

Pivovar M., Mezei P., Ďuračiová R., Jakuš R., 2025. Sentinel-2 and environmental data as predictors of the spatiotemporal dynamics of bark beetle (Coleoptera: Scolytinae) - induced tree mortality in natural spruce forests

Table S1 Scenes selected from the Sentinel imagery. The forest cover was classified for each year. We assessed the types of large-scale disturbances based on a priori knowledge of their occurrence within a specific year.

Year	Acquisition date	Sensing time	Sentinel launch	Mapped disturbances
2015	October 3	09:40 a.m.	S2A	W, HF*
2016	September 30	09:50 a.m.	S2A	W, BB, HF*
2017	October 2	09:40 a.m.	S2A	W, BB, HF*
2018	September 30	09:50 a.m.	S2A	W, BB, HF*
2019	September 22	09:40 a.m.	S2A	W, BB, HF*
2020	September 21	09:40 a.m.	S2B	W, BB, HF*
2021	September 11	09:40 a.m.	S2A	W, BB, HF*

*BB – Bark Beetle caused tree mortality, HF – Health Forest, W – Windthrow

Table S2 Extent of forest damage and area of healthy forest obtained using MAXL supervised classification.

Type	Year	Area (ha)
Forest	2015	1706,94
	2016	1706,94
	2017	1461,40
	2018	1529,64
	2019	1635,05
	2020	1539,47
	2021	1503,09
Initial	2016	21,33
	2017	15,31
	2018	2,94
	2019	1,12
	2020	5,29
Spread	2021	5,49
	2016	184,78
	2017	181,78
	2018	127,34
	2019	51,72
Windthrow	2020	139,9
	2021	115,11
	2015	401,28

The data from which Fig. 3 was created divided by bark beetle infestation type, windthrow and healthy forest are shown in Table S2.

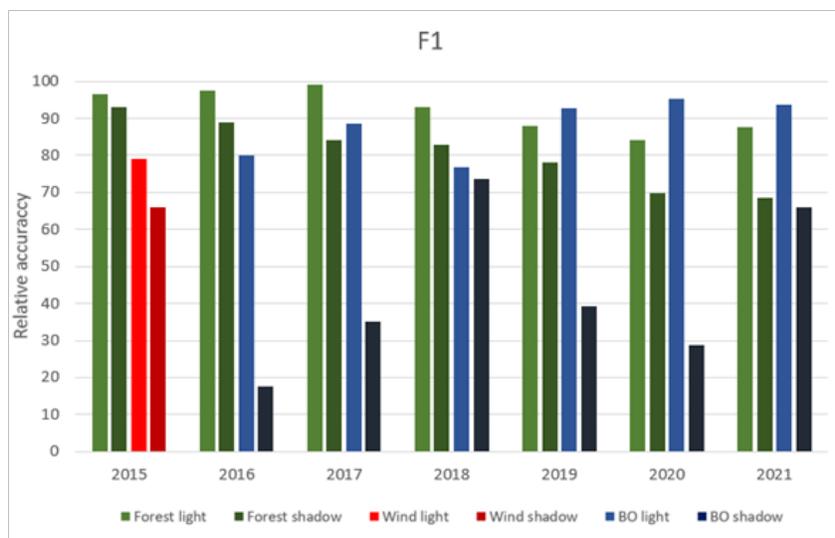


Fig S1: Harmonized mean accuracy and recall of MAXL classification using F1 scores for each forest damage class and healthy forest.

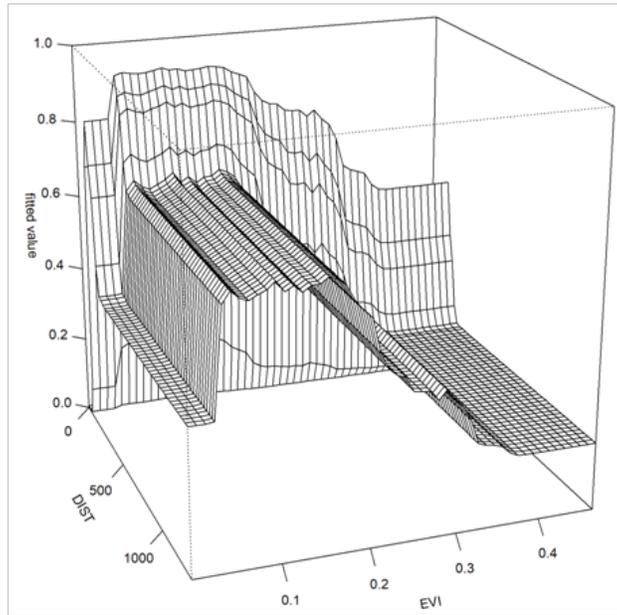


Fig S2: Prediction of bark beetle infestation on previously undamaged forest stands in a combination of strong correlations of spatial and spectral characteristics in 2017.

As an example of the dependence of the vegetation index EVI with the spatial characteristic Distance is shown in Fig. S2, in which we can see the strong influence of the bark beetle infestation within a distance of about 80 meters on parts of the forest that do not touch the damaged forest of the previous year and have a relatively higher level of physiological stress.

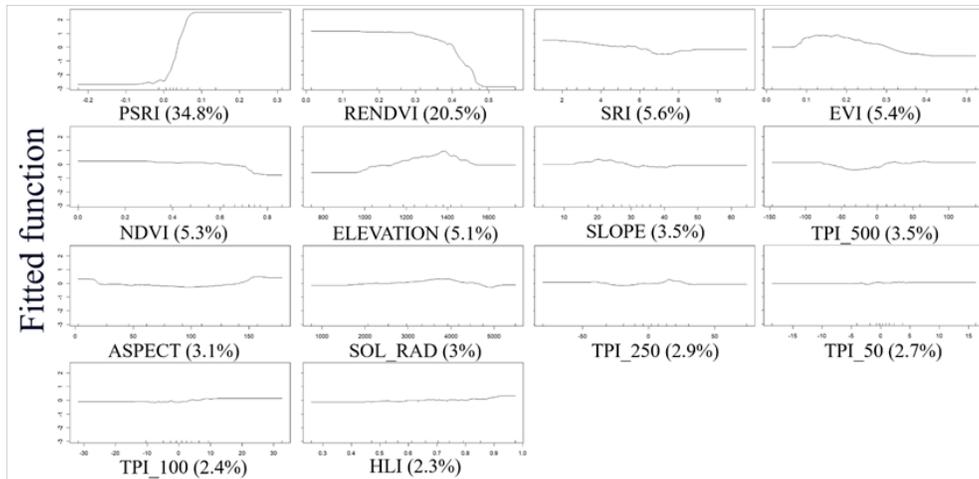


Fig S3: All predictor variables for wind disturbance based on BRT analysis in the Suchá dolina valley in 2014. The units of the x-axis variables are listed in Table 1.

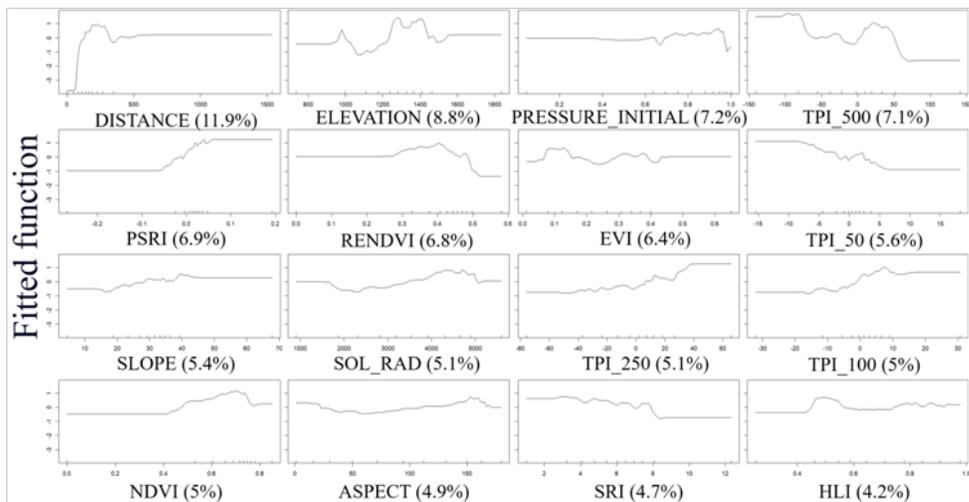


Fig S4: All predictor variables for initial bark beetle caused tree mortality based on BRT analysis between 2015 and 2016.

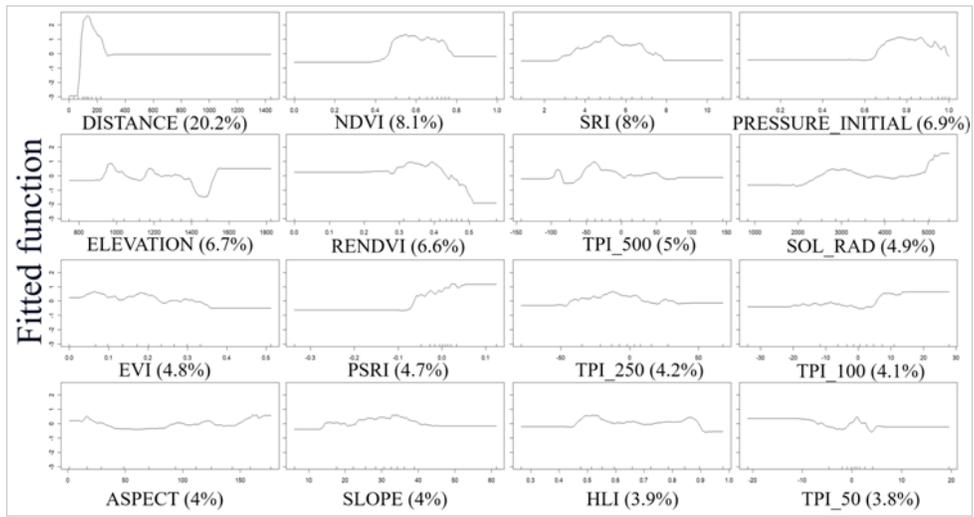


Fig 55: All predictor variables for initial bark beetle caused tree mortality based on BRT analysis between 2016 and 2017.

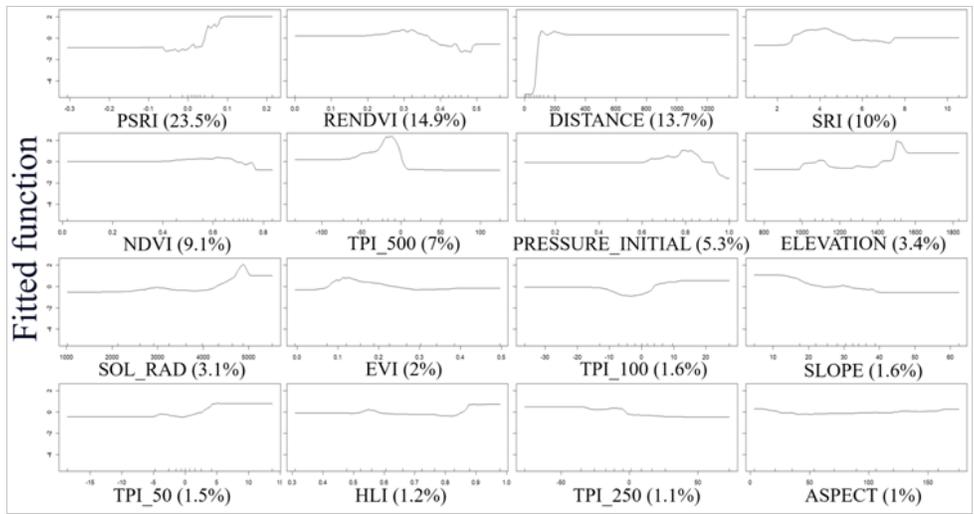


Fig 56: All predictor variables for initial bark beetle caused tree mortality based on BRT analysis between 2017 and 2018.

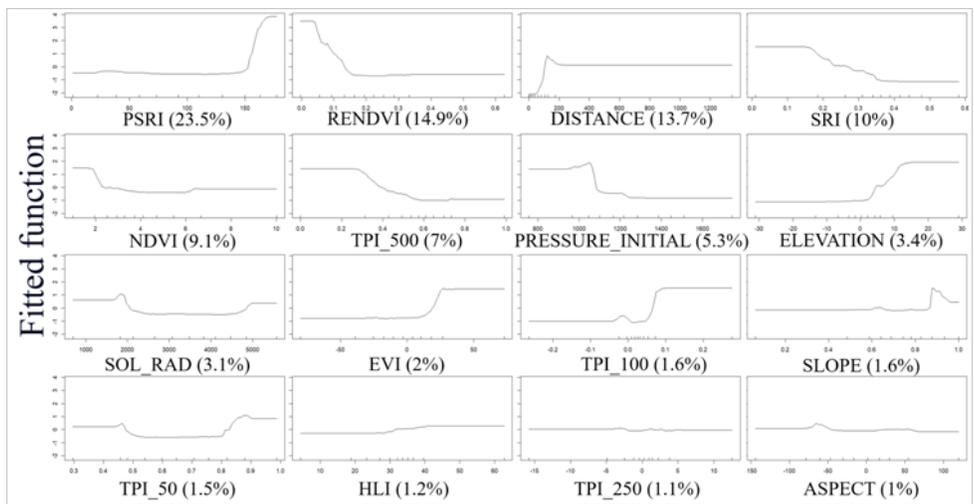


Fig 57: All predictor variables for initial bark beetle caused tree mortality based on BRT analysis between 2018 and 2019.

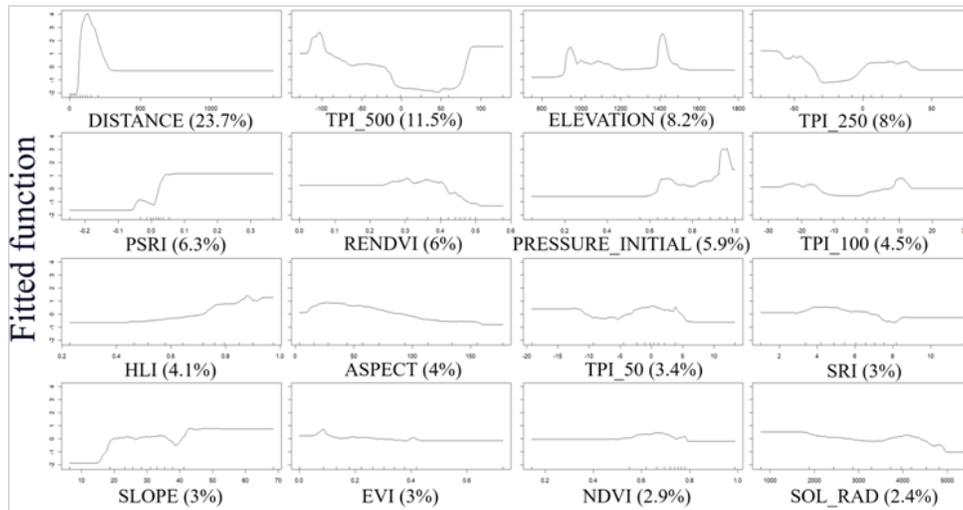


Fig S8: All predictor variables for initial bark beetle caused tree mortality based on BRT analysis between 2019 and 2020.

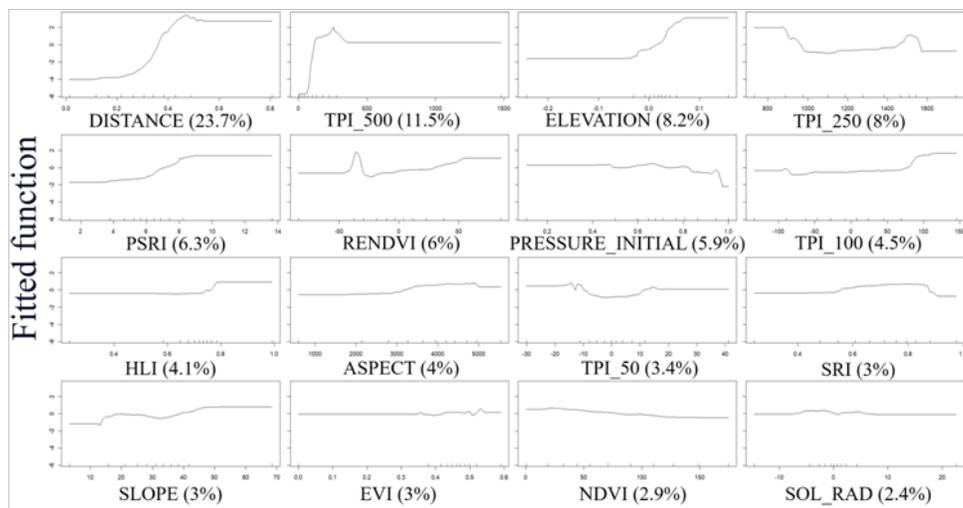


Fig S9: All predictor variables for initial bark beetle caused tree mortality based on BRT analysis between 2020 and 2021.

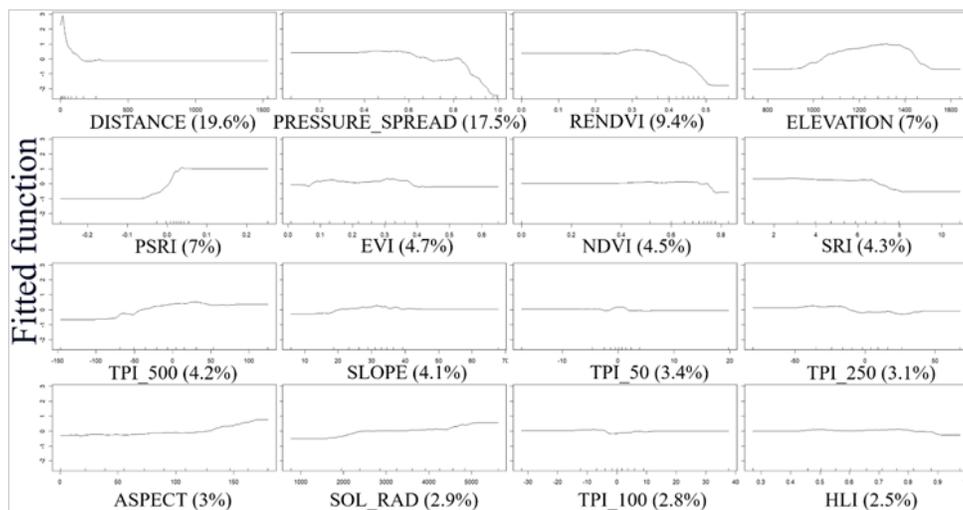


Fig S10: Most important predictor variables for the spread of bark beetle-induced tree mortality between 2015 and 2016.

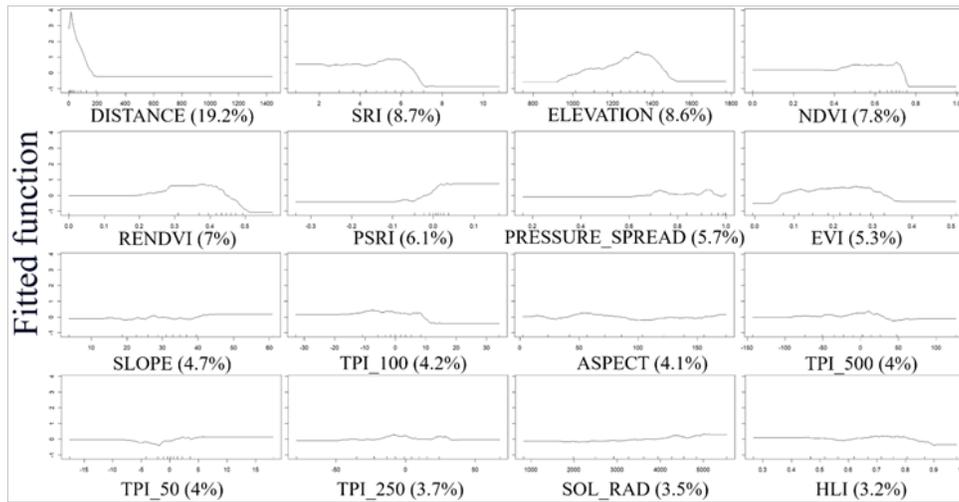


Fig S11: Most important predictor variables for the spread of bark beetle-induced tree mortality between 2016 and 2017.

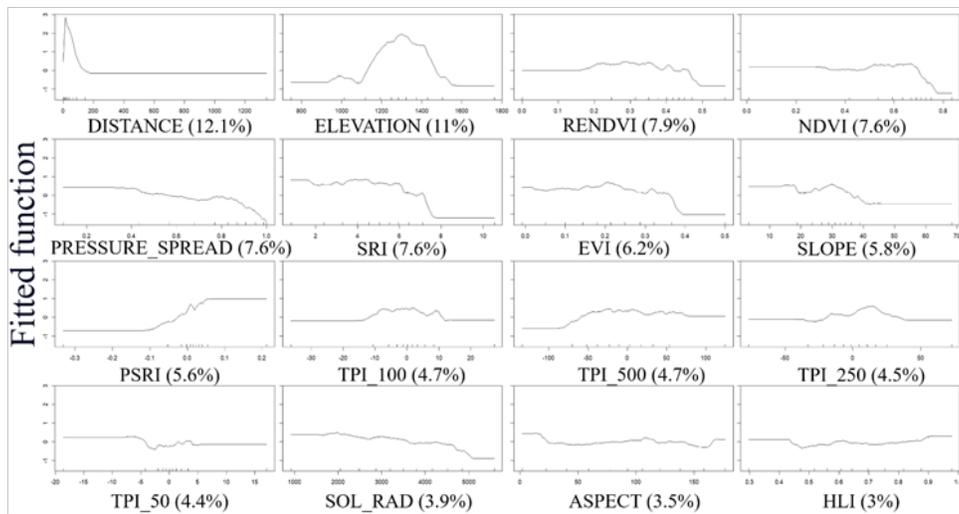


Fig S12: Most important predictor variables for the spread of bark beetle-induced tree mortality between 2017 and 2018.

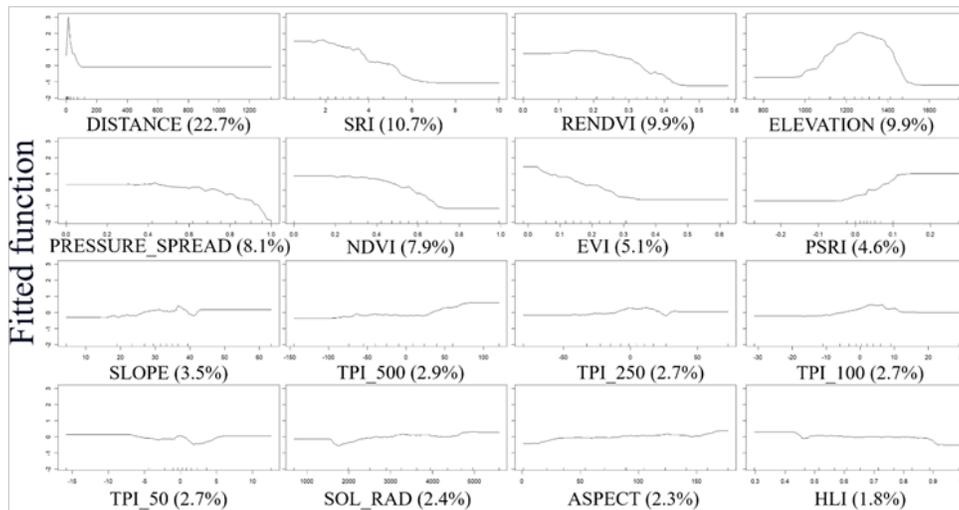


Fig S13: Most important predictor variables for the spread of bark beetle-induced tree mortality between 2018 and 2019.

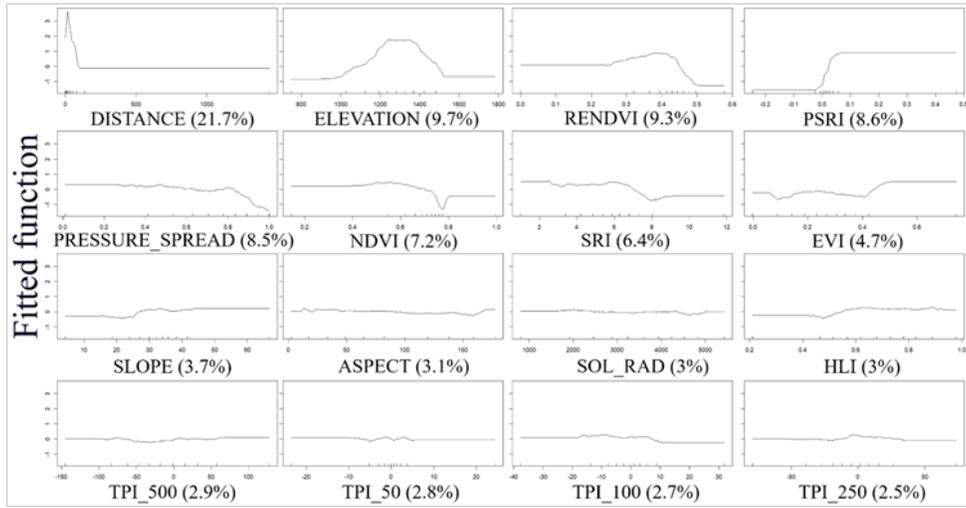


Fig S14: Most important predictor variables for the spread of bark beetle-induced tree mortality between 2019 and 2020.

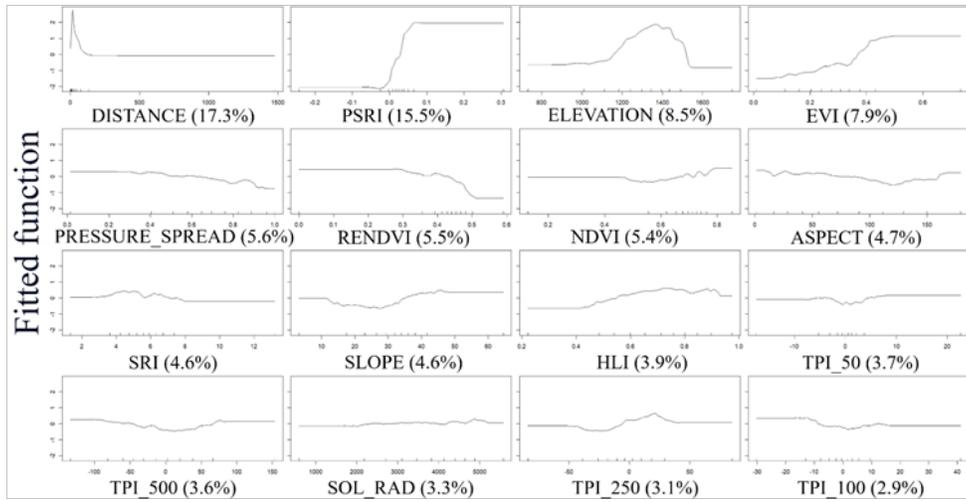


Fig S15: Most important predictor variables for the spread of bark beetle-induced tree mortality between 2020 and 2021.