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An Optimization Model that Links Masting to Seed Herbivory

Masting is a life history strategy whereby perennial plants have one or more years of little or no reproduction, punctuated by years with massive reproduction events. The literature on masting focuses on description of this behavior, particularly the common observation that individuals in a population act in synchrony. To date, there is no published work that connects masting to characteristics of the ecological niche of the plant species, such as the overall growing capacity or the extent of seed herbivory. In this study, we develop a resource-based optimization model with seed herbivory risk as a key parameter, and we show that the optimal strategy for such a scenario can be periodic masting, with the masting interval an increasing function of seed herbivory risk. In particular, this model suggests one possible reason why a species of conifer in Norway exhibits a masting cycle of two years in part of the country and a cycle of three years in another part.