Seedlings of 16 dipterocarp (Dipterocarpaceae) tree species were tested for their tolerances to flooding on lowland alluvial flats in Sepilok Forest Reserve. The Dipterocarpaceae contributes around 50% of canopy trees in the lowland tropical forests of Borneo28,29. Rainfall peaks from November to February (Fig. S2), during which time ephemeral shallow pools can form in the alluvial valley bottoms of lowland forests creating a heterogeneous landscape. We planted 2048 seedlings within 32 plots over the micro-topographical gradient of the alluvial zone. Seedlings were 3-4 months old when planted, at a stage shortly after loss of cotyledons and emergence of the first true leaves. Seedlings were censused every three months for one year. We mapped micro-topography using a laser lever at all plots and used mean flooding depth during the wetter period of the year (November to February) as a relative baseline for comparison among plots. We determined soil pH, and soil texture at the plot level. During periods of water inundation, depth of inundation was measured for each individual seedling.

All adult dipterocarps in the 160ha plot and four and a half 4 ha plots were mapped and tagged, with distributions being overlaid on a digital terrain model. For the main 160 ha forest plot, we used a quadratic equation to model the probability of occurrence of each species along elevation and hydrological gradients. Integrated Nested Laplace Approximation and Stochastic Partial Differential Equations (INLA-SPDE) were used for the analysis to account for spatial auto-correlation in the data using a matern correlation function30,31. The conditional predictive ordinate was used to select the most parsimonious model32.

Wood density measurements were determined from the global wood density database33. We combined the two analyses presented to understand the relationship between seedling mortality, adult distribution and community composition. Flooding sensitivity was calculated for each species by subtracting the probability of mortality of seedlings that were not flooded from those that were flooded (the statistic: absolute risk increase)34. The maximum peak of the quadratic equation describing the relationship with elevation was used to assign where adults of each species were most likely to be found along the elevation gradient. We ran regressions and ANOVA models weighted with species abundances to investigate the effects of wood density and flooding sensitivity on adult distributions (Fig. 2).

We tested the predictions of statistical model against the median elevation of 13 co-occurring species in the 18 ha of forest outside the 160ha plot. Each 4ha forest plot was at least 260 m apart, and we suggest plots are independent. The predicted elevations of each species from our statistical model were used to explain the variation in the median elevation a species was found at in these areas, weighted by the abundance. We calculated the r2 for the weighted mean elevation (n = 13) and for all individuals (n = 304).

Traditional ideas on wood density distribution throughout the landscape combined with our results suggests that wood density is distributed as a wedge shape along elevation distributions. To test this hypothesis we carried out a quantile regression on all the plot data we have (178 ha) for adult dipterocarps (species = 36). We convert all plots into a ¼ ha lattice of subplots, with the mean value of wood density, and elevation for each ha (n = 720 quarter ha quadrats).

Community similarity map (Fig. 1c) used the same 12 elevation bands as above. Non-metric multidimensional scaling35 was used to calculate the dissimilarity of each elevation band using all individual in the plot (species = 42), and axis 1 was used to create the map. We provide data and code for analysis found at *github.com/t03jam8* in the *ForestFloodingSensitivityAnalysis* repository.