



INTEGRATED FORESTRY-ECOLOGICAL RESEARCH OF RARE MOUNTAIN FORESTS IN THE TATRA MOUNTAINS

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Consequences of Bark beetle calamity in Central Europe, June 20th – 23th 2022, Jihlava

FORESTS' FUTURE 2022



Unique *Pinus cembra* forests in the High Tatra Mts.



Recovery of forest 16 years after windthrow disaster Area after processing of calamity wood



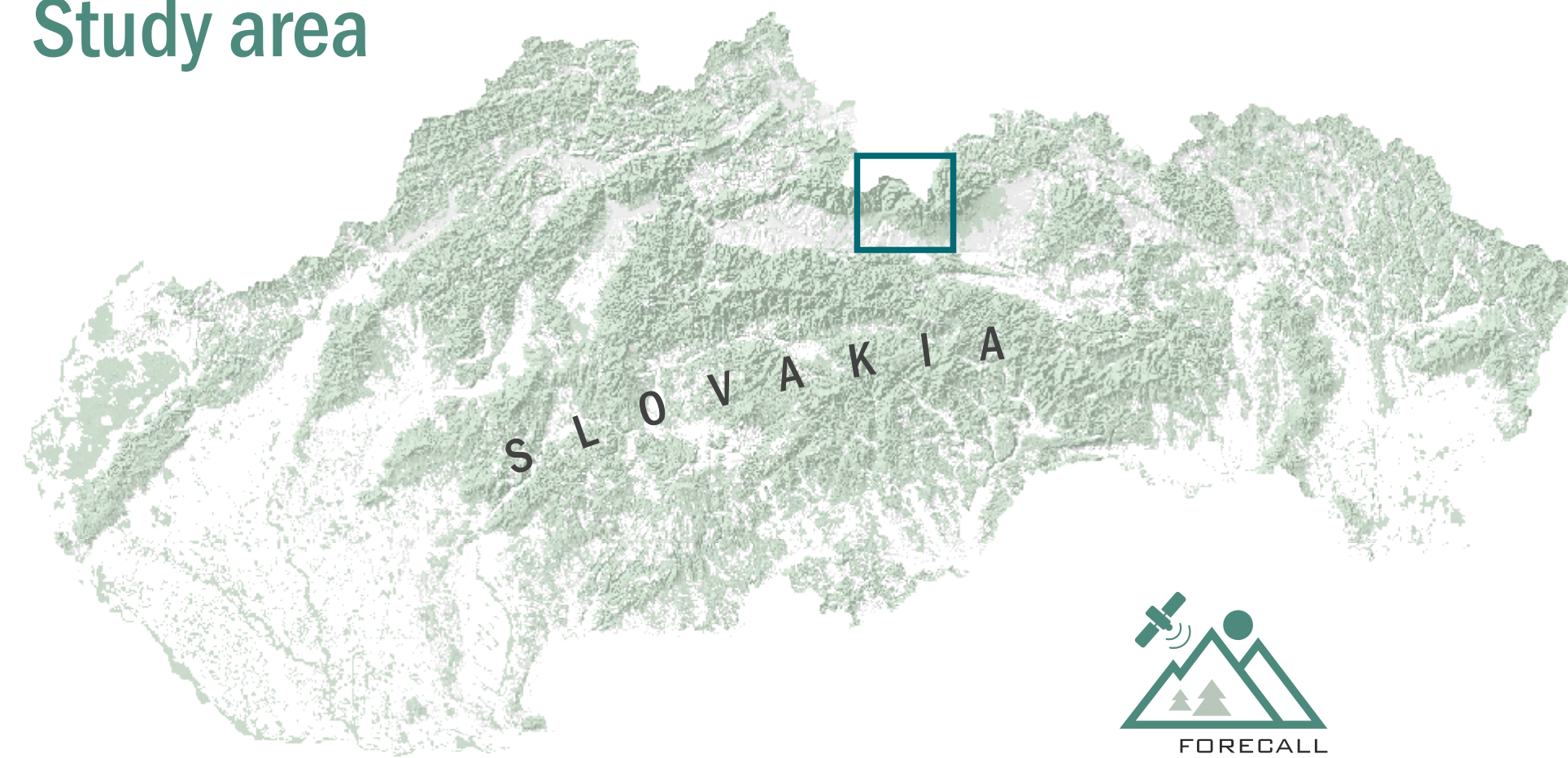
Author of the photographs: Zuzana Sitková, Luboš Frič

The poster focuses on the new research project titled “Integrated forestry-ecological research of rare mountain forests in the Tatra Mts.” (acronym FORECALL), that is implemented at the National Forest Centre in Zvolen (NFC) during the period from 2021 to 2024. The main objective of the project is to comprehensively assess the temporal and spatial dynamics of changes in unique montane forest ecosystems of the Tatra Mts., and to analyze the effects of climate change factors and development of forests after large-scale windthrow disaster and bark beetle outbreak on water regime, surface destruction, carbon balance, biodiversity, tree growth and forest regeneration. The ambition is to establish a basis for comprehensive ecological-nature conservation forestry research and to obtain scientifically based arguments that would contribute to better harmonization of forest management and nature protection.

The partial objectives:

- to analyse long-term development of forests in the territory concerned on the basis of remote sensing data sources with different detailed temporal and spatial resolution (satellite scenes, aerial photographs – LiDAR and multispectral – aerial and terrestrial); **Activity 1**
- to analyse the impact of the gradual post-disaster decline of forests and climate change on the water regime and degradation processes of surfaces and soil in the selected part of study area; **Activity 2**
- to map and evaluate temporal changes in carbon stock balance in the north part of High Tatra Mts.; **Activity 3**
- to assess the dynamics of the post-disturbance development of mountain forests and to map changes in the growth of forest trees, in the biodiversity of species and changes in other site indicators based on precise terrestrial measurements at minimum interval of 20 years and in view of the ongoing climate change; **Activity 4**
- to implement and compare development of artificial and natural regeneration in relation to climate factors and the intensity of forest interventions **Activity 5**

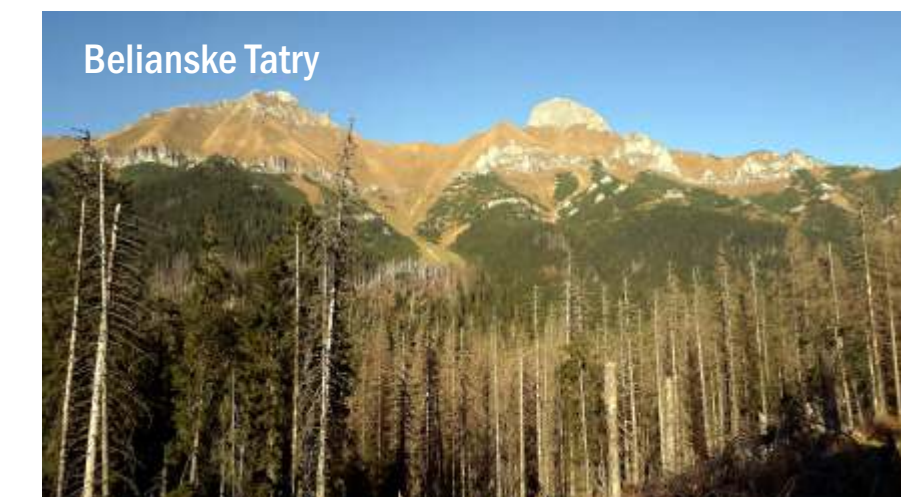
Study area



Tatra National Park

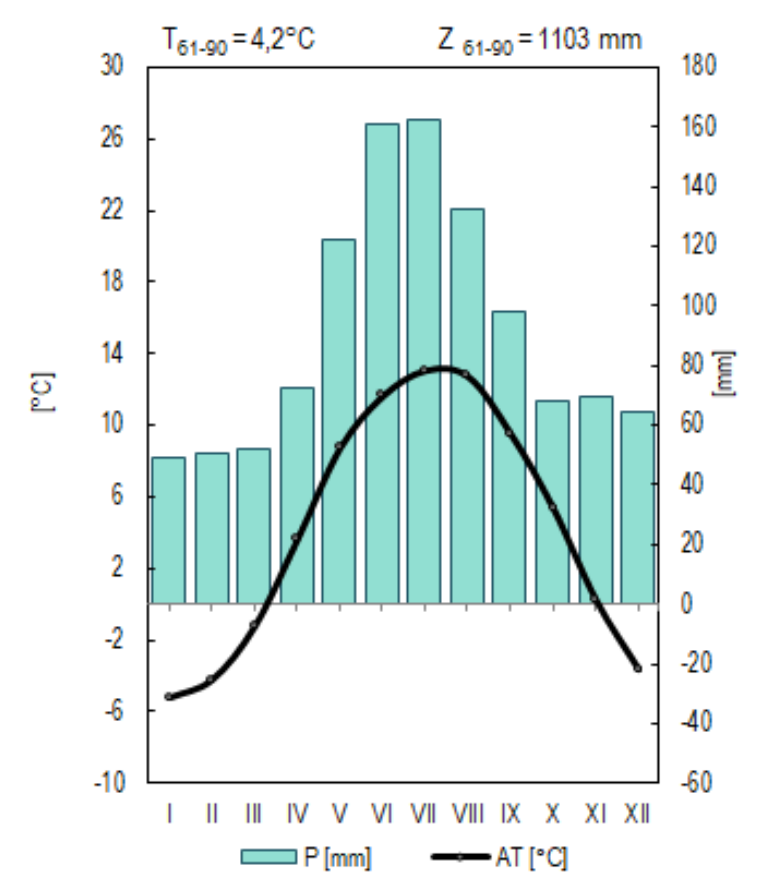
High Tatra Mountains

Eastern Tatra Mountains



Climate diagram

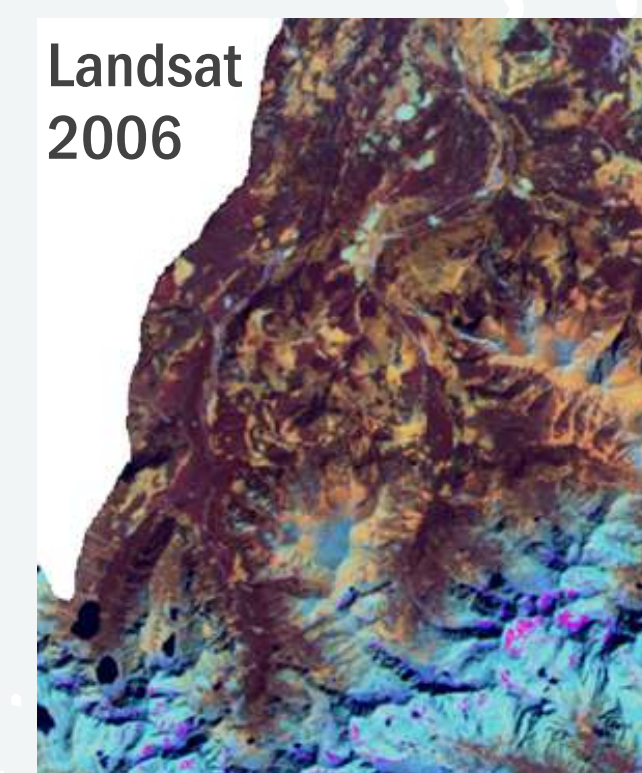
Weather station: Tatranska Javorina 1013 m asl



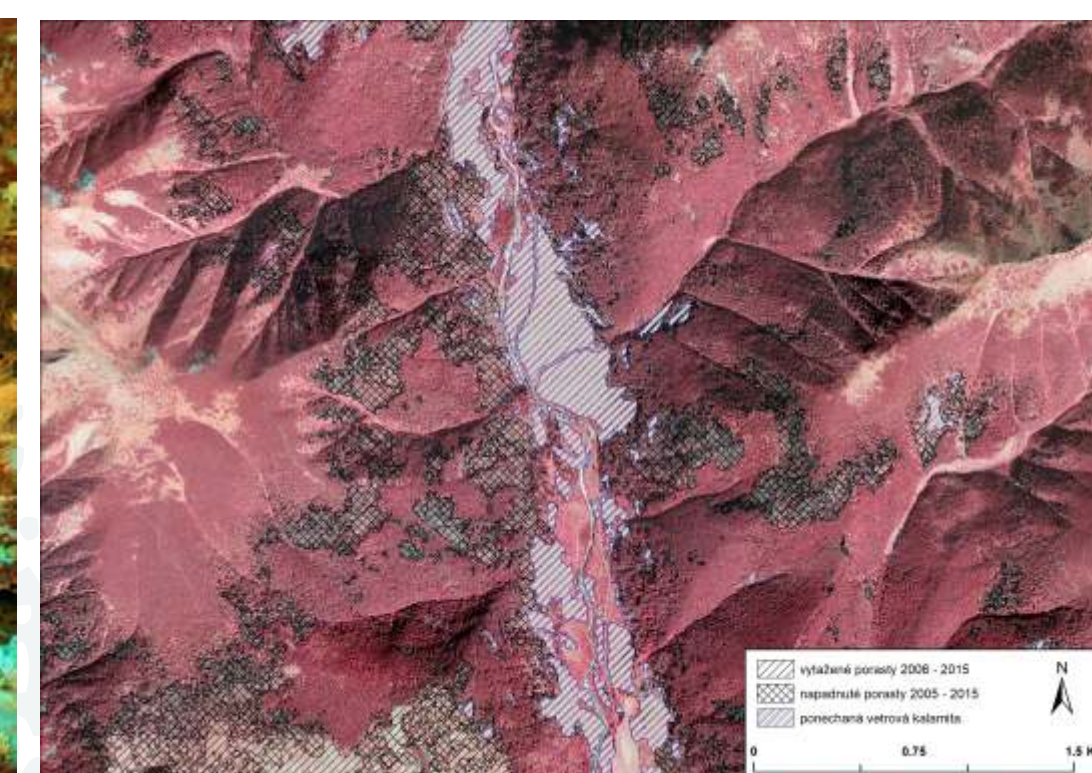
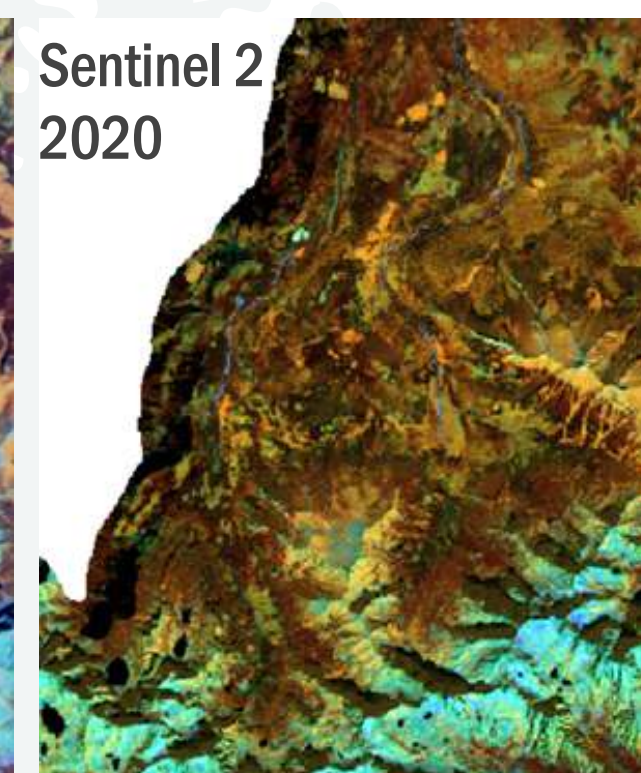
Activity 1 • REMOTE SENSING

Using of the various remote sensing data (satellite and aerial imagery, LiDAR) for assessment of the post-disturbance forest dynamics (decline and recovery) and for detailed mapping of destructive processes in study area (destruction of forest paths, streams and landslides after torrential rainfall).

Landsat 2006

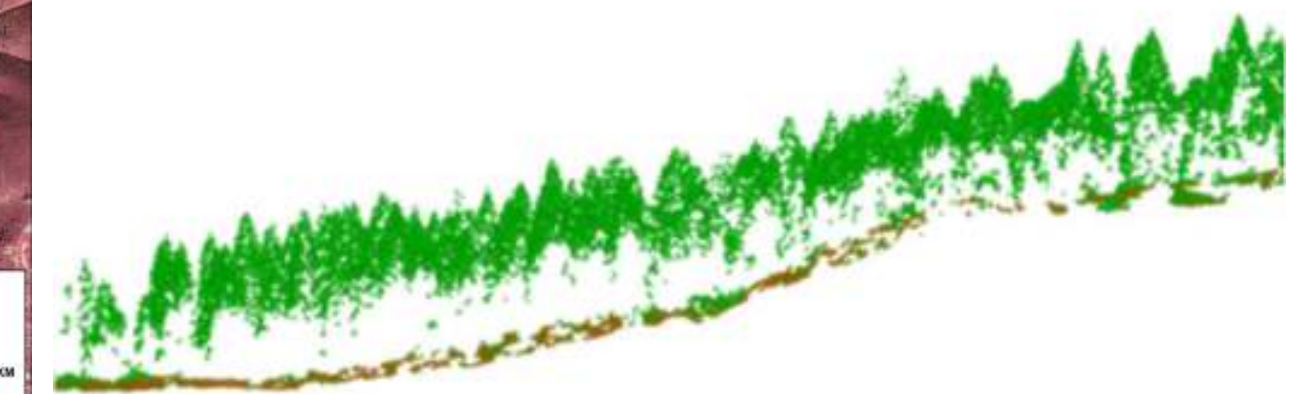


Sentinel 2 2020



Forests after windthrow and bark beetle disaster

Aerial photo – 20 cm resolution



Aerial LiDAR data – 2D

Activity 2 • WATER REGIME, DESTRUCTION PROCESSES

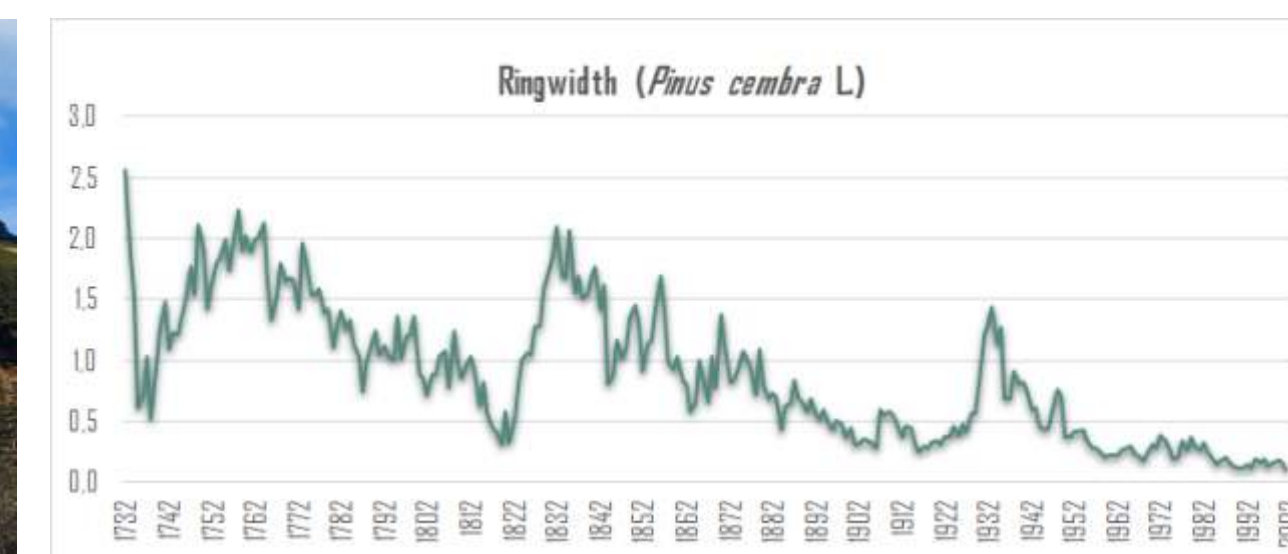
Terrestrial research and analysis of long-term climate and hydrological data to demonstrate the degree of influence of gradual decline of forests and factors of climate change on water balance and soil degradation processes (landslides, erosion). Besides, the meteorological variables will be measured using automatic weather stations located in study area.

Activity 3 • CARBON BALANCE

Calculation and analysis of the changes in carbon stocks in the living biomass based on the gains and losses of wood mass between the years 2007 and 2017. The data on forest management plans and forest evedency will be used as input.

Activity 4 • MOUNTAIN FORESTS

Assessment of the post-disaster dynamics and development of rare mountain forests based on the repeating of dendrometric measurements of 836 trees after 20 years (using FieldMap technology). Repeated dendrochronological analysis should reveal the relationship between the growth dynamics of mountain forests, natural disturbances and the rapidly changing climatic conditions and extremes that have been recorded in recent decades (drought, heat waves).



Activity 5 • FOREST REGENERATION

Measurements of dendrometric characteristics in young forest stands (Norway spruce, Silver fir, Sycamor maple) established by a combination of artificial and natural regeneration. Increments will be evaluated in relation to climate and to the intensity of forest intervention (thinning cutting). For continuous measurements of seasonal growth of young trees the automatic dendrometers will be used.

Acknowledgement

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