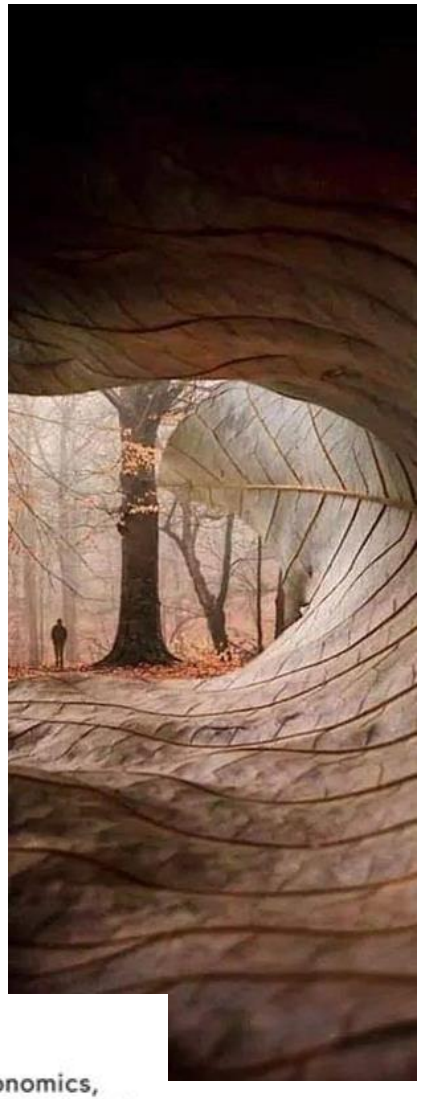
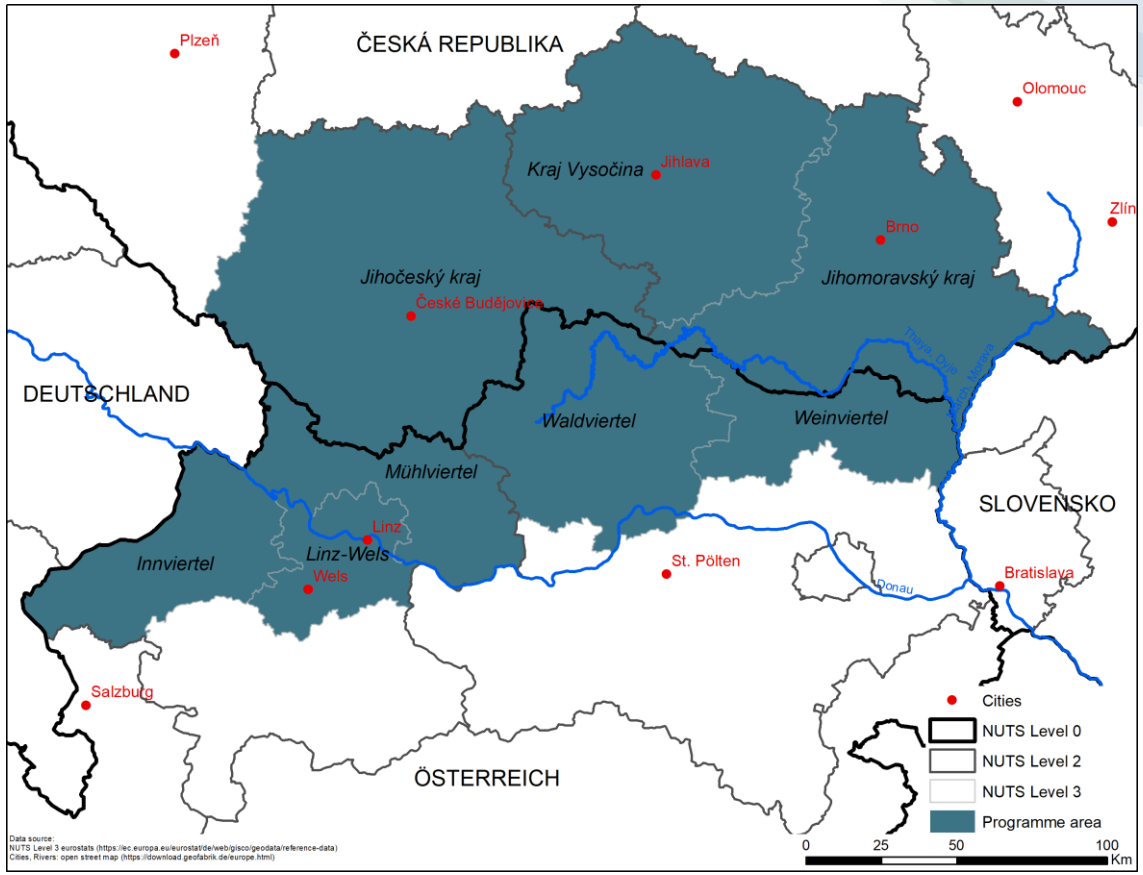
Brochure
&
Current situation
&
FSE MF Křtiny

FORRISK

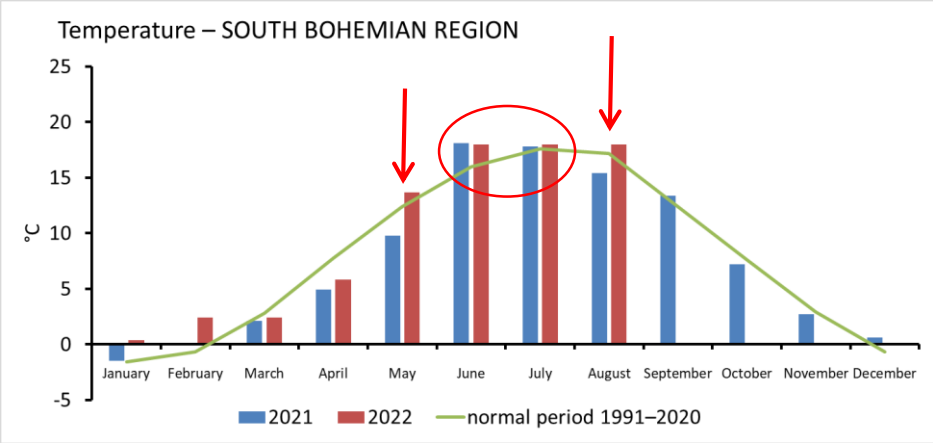
Cross-border forest risk management

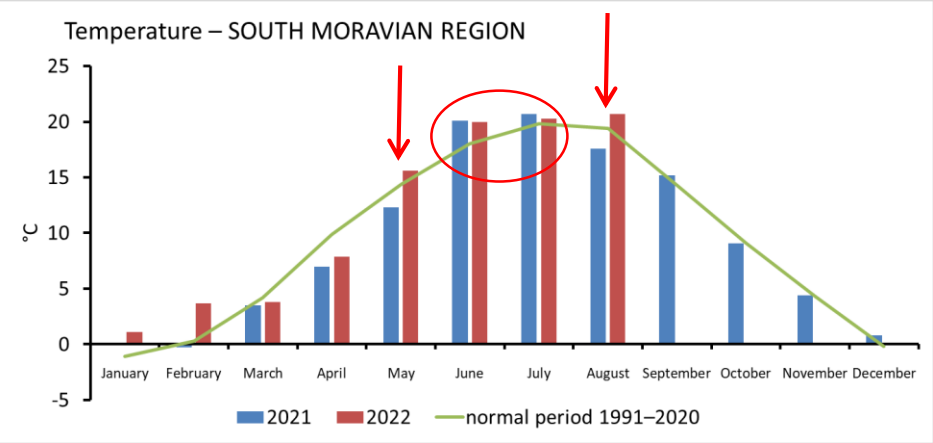


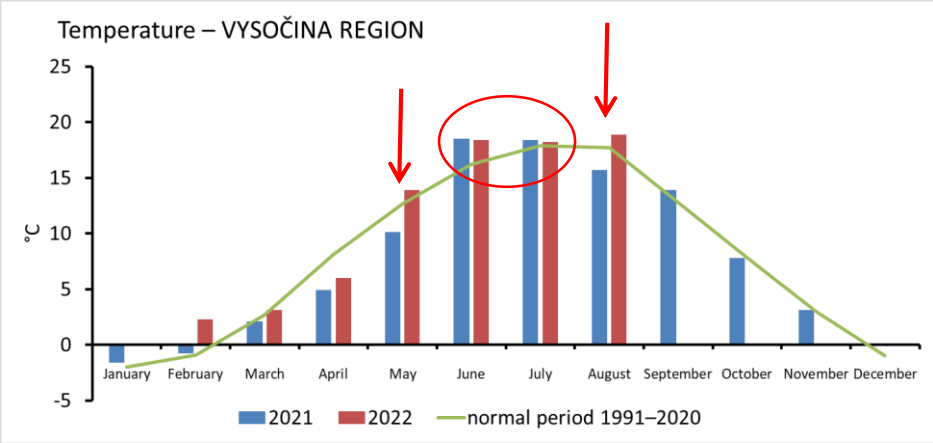
- Introduction
- Main project outputs overview
- What is risk and how to deal with it
- Risks in forestry
- Current problems
- Tree species selection – a key element to avoid risks
- Preparedness /Austria - Czech Republic/
- Integrated bark beetle management
- Forest recovery after a calamity
- Prevention – application of adaptation strategies
- Good practice examples



Temperature 2021, 2022 in Czech Republic

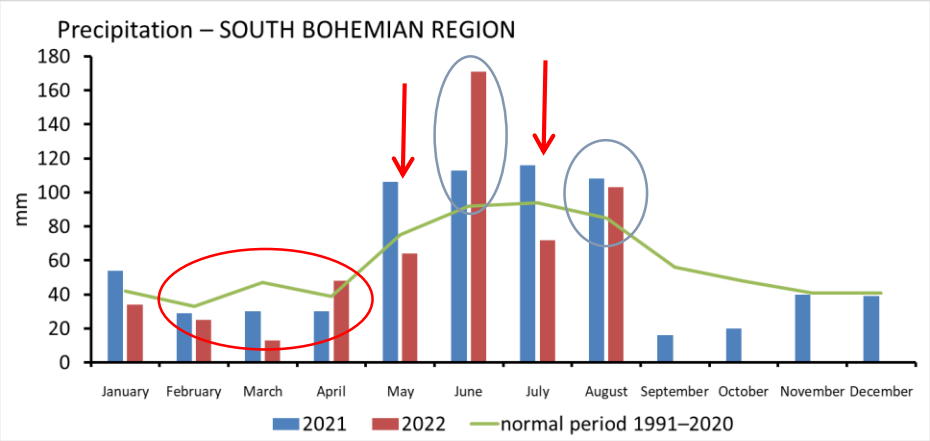


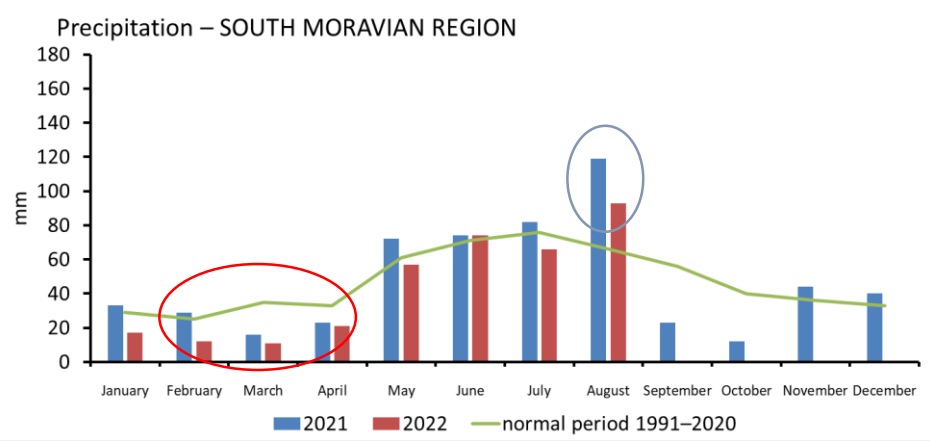


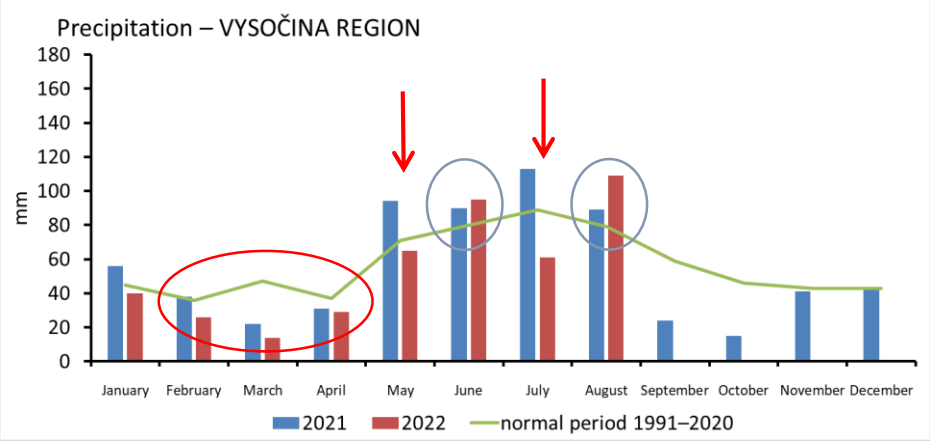


- above normal temperatures in June, July (both years) and May, August (2022)
- subnormal temperatures in April (both years) and May, August (2021)
- shorter warm period in 2021 than 2022

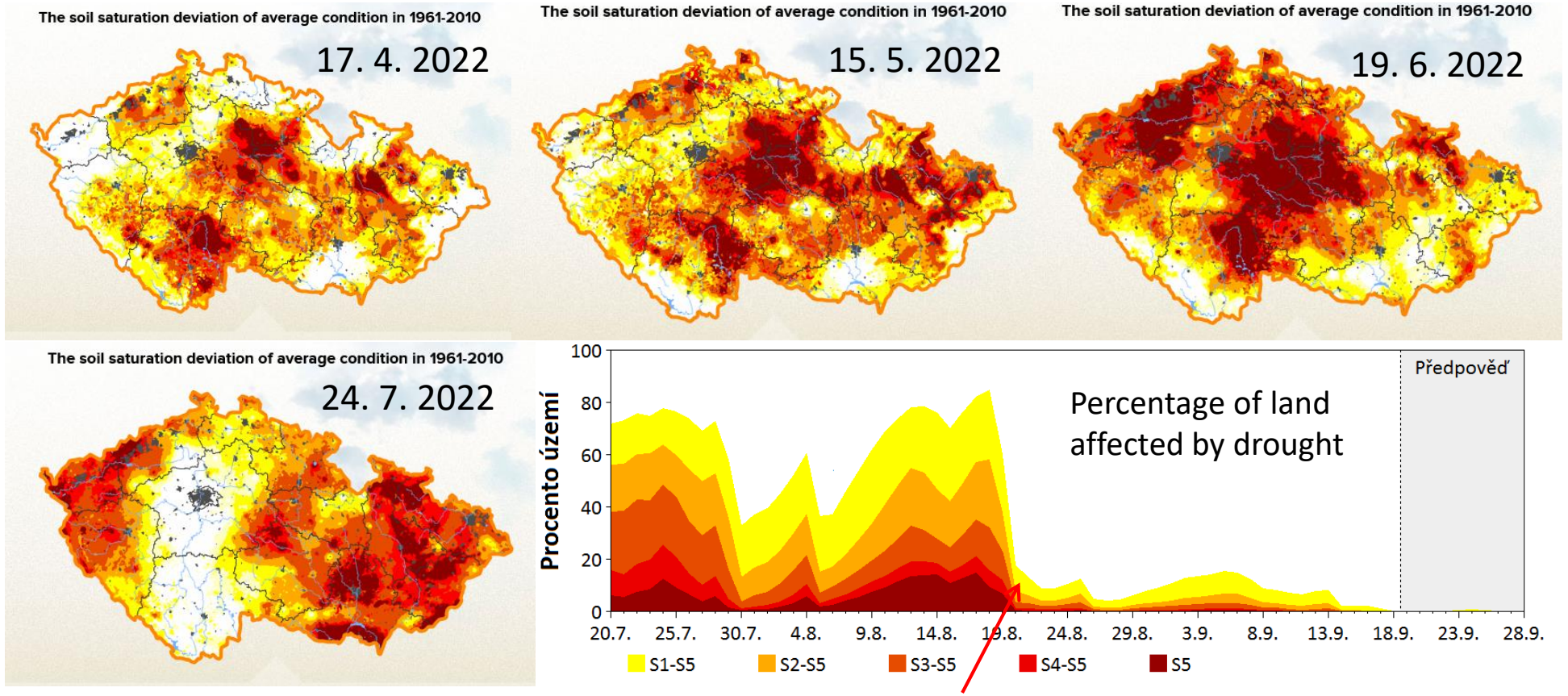
Precipitation 2021, 2022 in Czech Republic



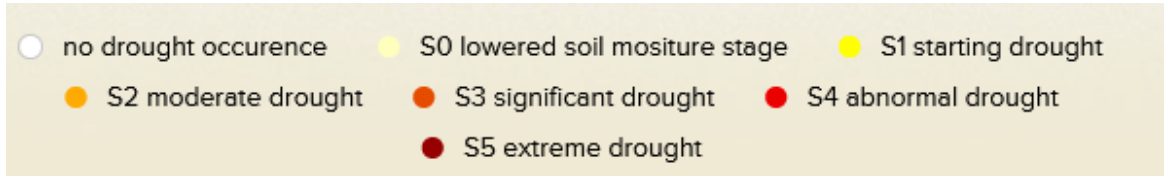




- dry end of winter and spring (II–IV)
- above normal precipitation in August – too late for forests
- summer precipitation (above all V–VII) – big differences between regions and years
- 2022 was noticeably drier than 2021

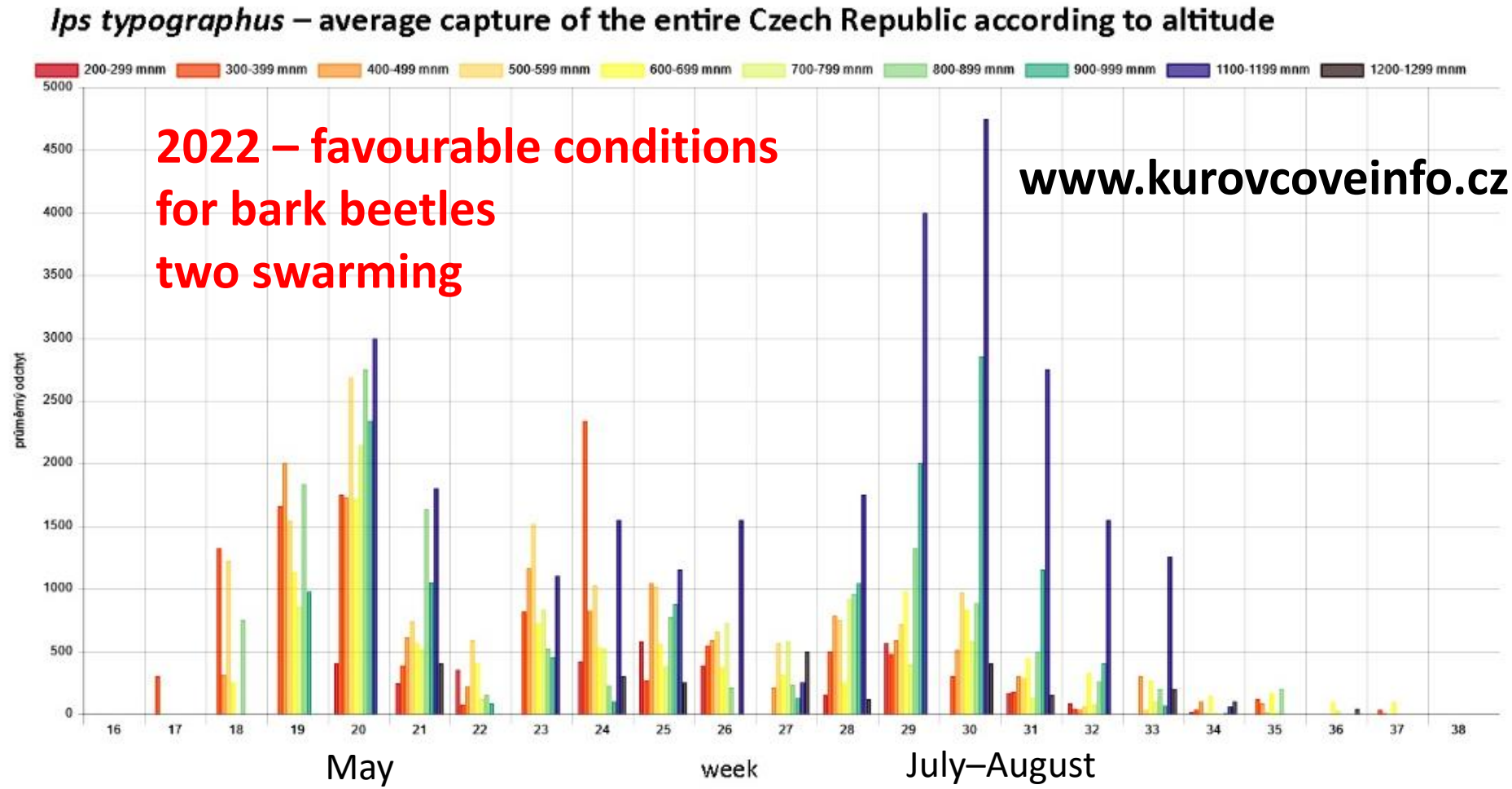


2022 – drought in a large part of the territory until August

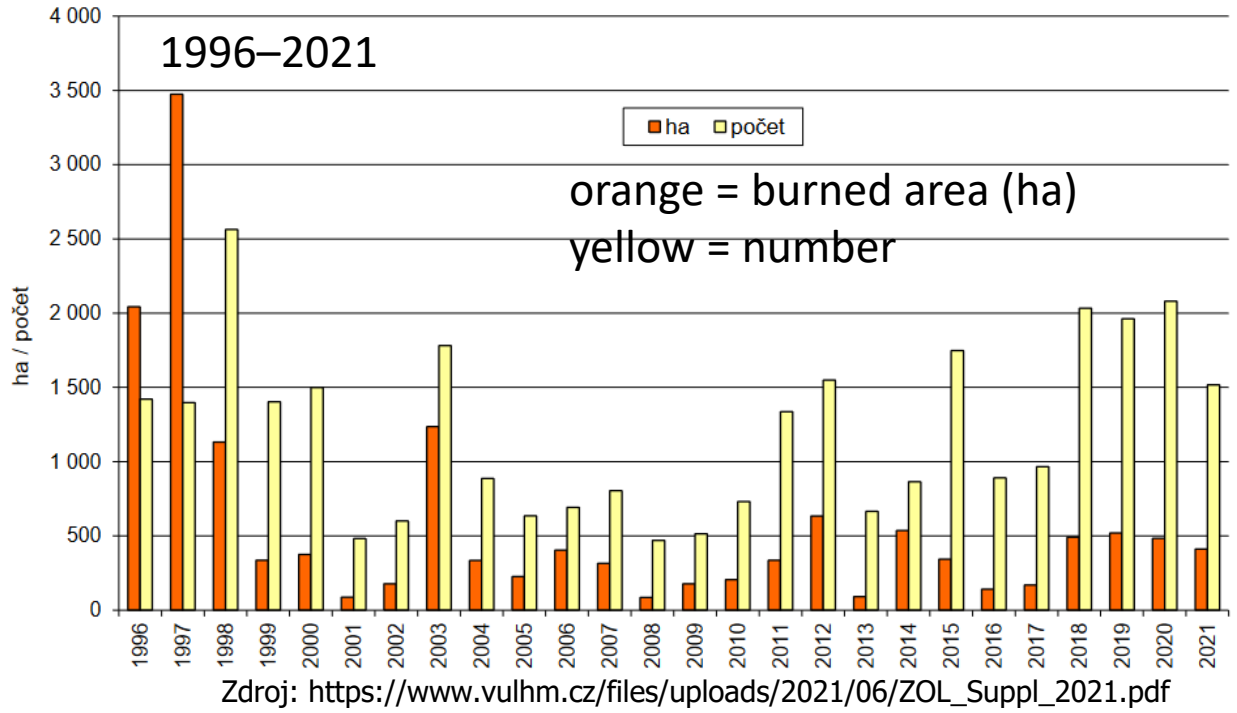


INTERSUCHO intersucho.cz

Bark beetle *Ips typographus* 2022 in Czech



Forest fires in Czech Republic



Zdroj: https://www.vulhm.cz/files/uploads/2021/06/ZOL_Suppl_2021.pdf

2022 from January to August

CR burned area: 1 436 ha

Source: EFFIS – https://effis.jrc.ec.europa.eu

The largest forest fire in the Czech Republic

National park České Švýcarsko

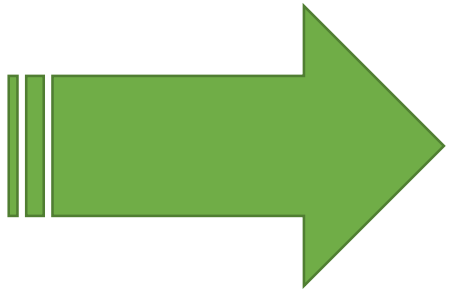
July–August 2022

The fire affected a total area of **1060 hectares**

www.hzscr.cz

- State Forests´ Company decides stop to rent hunting areas..
- 1st forest plan prepared using the control method

  (for period 2023-2032, FSE MF Křtiny)



Adaptation strategy for the forests of the Mendel University in Brno with regard to climate change

/prepared in 2021/

- **Analytical part**
  - Expected changes
  - Impacts in individual areas
    - Forestry area
    - Water management area
    - Area of research and education
    - Other non-production functions of the forest
  - Main conclusions from the survey for the public
    - Data collection and sample of respondents
    - Attitude towards FSE
  - Main conclusions from the poll for the mayors of the municipalities neighboring the FSE
    - Cooperation with FSE MF Křtiny
    - Functions of FSE MF forests and impacts of climate change
  - Starting points and main conclusions from the analytical part
    - Expected changes
    - Main threats
    - Main conclusions from the survey for the public

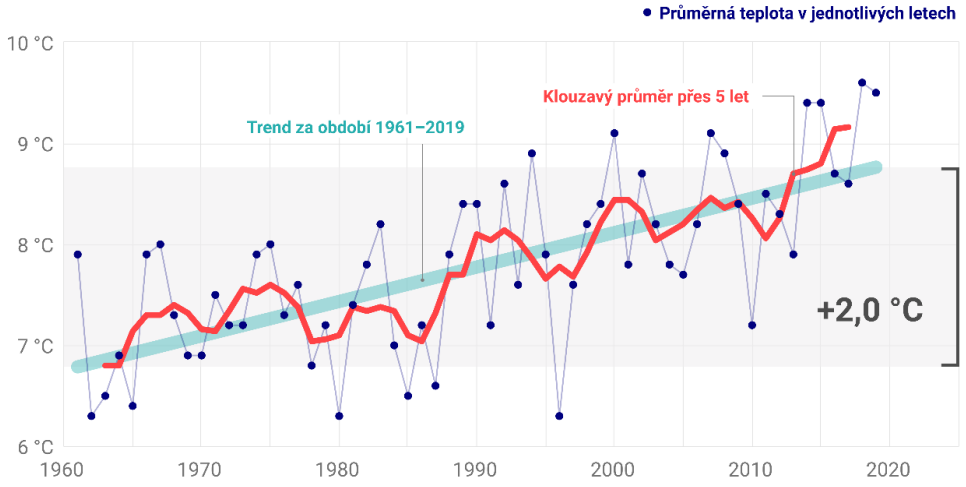
- **Design part**
  - Vision and goals
  - Adaptation strategy on the forest lands of the Mendel University in Brno
    - Vision
    - Objectives
  - Proposed adaptation measures General recommendations on identified threats
    - Proposals for adaptation measures in the area of management and care of forest stands - management framework guidelines
    - Proposals for type measures
    - Proposals for specific investment actions in the form of concept studies

- **Implementation part**
  - Setting up the management structure
    - Institutional security and management structure
  - Setting up monitoring and evaluation
    - Monitoring indicators
  - Action plan

AIR TEMPERATURE – RECENT HISTORY

PRŮMĚRNÁ ROČNÍ TEPLOTA V ČR

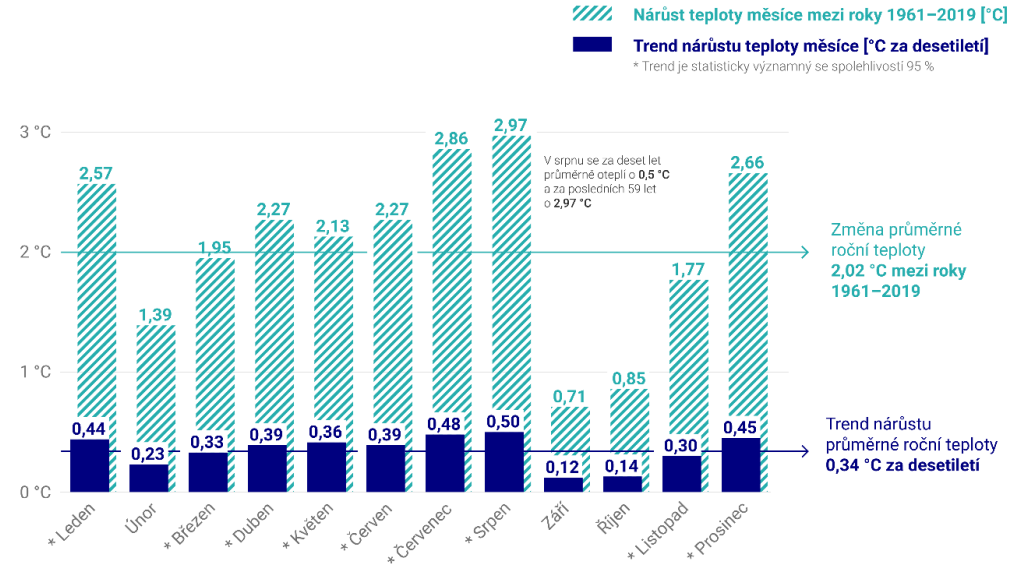
Teplota se od roku 1961 **zvýšila o 2,0 °C**.



vice info na **faktaoklimatu.cz**/teplota-cr

zdroj dat: ČHMÚ

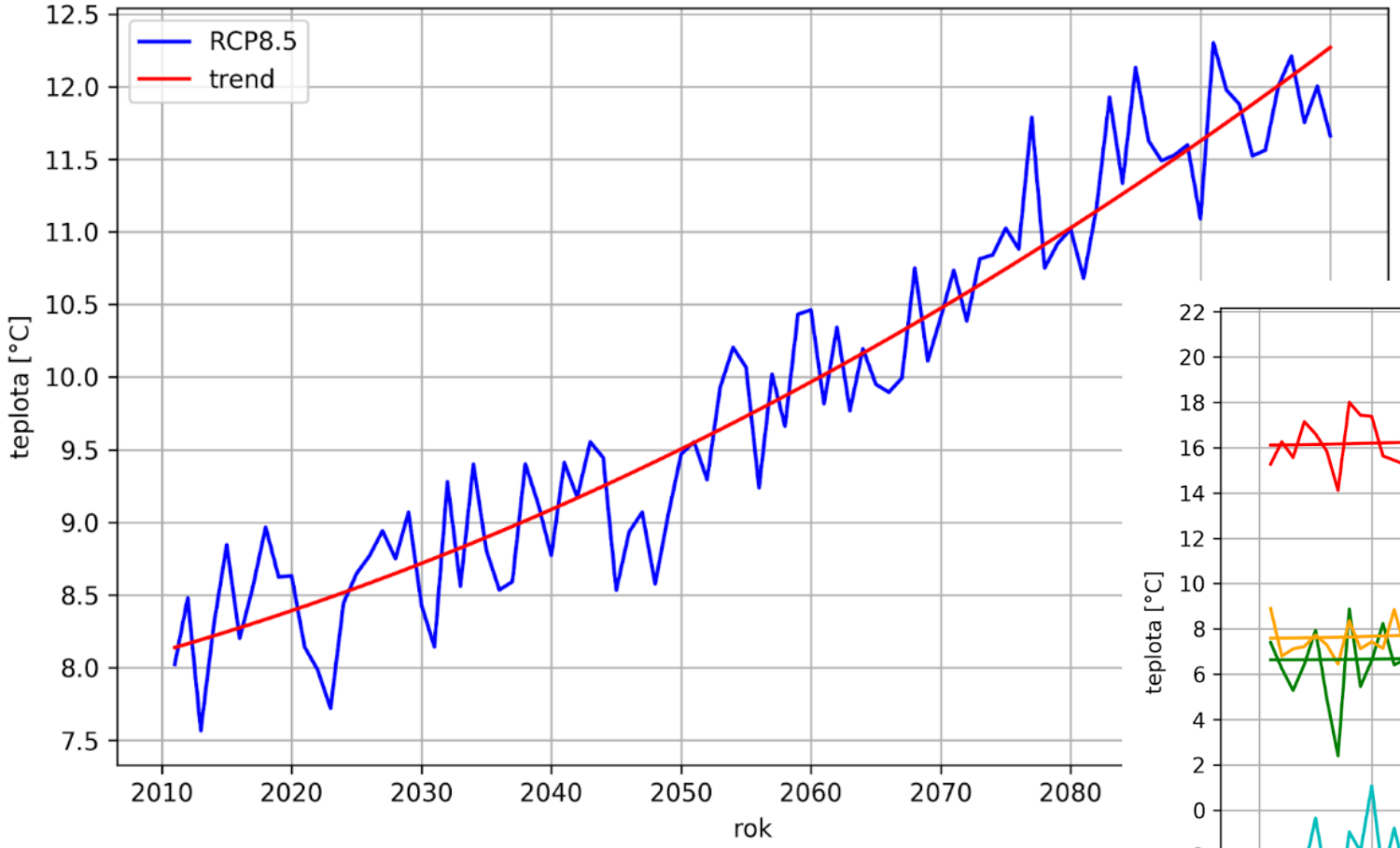
TREND NÁRŮSTU TEPLOT V ČR V JEDNOTLIVÝCH MĚSÍCÍCH

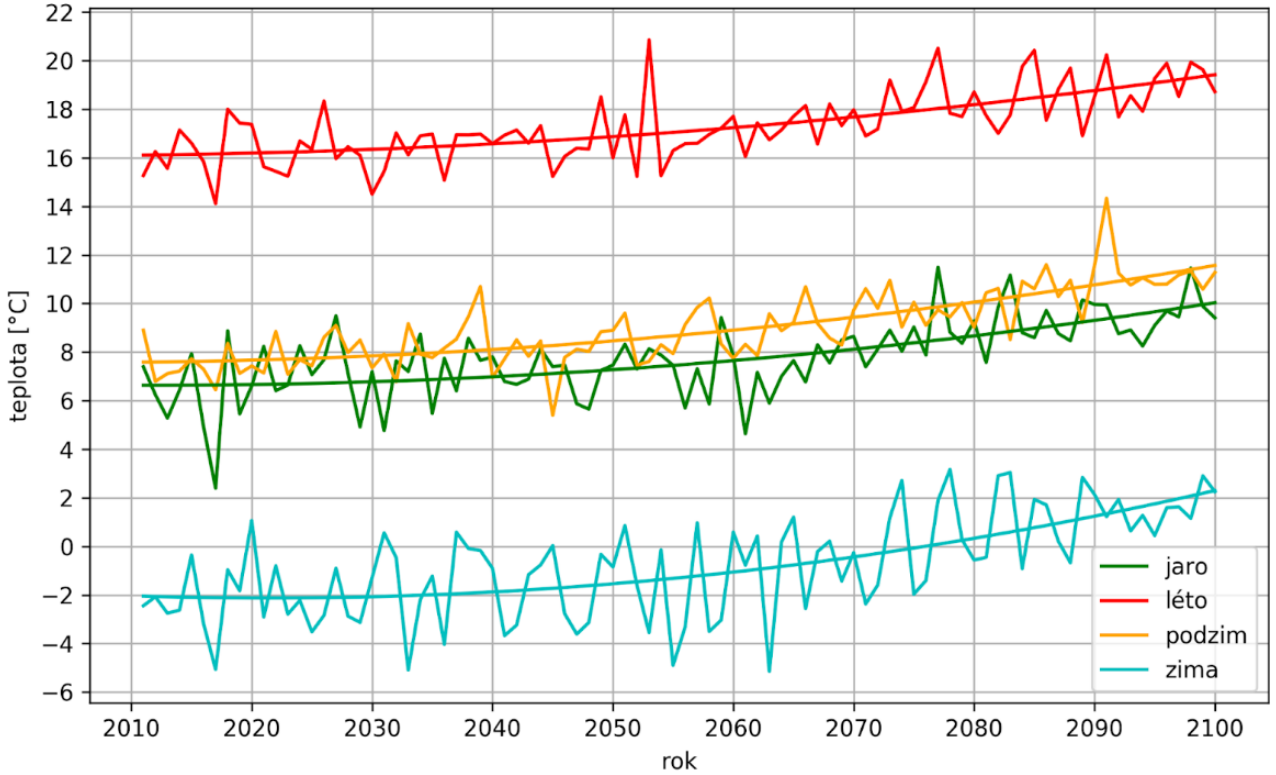


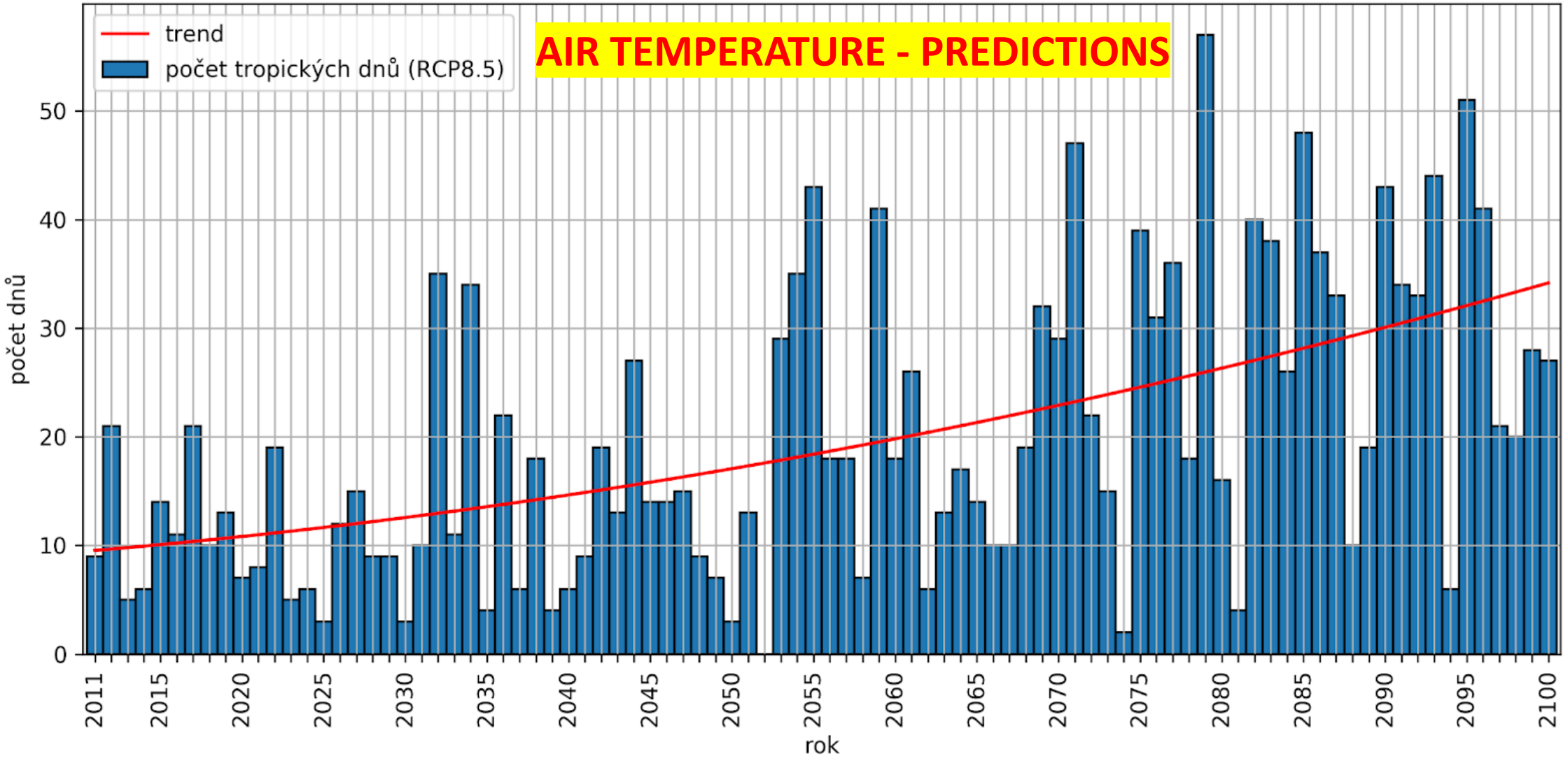
vice info na **faktaoklimatu.cz**/trend-teplot-cr

zdroj dat: ČHMÚ

AIR TEMPERATURE - PREDICTIONS

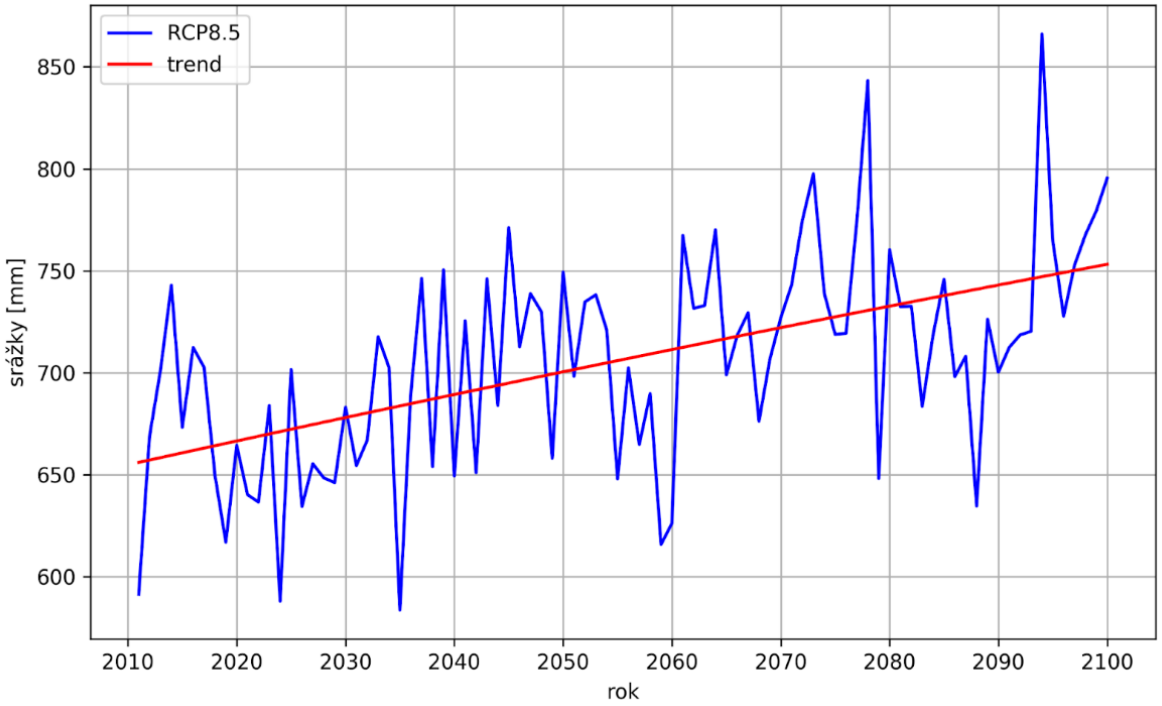


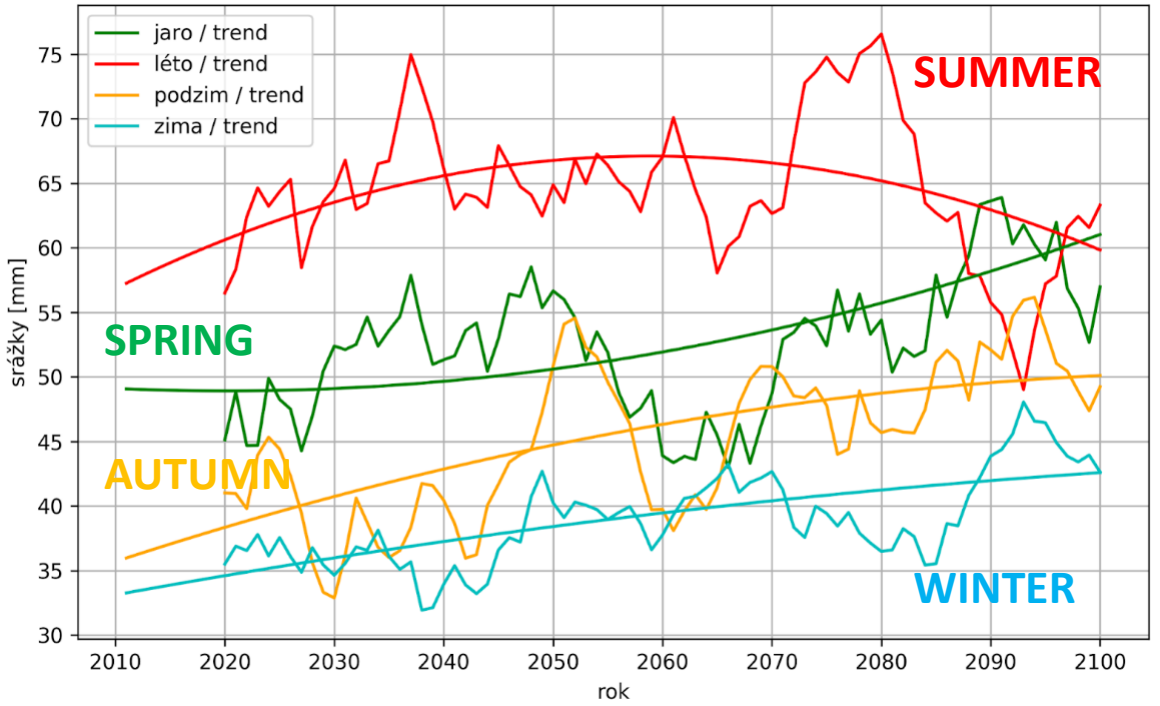




Number of tropical days in the years 2011-2100 in the FSE MF Křtiny area. Source: ASITIS, according to EURO-CORDEX (SMHI RCA4 model, RCP8.5 scenario).

PRECIPITATION - PREDICTIONS





Modeled annual and seasonal (5-year average) distribution of precipitation in the years 2011-2100 in the FSE MF Křtiny area. Source: ASITIS, according to EURO-CORDEX (ensemble, RCP8.5 scenario; SMHI RCA4 model used for seasonal distribution).

Main threats

THREAT	DESCRIPTION	PROBABILITY	SEVERITY
Drought	Higher evapotranspiration due to higher temperatures causes water deficit. Woodland can be damaged either directly by a lack of water or indirectly by an increased sensitivity to attack	5	5
Increase in the frequency of damaging winds	Wind with destructive effects on forest trees and vegetation. These can be strong steady winds, gusty winds, gusty winds, wind storms, tornadoes and tornadoes	4	5
Extreme rainfall	Extreme rainfall or torrential rain. Drops, hail or heavy snow cover can have destructive effects on vegetation. Furthermore, rapid saturation of the soil and even flooding, which leads to damage to trees, or damage to the forest infrastructure	4	2
Temperature extremes	The risk is particularly rapid temperature changes and late spring frosts, which damage reproductive organs. On the contrary, long-term heat waves can lead to damage to the leaves	3	3
Increased occurrence of pests	With rising temperatures and rising drought, the activity of camboxylophagous and leaf pests, fungi increases and there is an overpopulation of rodents. This results in the death of trees, which can take on a catastrophic form	4	5
Increased proportion of calamity areas (clear cuts) and sparse stands	They are created by salvage logging. Climatic extremes and the game browsing often make it impossible to regenerate of the vegetation, which leads to economic losses and to the loss of biodiversity	3	2

Main threats

THREAT	DESCRIPTION	PROBABILITY	SEVERITY
Acidification and nutritional degradation of forest soils	Long-term acidification of soils caused especially by emissions of sulfur oxide (rather in the past) and nitrogen oxides. Related to this is the loss of basic cations in the soil needed to nourish vegetation and the deposition of elements that are toxic to plants.	2	3
Forest fires	Drought together with high temperatures increases the risk of fires. Drying spruce stands are especially susceptible. The most common cause of fires is carelessness associated with the use of forests by tourists.	1	2
Spread of non-native, invasive and quarantine species	Invasive non-native species disturb the stability of the ecosystem. These are often competitively strong species or forest pests, which leads to a reduction in biodiversity or economic losses	3	3
Reduction in biodiversity	As a result of a change in climate conditions, species may decline or die out. It can be more rare tree species, species of forest undergrowth or non-forest species of protected areas.	4	2
Release of stored carbon into the atmosphere	A large amount of carbon is accumulated in forest stands and forest soil. With long-term management, the overall carbon balance is balanced. However, large-scale logging (calamities) can lead to its more significant release	3	3
Endangering non-productive functions of the forest	This is mainly a disturbance of the functions of the forest associated with the ecological stability of the territory, landscape design and the recreational use of forests	2	3

Expected impacts of climate change on forest:

- Reduction of the overall ecological stability of forests,
- Higher damage to forests during storms, drought, fires and the occurrence of pests and fungal infections,
- Higher need of salvage cutting,
- Significantly higher risk of forest fires,
- Spread of invasive and expansive species,
- Complete disintegration of current spruce (coniferous) stands,
- The impossibility of successful cultivation of spruce at lower altitudes on unsuitable habitats,
- Less successful forest regeneration, higher economic demands of restoration,
- Reduction or change of non-production functions of the forest.

Expected impacts of climate change on water regime:

- Spring thaw shift to earlier periods.
- Reduction of flows in streams and rivers.
- Longer retention time of water in reservoirs, which will lead to deterioration of its quality.
- Higher average annual water temperature.
- Greater potential for cyanobacteria and algae growth.
- Greater flow fluctuation.
- Seasonal drying of some streams.
- More frequent sudden increases in flow in streams
- Higher soil erosion in deforested areas due to extreme rainfall.
- Long-term depletion of groundwater.

VULNEREABILITY

The most vulnerable to drought are:

- Spruce stands at lower forest vegetation zones - almost all sites within the FSE MF Křtiny.
- Homogenous, even-aged forest stands.
- Stands managed by clear-cut management.

The most vulnerable to destructive wind are:

- stands with low tree species and spatial diversities,
- conifers, especially spruce,
- windward edges of forest, cuts,
- forests with an exceeded rotation period.

The most vulnerable stands to pests are:

- Stands suffering from drought.
- Stands in warm areas, where multiple generations of bark beetles can develop.
- Forests in the phase of regeneration (especially endangered by rodents)

Target goals

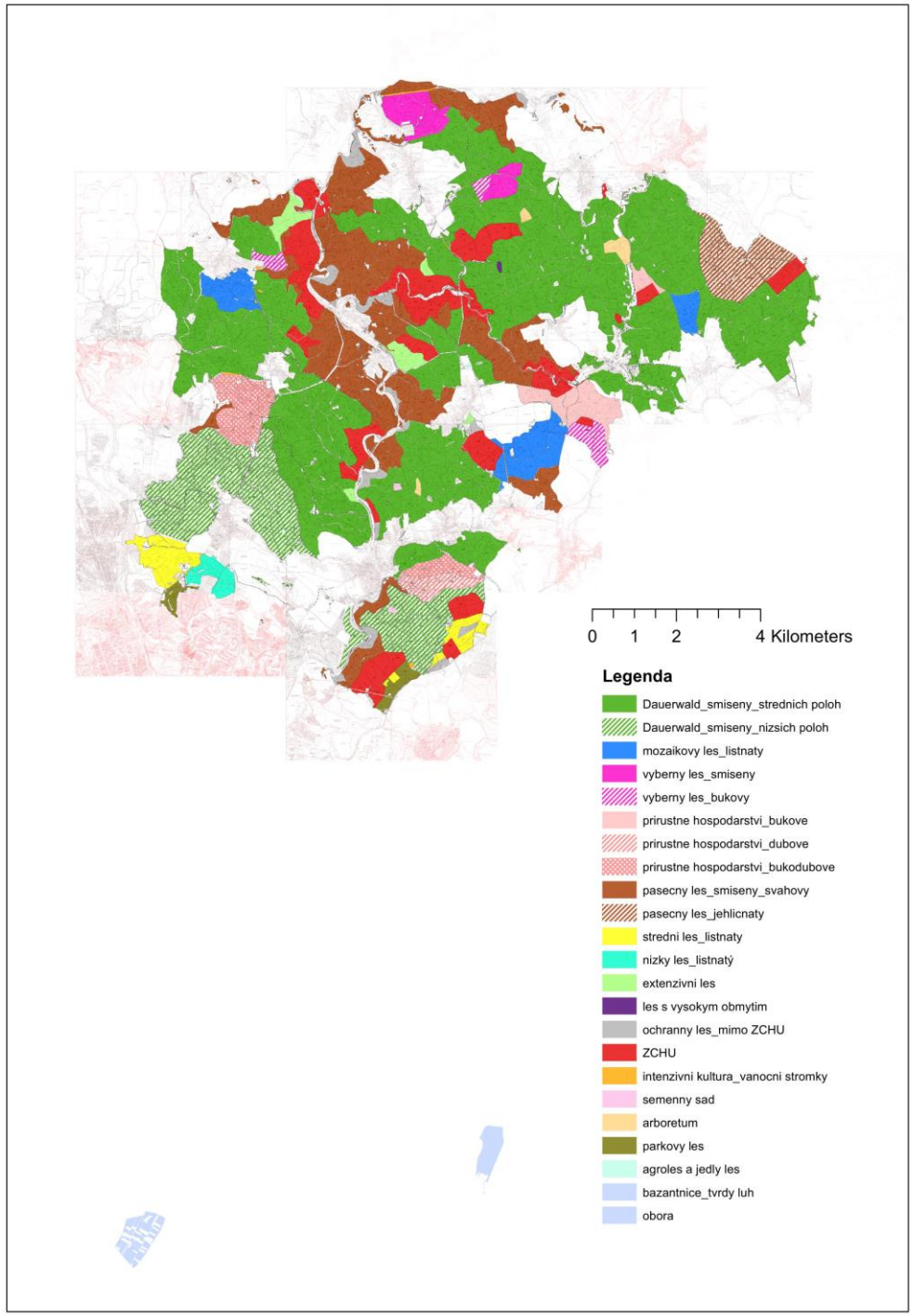
- Effective forest management in a harmony with nature, keep the ecological status of the territory
  - Increase the species diversity in forests and the ecological and static stability of stands
  - Increase the efficiency of management (reduction of costs and increase of yields) using natural processes
  - Set up a system of economic management of the forest and planning that reflects climate change
- Good water regime with an effective retention of water in the landscape
  - Management in a way that does not disturb the water regime of the landscape.
  - Active construction and maintenance of elements used to capture water in the landscape and restoration of the hydrological state that was disturbed in the past

Common recommendations

Drought	Increasing the tree species, age and spatial diversity of the tree stand composition, use of natural and vegetative regeneration, small-scale understory and non-clearcutting methods of management, adjustment of run-off conditions, leaving a higher proportion of wood for decomposition, reduction of rotation period, use of pioneer and ameliorative tree species.
Increasing frequency of strong winds	Extending regeneration periods and reducing rotation periods, limiting clear-cutting, promoting natural regeneration, creating a resistant vegetation edge-cover, early tending and support of vital trees, increasing the representation of deep-rooted tree species, non-clear-cutting methods of management.
Extreme precipitation events	Revitalization of erosion furrows, road networks and inappropriate drainage; increasing the variety of tree species, extending the regeneration period, use two-phase regeneration methos on waterlogged cler-cut areas, eliminating clear-cutting method, extraction trucks with a small slope, anti-erosion modifications of the most endangered places, modification of stream beds by placing transverse objects, leaving a higher proportion of dead wood, coppice forests, regeneration under the mother forest.
Temperature extremes	Exclusion of clear-cutting, non-clear-cutting method of management, prioritization of habitat-suitable species and species with a large temperature valence, reduction of rotation period, increase of species, age and spatial variability.
Increased incidence of pests	Monitoring, prevention, timely search and sanitation of attacked trees, increase of species, age and spatial variability of the forest, development of the use of predators and parasitoids and support of natural enemies, reduction of rotation period, greater use of selections and successional tree species, restriction of the cultivation of unsuitable tree species in unfavorable sites.

Increased proportion of calamity clear-cut areas and thinned stands	Increasing the stability of stands by intensive targeted tending, creating rich-structured stands with a suitable stand edge, using two-phase and simultaneous natural forest regeneration, early thinning interventions, adequate reduction of unwanted competing vegetation, elimination of tree damage during logging and wood transport, achieving tolerable level of game population.
Acidification and nutritional degradation of forest soils.	Optimization of the road network, anti-erosion measures and culverts, limitation of clear-cutting management, exclusion of clear-cutts, anti-erosion dikes, protective reservoirs, prioritization of deciduous and mixed forests, increase of species, age and spatial variability of the forest.
Forest fires	Cooperation with Integrated Rescue System (IRS) units, prioritizing tree species with lower moisture requirements, increasing the stability of stands through intensive targeted tending, rapid processing of harvested wood in disaster situations.
Spread of non-native, invasive and quarantine species	Consistent monitoring and inventory of species, targeted elimination of invasive species, increasing the species diversity of tree species, non-clear-cutting management system and the use of management approaches that support ecological stability, consistent application of care plans for protected areas, use of the method of suppressing expansive plants using semi-parasitic species.
Reduction of biodiversity	Establishment and consistent observance of no-intervention zones on naturally valuable areas, consistent observance of conservation plans for protected areas, use of rarer species of trees, rich species, age and spatial structure of stands, non-clear-cutting method of management, achievement of tolerable levels of game population
Release of stored carbon into the atmosphere	Consistent regeneration of clear-cut areas, non-clear-cutting method of management, keeping part of forests in high to virgin forest age, afforestation of non-forest lands, support of the stability of forest ecosystems, increase of species, age and spatial variability of forests.
Endangering non-production functions of the forest	Support of rich structured, species-diverse forests, the use of wood species corresponding to local conditions, ensuring the permeability of the territory and the safety of tourists when moving via roads and tourist routes.

The proposed changes in the forest management, which have the potential to increase resistance to climate change, consist in changing the stand structure, or in the overall change of previous approaches or management models.



Forest Management Plan 2023–2032 is under preparation.
The guidelines have been created for the following economic groups:

- 44d Special purpose management in the Dauerwald model of middle elevations
- 44f Special purpose management in the Dauerwald model of middle elevations in the gene base
- 24d Special purpose management in the Dauerwald model of lower elevations
- 44d Special purpose management in the mosaic forest model
- 44d Special purpose management in the selective forest model
- 44f Special purpose management in the model of selected forest in the gene base
- 24d Special purpose management in the increment model
- 40d Special purpose management in the clear-cut forest model
- 40f Special purpose management in the model of clear-cut forest in the gene base
- 24d Special purpose management model in coppice with standards
- 24d Special purpose management model in coppice with seed trees
- 44d Special purpose management model in the forest with high rotation period
- 40d Special purpose management model in the extensive forest
- 01 Protective forests in extremely unfavorable habitats
- 01 Protection forests in extremely unfavorable habitats in the territory of the Special Protected Areas
- 44 Special purpose management on the territory of the Special Protected Areas
- 24d Special purpose management in the park forest model
- 18g Special purpose management model in pheasantery – hard-wood floodplain forest
- 18g Special purpose management in the game-enclosure

Management framework guidelines

FMU FSE MF Křtiny

Označení hospodářské skupiny:					(ha) Výměra (%)	
44d_1	SPECIAL PURPOSE MANAGEMENT IN THE DAUERWALD MODEL OF MIDDLE ELEVATIONS				4 158	42,2
Forest category	les zvláštního určení – sloužící lesnickému výzkumu a lesnické výuce (§ 8, odst. 2, písm. d) zákona č. 289/1995 Sb.)					
Basic MU:	44	Základní PCHS:	44 a,b,c	Základní SLT (LT):	3-4 S, B, H, D, W	
Natural forest area	30 – Drahanská vrchovina			Maximální podíl GND:	dle PLO a CHS	
Current forest types		Forest form :		Minimální počty sadebního materiálu:		
spruce, beech, mixed		High forest		dle Přílohy č.6 k vyhlášce č.139/2004 Sb.		
Target tree species composition	BK4, DBZ2, JD1, MD1, SM1, DG1, BO, KL, JS, LP, JL, TR, HB					
Basic management recommendation						
Clear-cut size :	Clear-cut width:	Time of forest establish-ment after clear-cut	Minimum share of ameliorative tree sp. :	Soil-improving and soil-binding tree sp.		
up to 0.1 ha (in spec. reasonable case up to 0.3 ha)	up to 1x AFH	max. 5+7 years	dle Přílohy č.2 k vyhlášce č.298/2018 Sb.	dle Přílohy č.2 k vyhlášce č.298/2018 Sb.		

Interreg Austria-Czech Republic
European Regional Development Fund

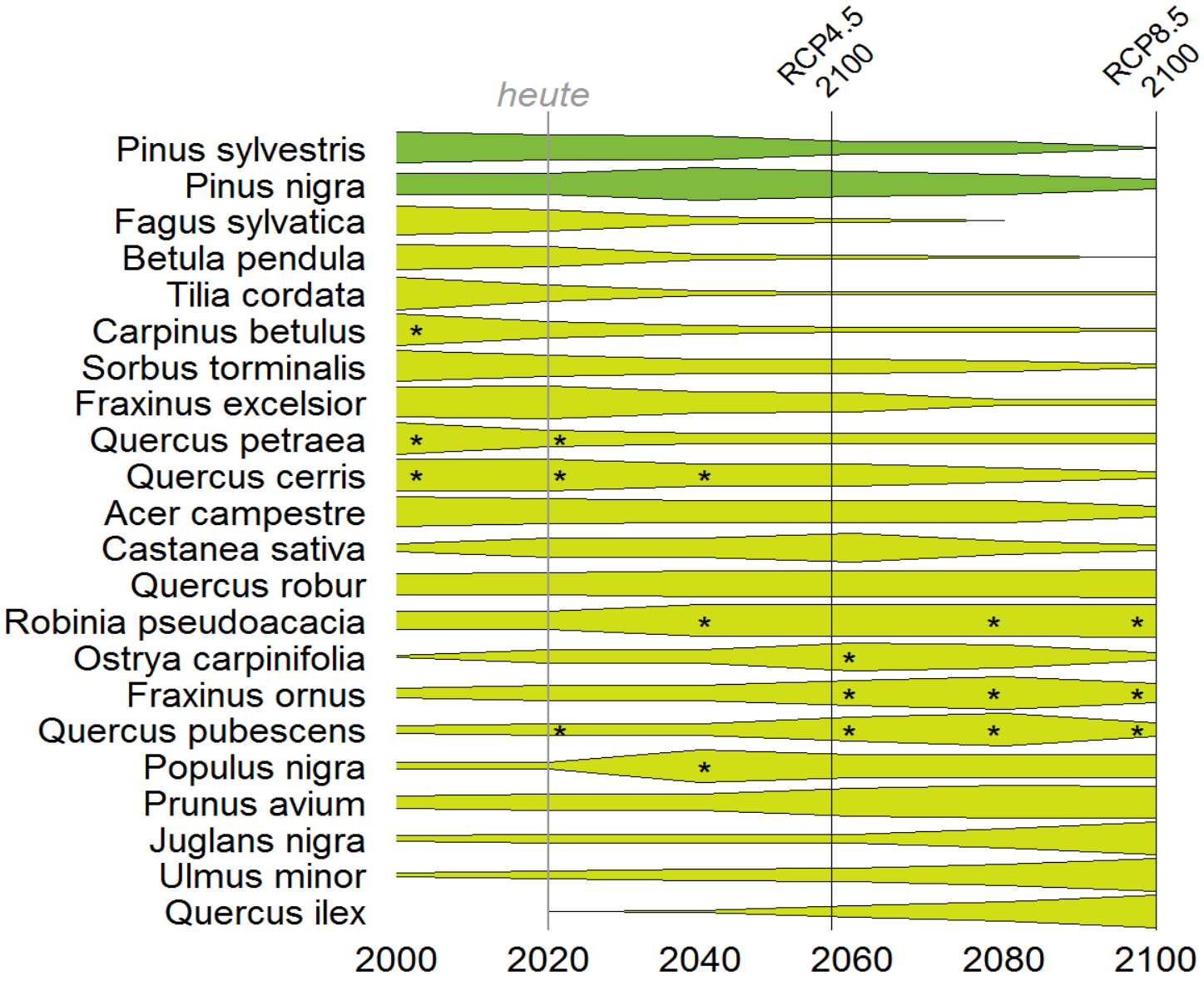
EUROPEAN UNION

BOKU

Mendel University in Brno

Federal Institute of Agricultural Economics, Rural and Mountain Research

Forest type	SPRUCE (in transformation)		BEECH / MIXED (in transformation)		MIXED with RICH STRUCTURE and TEXTURE (target)	
Management unit	441d		446d		447d	
Main management recommendation	*Obmýtí*	*Obnovní doba*	*Obmýtí*	*Obnovní doba*	*Obmýtí*	*Obnovní doba*
	80	30	(100)	(40)	(90)	(60)
	Počátek obnovy	*Hospodářský způsob*	*Počátek obnovy*	*Hospodářský způsob*	*Počátek obnovy*	*Hospodářský způsob*
	61		(81)		(61)	
Alt. cílová druhová skladba						
Management goal	Stability, quality in part, transformation of the species composition and transfer to the target state.		Quality (grading the value increment on the best quality trees) and stability, conversion to the target state.		Quality and stability, mixed, forest stands differentiated in stem diameter, height and age, with a continuous canopy and a balanced stand stock (around 300 m3/ha).	



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Austria-Czech Republic
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Tree species suitability for 2100 according to two different scenarios rcp4.5 and rcp8.5 for South Moravia region (CZ; source: T. Mette et al. LWF, 2021, see ASFORCLIC project).

Discover more
www.at-cz.eu/forrisk