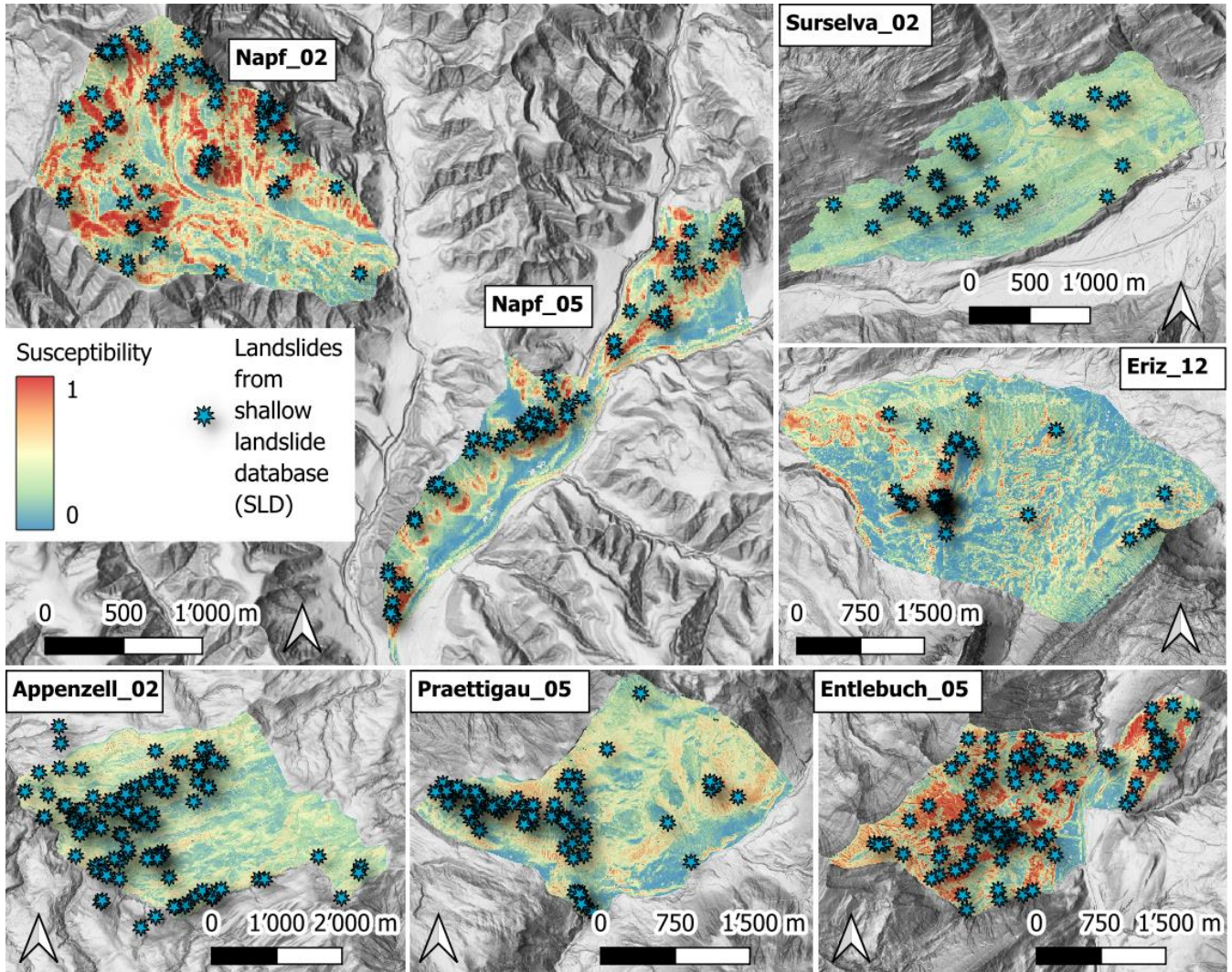


Figure S1. Partial dependence plot of each explanatory variable used in the independently trained model over the canton Bern. The trends indicate average change in predicted susceptibility over all raster cells of the training area. TWI stands for Topographic Wetness Index, TPI for Topographic Position Index and NDVI for Normalized Difference Vegetation Index. Prec_60min_30y and Prec_24h_30y stand for extreme precipitation events with a return period of 30 years in durations of 60 minutes or 24 hours, respectively; and Prec_60min_30y_per_mean as well as Prec_24h_30y_per_mean for these attributes divided by mean annual precipitation. Categorical variables are displayed in column bars. *Forest* indicates whether cells are located outside forests (0) or inside forests (1). *Main geological classes* assigns the landscape into different main geological subsurface material: (1) unconsolidated material, (2) sedimentary rocks, (3) magmatic rocks, (4) metamorphic rocks, and (5) lakes and (6) glaciers. *Mixed geological classes* uses the same categories, with additional differential for quaternary unconsolidated material into: (210) Silts to sands, with gravel, stones and blocks, (211) Silts to silty sands, often clayey, mostly calcareous, (212) clayey silts to clays with sand layers, (220) gravels and sands, (230) gravels and sands, partly with clayey or silty layers, (231) sands, gravels, stones and boulders, (232) boulder debris and hanging debris (Swisstopo, 2025b). *Hydrogeological classes* assigns areas into different productivities of ground water resources:

- 15 (1) less productive groundwater resources in fissured and porous media, (2) productive groundwater resources partly outside valley floors, (3) areas without productive groundwater resources, (4) very productive groundwater resources in valley floors, (5) less productive groundwater resources, (6) undetermined areas, and (7) groundwater resources in karst-prone solid rock, (8) glaciers, (9) lakes and rivers.

20



25 Figure S2. Susceptibility maps of the seven shallow landslide database (SLD) perimeters not shown in Fig. 2. Trained based on the canton of Bern independently of the SLD.

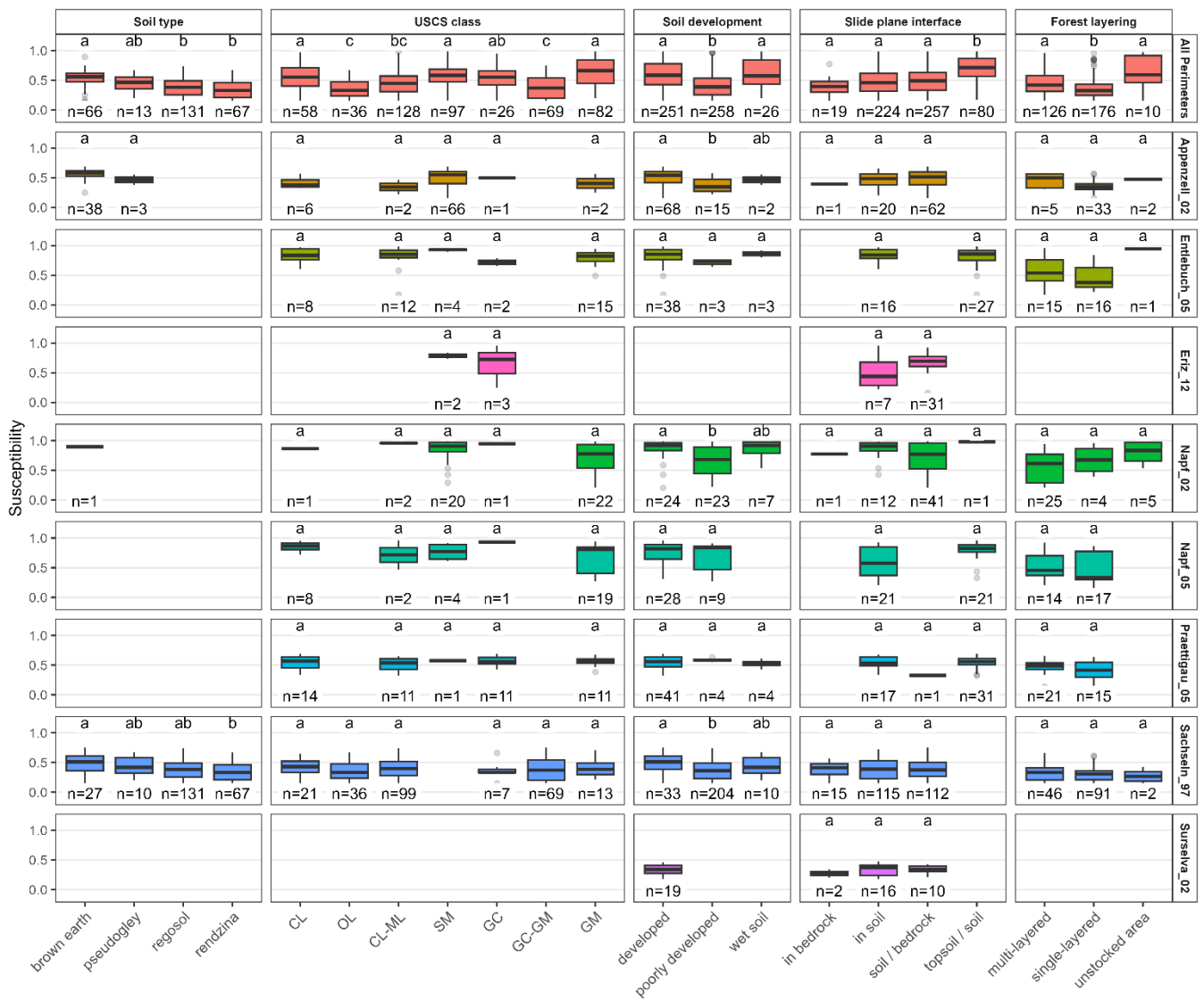
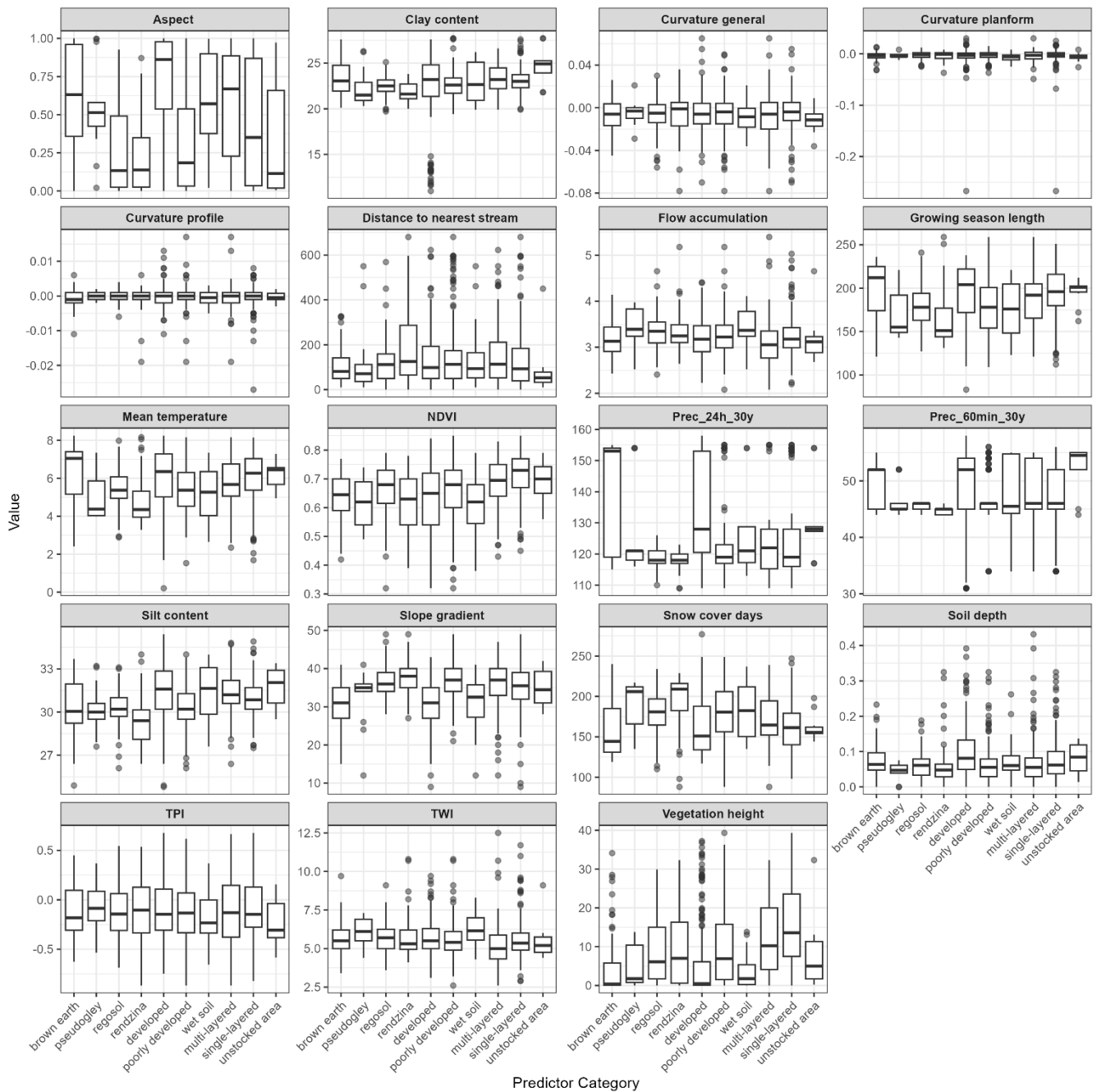


Figure S3. Distribution of predicted susceptibility values based on the independent model of the hidden variables with the highest effect sizes (Fig. 4), shown as compound overall perimeters (top row) and separately for each SLD perimeter (bottom rows). Lowercase letters denote statistical significance ($p < 0.05$) based on Dunn's test with Bonferroni p-value adjustments; distinct letters indicate significant differences between groups within the same category and perimeter. Unified Soil Classification System (USCS) are sorted from fine-grained to coarse-grained classes: CL = silty clay, OL = organic silt, CL-ML = clayey silt, SM = silty sand, GC = clayey gravel, GC-GM = silty to clayey gravel, GM = silty gravel.

30

35



40 **Figure S4.** Comparison between the main categories of the hidden variables *soil type*, *soil development* and *forest layering* (x-axis) versus the numerical explanatory variables used to in the dependently trained Random Forest model (y-axis). TWI stands for Topographic Wetness Index, TPI for Topographic Position Index and NDVI for Normalized Difference Vegetation Index. Prec_60min_30y and Prec_24h_30y stand for extreme precipitation events with a return period of 30 years in durations of 60 minutes or 24 hours, respectively.