Supplementary materials

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1 Country specific protocols

1.1 Finnish National Forest Inventory

We used data from the eighth NFI (NFI8) of Finland sampled in the period 1985-1986 to 1995. For the inventory dataset we used information from plots surveyed in 1995. The sample plots are located in a systematic grid across the country of plot clusters in forested areas (Mäkipää & Heikkinen, 2003). In Southern Finland the grid is 16 km by 16 km square, with four plots in each cluster at 400 m intervals, while in Northern Finland the grid is a 24 km by 32 km rectangle with three plots per cluster, at 600 m intervals. These permanent sample plots were sampled using a variable radius technique with two concentric circular subplots of radius 5.64 m (i.e. 100 m^2) for trees with a diameter at breast height (DBH) below 10.5 cm and 9.77 m (i.e. 300 m^2) for trees with a DBH above 10.5 cm.

1.2 French National Forest Inventory

The French NFI (IFN 2014) is based on a systematic 1 km^2 square grid covering the entire country. A forest is defined in the French NFI as a stand of more than 0.05 ha and wider than 20 m in which crowns from forest trees can reach 5 m and cover more than 10 percent of the area. The whole grid is measured in 5 years and the 5-year sample is divided into five systematic annual subsamples. Trees are measured in three concentric plots, depending on their circumference at 1.3 m height. Trees with a circumference above 23.5 cm (corresponding to a DBH of 7.5 cm) are measured on a 6 m radius plot; trees with a circumference above 70.5 cm (DBH = 22.4 cm) are measured on a 9 m radius plot; trees with a circumference above 117.5 cm (DBH = 37.4 cm) are measured on a 15 m radius plot; trees with a circumference below 23.5 cm are not measured. For living tree, radial growth over the last five years is measured on short cores. See Bourdier et al. (2016) for details on the processing of the data to compute basal area growth at the plot scale.

1.3 German National Forest Inventory

We used information from the first and second German NFI. The German NFI uses a systematic grid of clusters, sampled during the periods 1986-1990 (undertaken in West Germany only) and

2001-2002. The size of the sample grid is 4 km by 4 km, however, it is reduced in some federal states to either 2.83 km by 2.83 km or 2 km by 2 km. Each cluster is a quadrangle of 150 m in length with a sample plot on each corner (Kandler, 2009). Trees with a DBH above 10 cm in the first inventory and above 7 cm in the second were selected by the angle-count method with a basal area factor (BAF) of 4 m^2ha^{-1} if they are alive or recently dead.

1.4 Spanish National Forest Inventory

We used information from the second and third Spanish NFI (surveyed during the periods 1986-1996 and 1997-2007, respectively). The Spanish NFI plots are located on a 1 km^2 grid over forested regions (Villaescusa & Díaz, 1998; Villanueva, 2004). Spanish NFI plots were sampled using a variable radius technique with four concentric circular subplots of radius 5 m, 10 m, 15 m and 25 m. Within each subplot, trees were included in the sample according to their DBH, with trees smaller than 12.4 cm measured in the 5 m radius subplot, those of 12.5-22.4 cm in the 10 m radius subplot, those of 22.5-42.4 cm in the 15 m radius subplot, and those with a DBH above 42.5 cm in the 25 m radius subplot.

1.5 Swedish National Forest Inventory

The permanent Swedish inventory uses a regular sampling grid and includes about 4,500 permanent tracts, each surveyed every five years. Plots in the first census were surveyed between 2003 and 2005 and plots in the second census were surveyed between 2008 and 2010. The tracts are rectangular and have different dimensions depending on the location within the country; each tract has between four and eight circular sample plots. All trees with a DBH above 10 cm are sampled in a 10 m radius.

Country	Protocol method	Survey Dates	Plot radius/ minimum DBH	Plot radius/ minimum DBH	Plot radius/ minimum DBH	Plot radius/ minimum DBH
Spain	Variable radius	1986/1996 1997/2007	5 m / 7.5 cm	10 m / 12.5 cm	15 m / 22.5 cm	25 m / 42.4 cm
France	Variable radius	Yearly 20052011	6 m / 7.5 cm	9 m / 22.5 cm	15 m / 37.5 cm	
Sweden	Variable radius	2005/2010 2008/2010	10 m / 10 cm			
Finland	Variable radius	1985/1986 1995	5.64 / <10.5 cm	9.8 m >10.5		
Germany	Angle count 4 m^2ha^{-1}	1986/1990 2001/2002				

2 SDM evaluation

For each species, probability of presence is fitted using an ensemble model. Each model (Generalized Linear Models, Generalised Additive Models, Generalized Boosted Models and Random Forests) are evaluated using two discrimination scores: Area Under the Curve (AUC) and True Skill Statistic (TSS). Results are summarised in figure 1.

References

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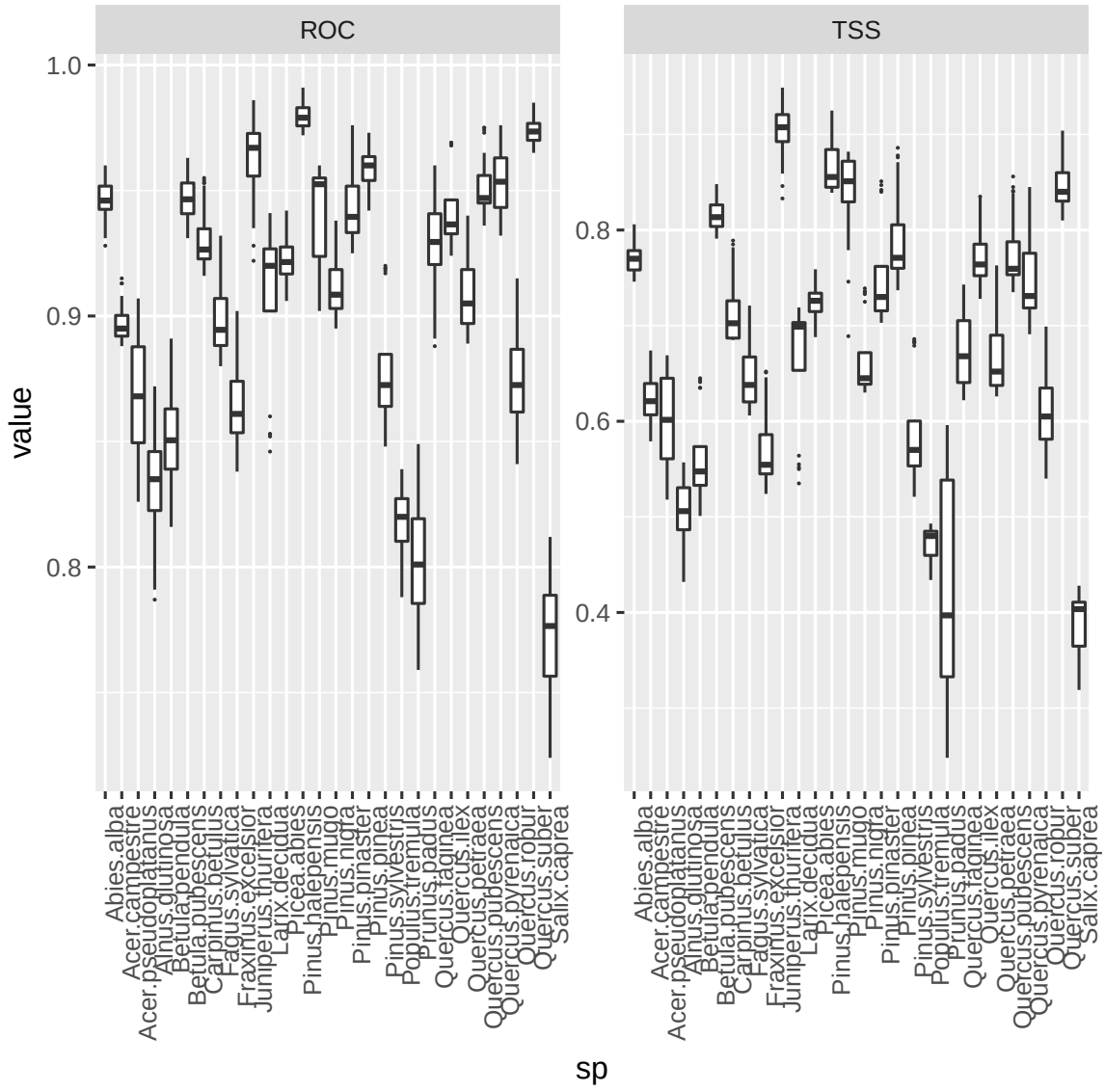

Figure 1: Discrimination scores (Area Under the Curve on the left, True Skill Statistics on the right) for every species. Boxplots summarise the scores from different model formulation (GLM, GAM, GBM and RFF).