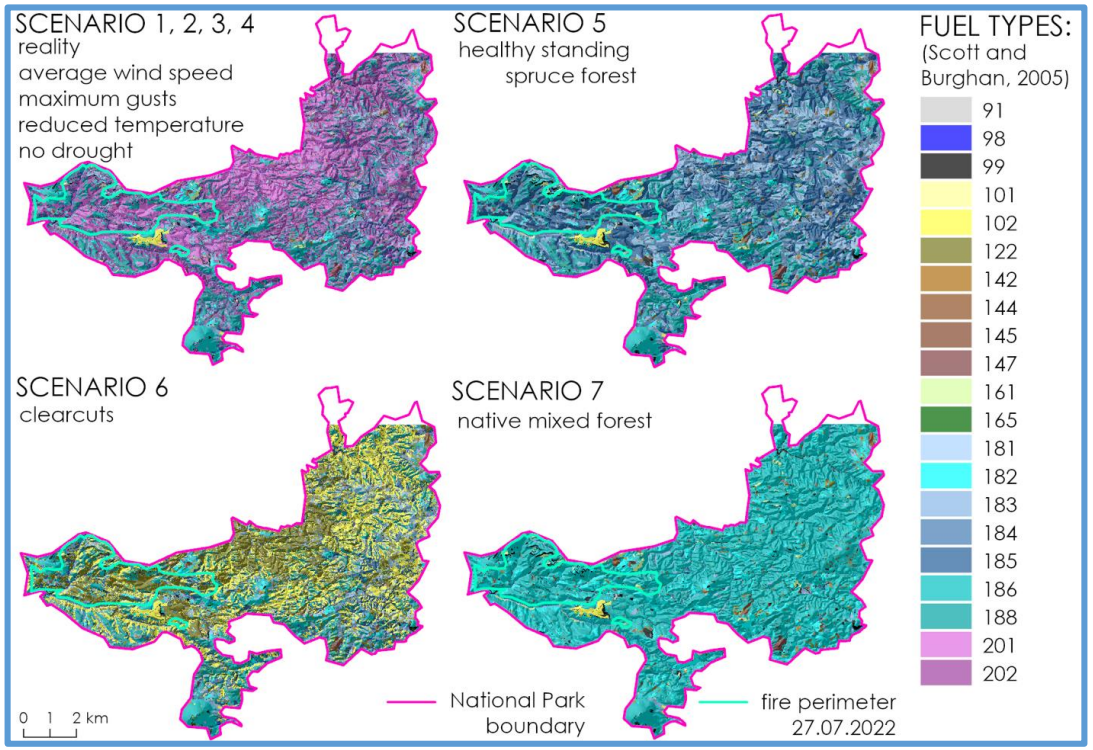
FarSite – influence of weather and climate

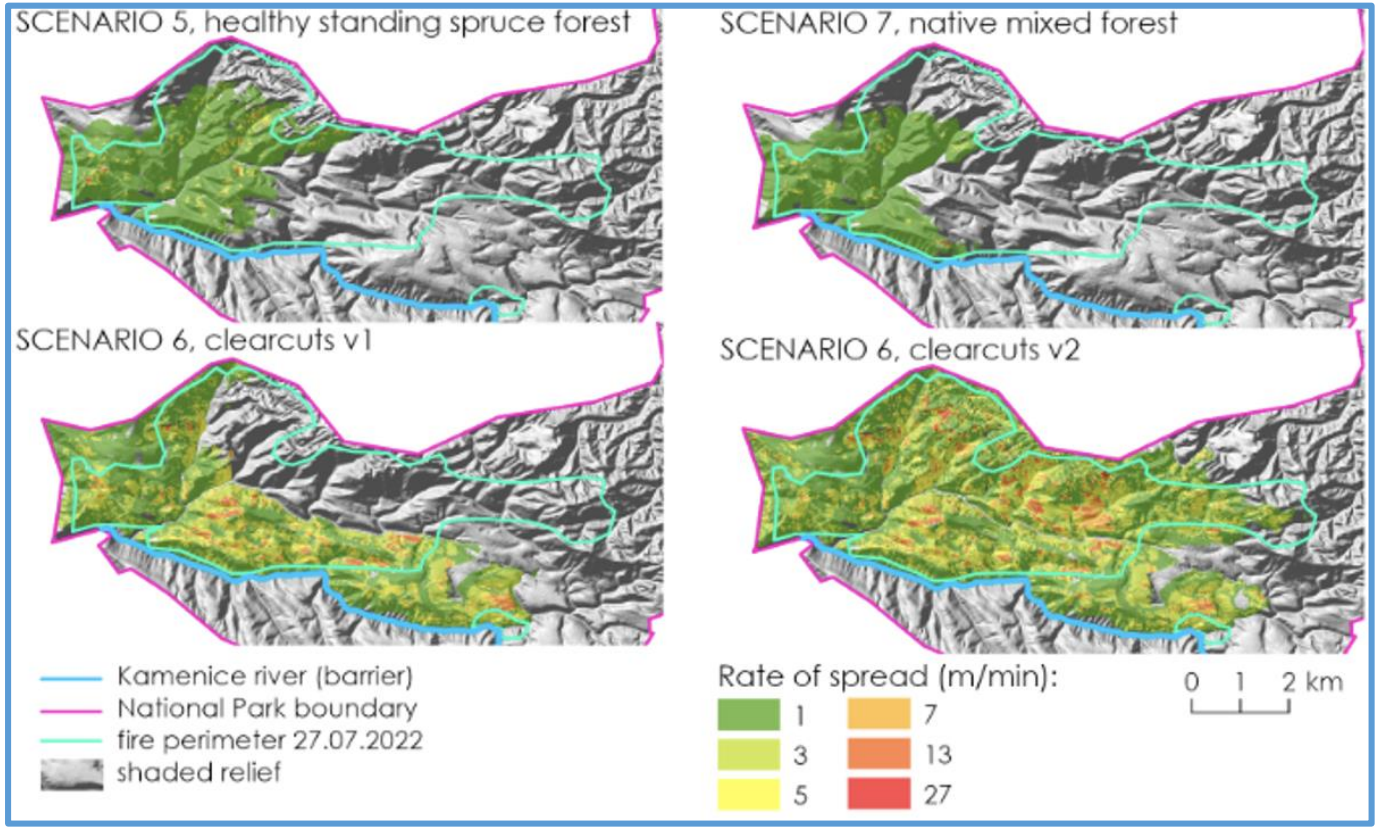


Kudláčková et al. in prep.

FarSite – influence of vegetation







Kudláčková et al. in prep.

Thank you for attention

Questions, comments, suggestions?

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