**Variation among tree species in their environmental tolerances can contribute to species coexistence through niche partitioning**1**. Topographical distributions of tropical tree species have long been associated with local soil water requirements**2–5**, but clear evidence for traits influencing these patterns is not forthcoming. Decreasing water availability at higher elevations appears to impose an upper barrier to many tree species distributions**2,4,6–9**, but factors mediating lower elevational limits remain unresolved**3,10**. We show that water inundation episodes constrain species distributions at lower elevational gradients in tropical forests. Estimates of species-specific seedling responses to water inundation accurately predicted adult tree distributions in a large-scale forest dynamics plot. Our analysis also indicates that water inundation provides an additional niche axis that may partially explain the occurrence of high wood density species within wet low-lying areas of tropical forests. Higher adult wood density predicted tolerance of water inundation as seedlings. However, we found that seedling wood density values were unrelated to tolerance. In a separate experiment, we found that increasing frequencies of inundation typically increased the wood density seedlings by 20% across the gradient. Moreover, adult wood density values predicted the plasticity. Our results suggest that the distribution of higher wood density species on low lying nutrient-rich alluvial forest is perhaps related to the seedlings capacity to grow high wood density under stressful conditions, rather that providing tolerance itself. This may be interpreted as the capacity to grow heavier wood under reduced decline carbon intake during periods of stress. The differential seedling responses to water inundation captures larger scale filtering processes that determine adult topographical distributions of species. However, may also point towards as a potential trade-off between tolerances across the soil water gradient. Given our findings, increasingly variable rainfall amplitude in the region**11 **is likely to affect the spatial structure, species composition, and diversity of future forests.**