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WP7. Enhancing REFOCuS results
7.5 Forest Health Risk Maps of projected threat impacts

Output 7.1: Forest Health Risk Maps

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Introduction

Riparian forests in Europe are under threat of climate change and consequently increasingly damaged by biotic threats. Especially insect outbreaks,diseases and invasive alien species are seen as the most problematic threats in the coming century. In order to anticipate to these threats, risk maps are an important tool for forest management. Risk maps show the locations where there is a higher risk of damage or abundance by certain biotic threats. This output shows the risk map for leaf damage by insects and fungi and abundance of alien species in the Mura-Drava-Danube Transboundary Biosphere Reserve.

Methods

The risk maps are based on models of site, climate and silvicultural characteristics for the biotic threats leaf damage caused by insects and fungi and the abundance of alien species.

Risk simulations were conducted based on climate indices from the ECLIPS2.0 dataset (Chakraborty et al. 2020) derived from regional climate model projections (Max Planck Institute; RCM MPI-CSC-REMO2009) based on the RCP8.5 scenario (Moss et al. 2008). Values are calculated separately for each sample point for alien plant abundance, fungi-induced defoliation and insect-induced defoliation for the present and a future time span (2040-2060). The resulting values were transformed into logarithmic expressions and consequently interpolated for the study region (Fig. 1-6).

We created the maps in QGIS software using an inverse-distance-weighting (IDW) interpolation method on a pixel size of 1000x1000 meters. The IDW-technique rates the influence (weight) of the closest observational points on unknown points according to their distance to one another. The closer a prediction location, the higher are the weights of its values to the unknown points. Hence, weights diminish as a function of distance.

Riskmaps

The maps showing damage due to insects and fungi (Fig. 1-4) represent percentages on a common logarithmic scale with a base of 10 ranging from -2 to 2. This means that a log-value of -1 is equal to a percentage of 0.1%, a logvalue of 0 is 1%, a log-value of 1 equals to 10% and 2 equals to 100%. Low defoliation is shown in blue, high defoliation is represented by a bright red colour.

The maps showing alien plant abundance (Fig 4 and 5) are also shown in a common logarithmic scale but represent abundance units varying from -2 to 3. As they do not show percentages they can accelerate values of 100 up to 1000. Log-values of 3 mean abundance values of 1000 plant units. Low plant abundance is shown in blue, very high abundance is represented by a dark red colour.Insect leaf damage2021

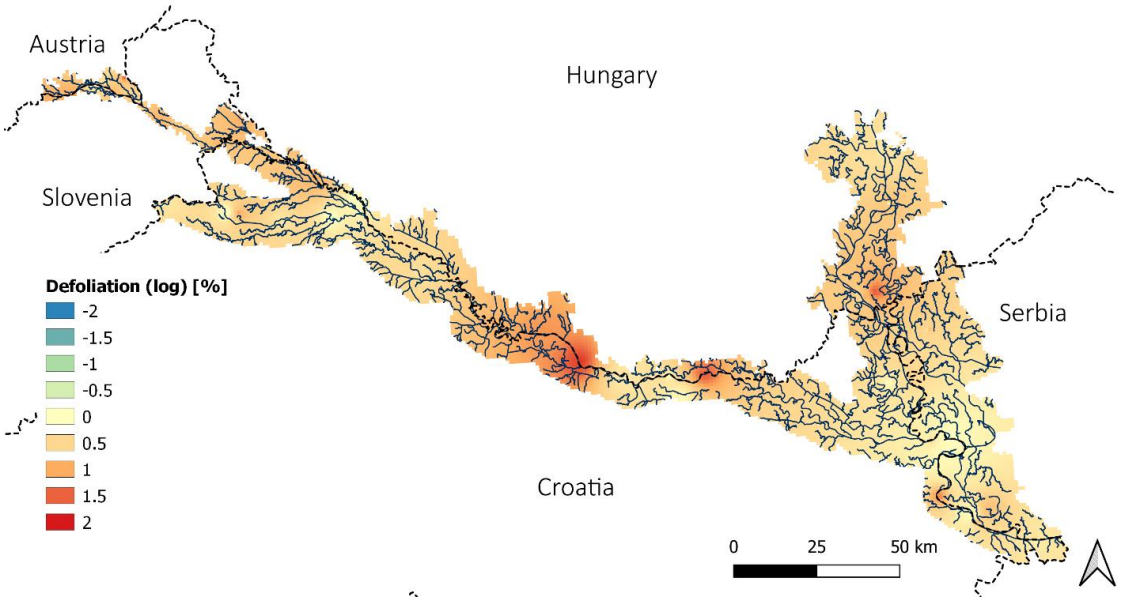

Figure 1: Risk map of leaf damage induced by insects in 2021 with the simulation according to the RCP8.5 scenario (modeled using RCM MPI-CSC-Remo2009).

2041-2060

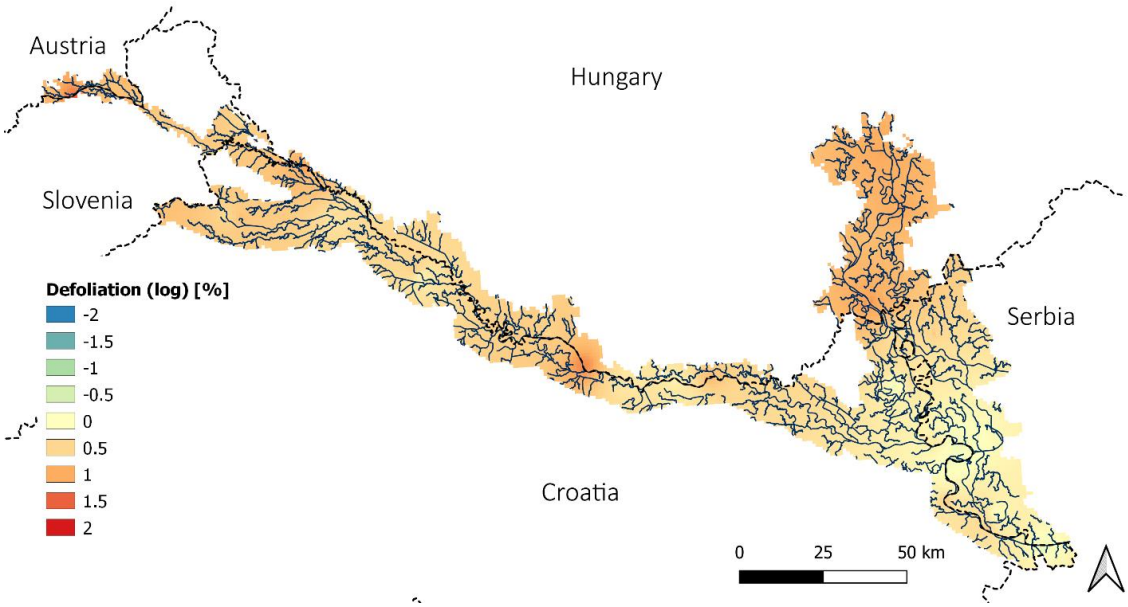

Figure 2: Risk map of the leaf damage induced by insects for the period 2041-2060 with the simulation according to the RCP8.5 scenario (modeled using RCM MPI-CSC-Remo2009).

Fungi leaf damage

2019

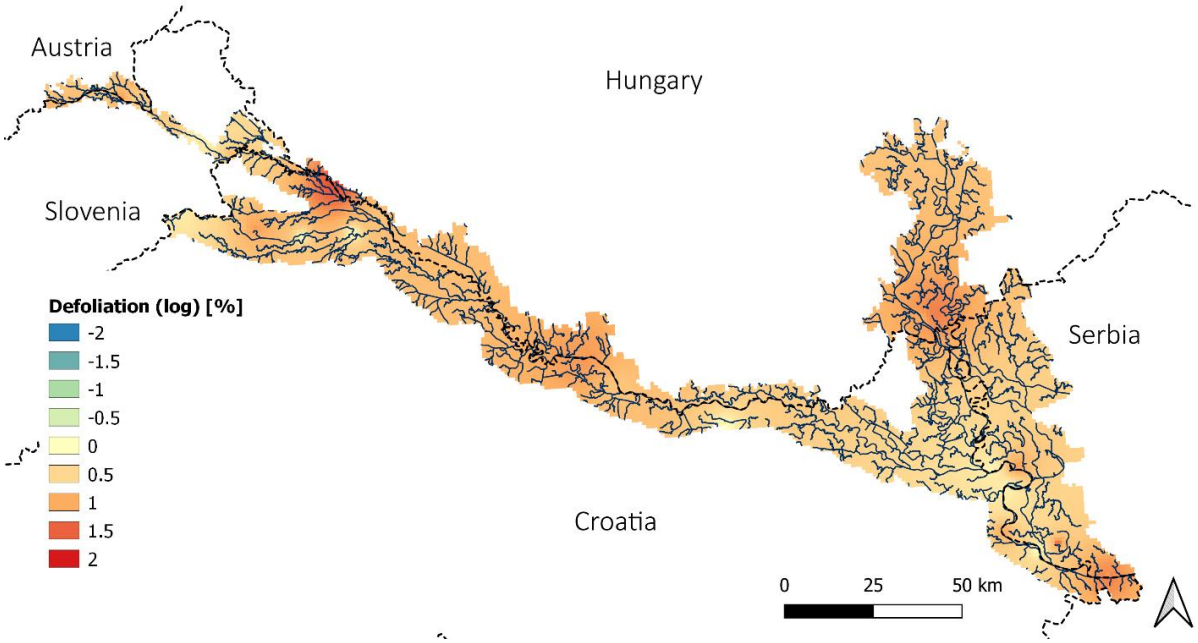

Figure 3: Risk map of leaf damage induced by fungi in 2021 with the simulation according to the RCP8.5 scenario (modeled using RCM MPI-CSC-Remo2009).

2041-2060

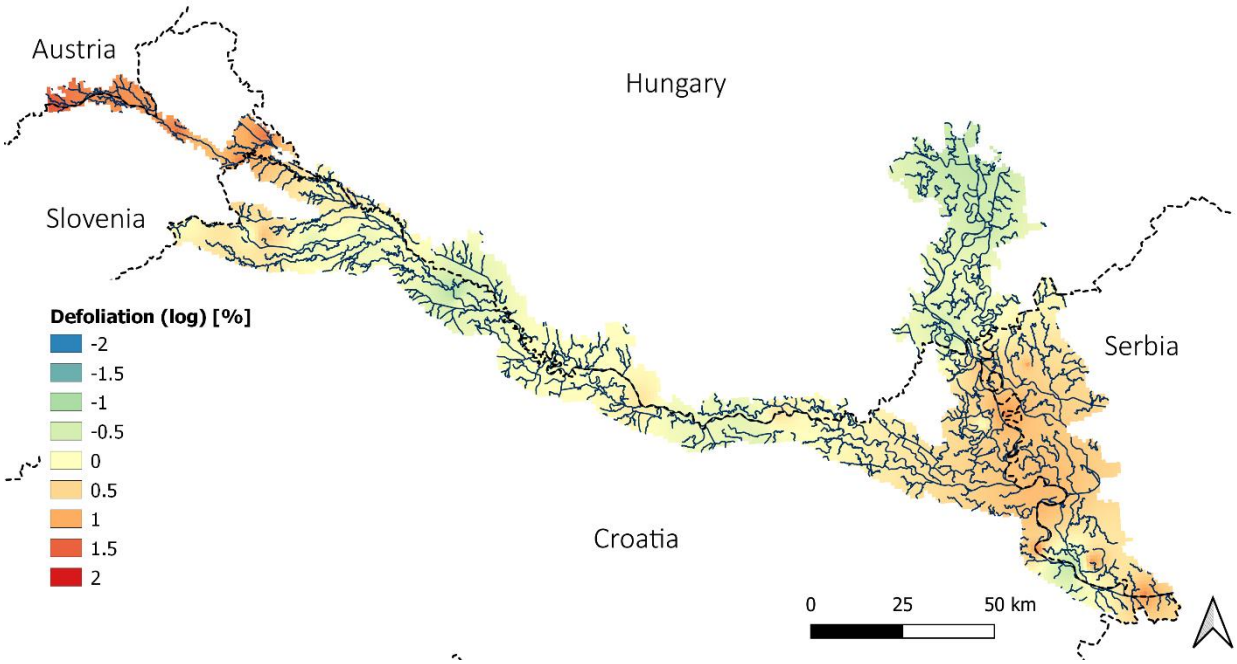

Figure 4: Risk map of leaf damage induced by fungi for the period 2041-2060 with the simulation with the simulation according to the RCP8.5 scenario (modeled using RCM MPI-CSC-Remo2009).

Alien plant species

2019

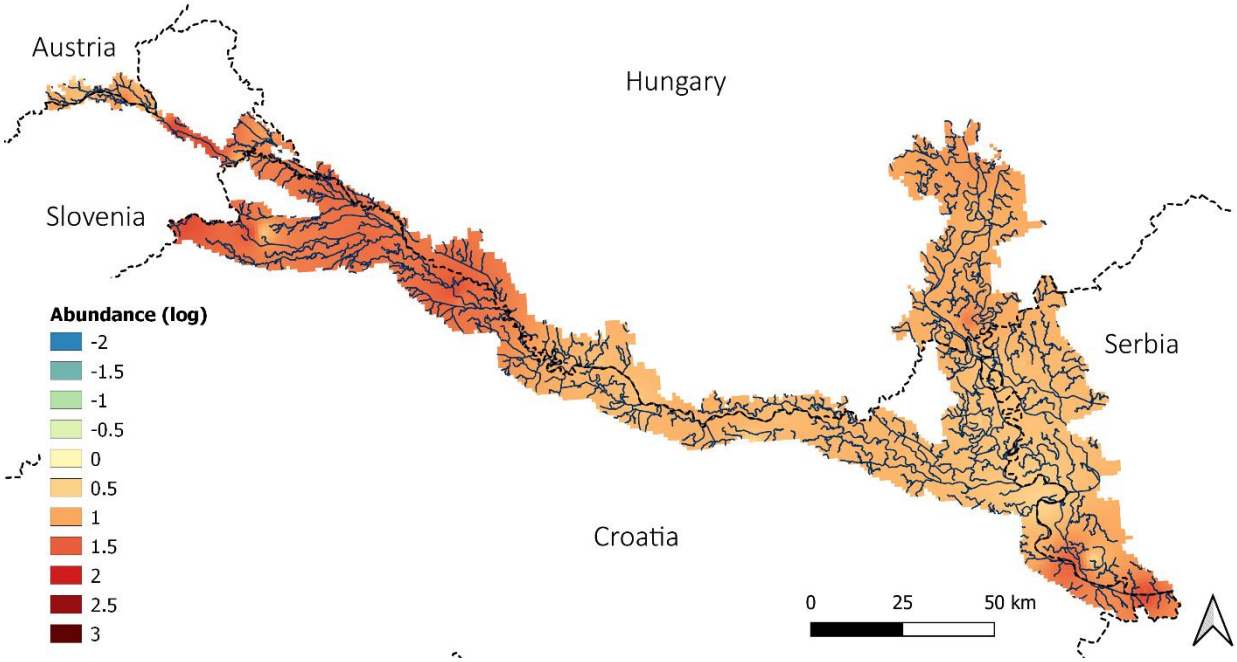

Figure 5: Risk map of alien plant abundance in 2021 with the simulation according to the RCP8.5 scenario (modeled using RCM MPI-CSC-Remo2009).

2041-2060

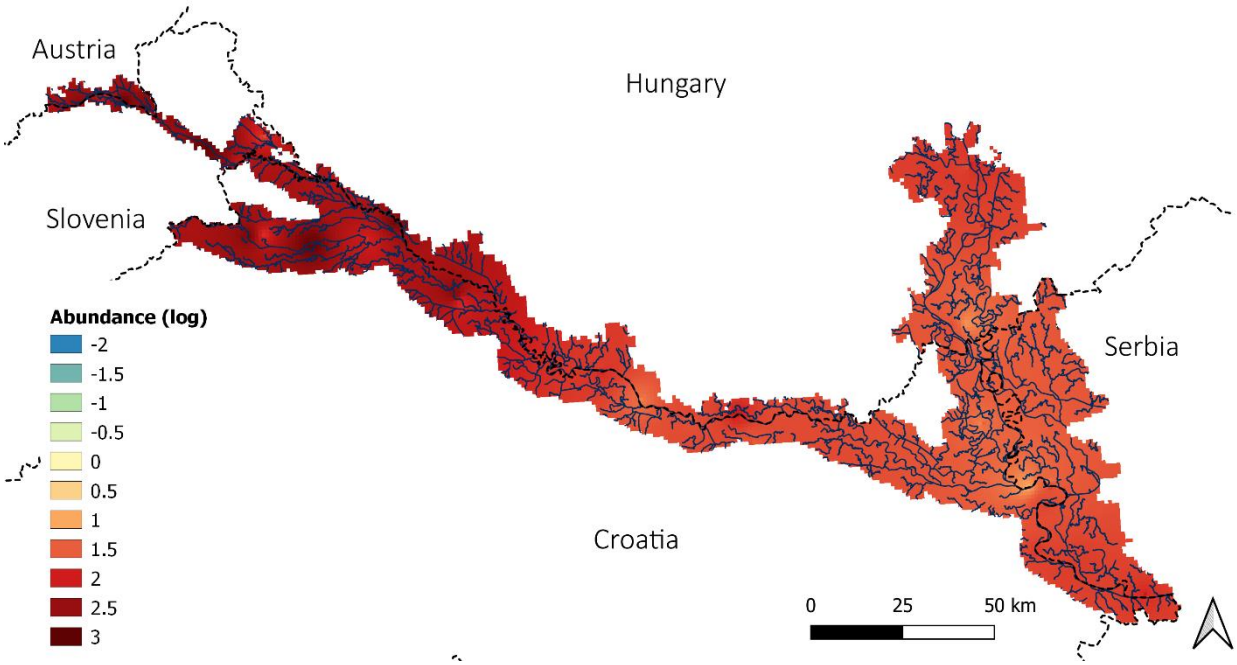

Figure 6: Risk map of alien plant abundance for the period 2041-2060 with the simulation with the simulation according to the RCP8.5 scenario (modeled using RCM MPI-CSC-Remo2009).

Literature:

Chakraborty, D., Dobor, L., Zolles, A., Hlásny, T., Schueler, S., 2020. High-resolution gridded climate data for Europe based on bias-corrected EURO-CORDEX: The ECLIPS dataset. Geosci. Data J. gdj3.110. https://doi.org/10.1002/gdj3.110

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